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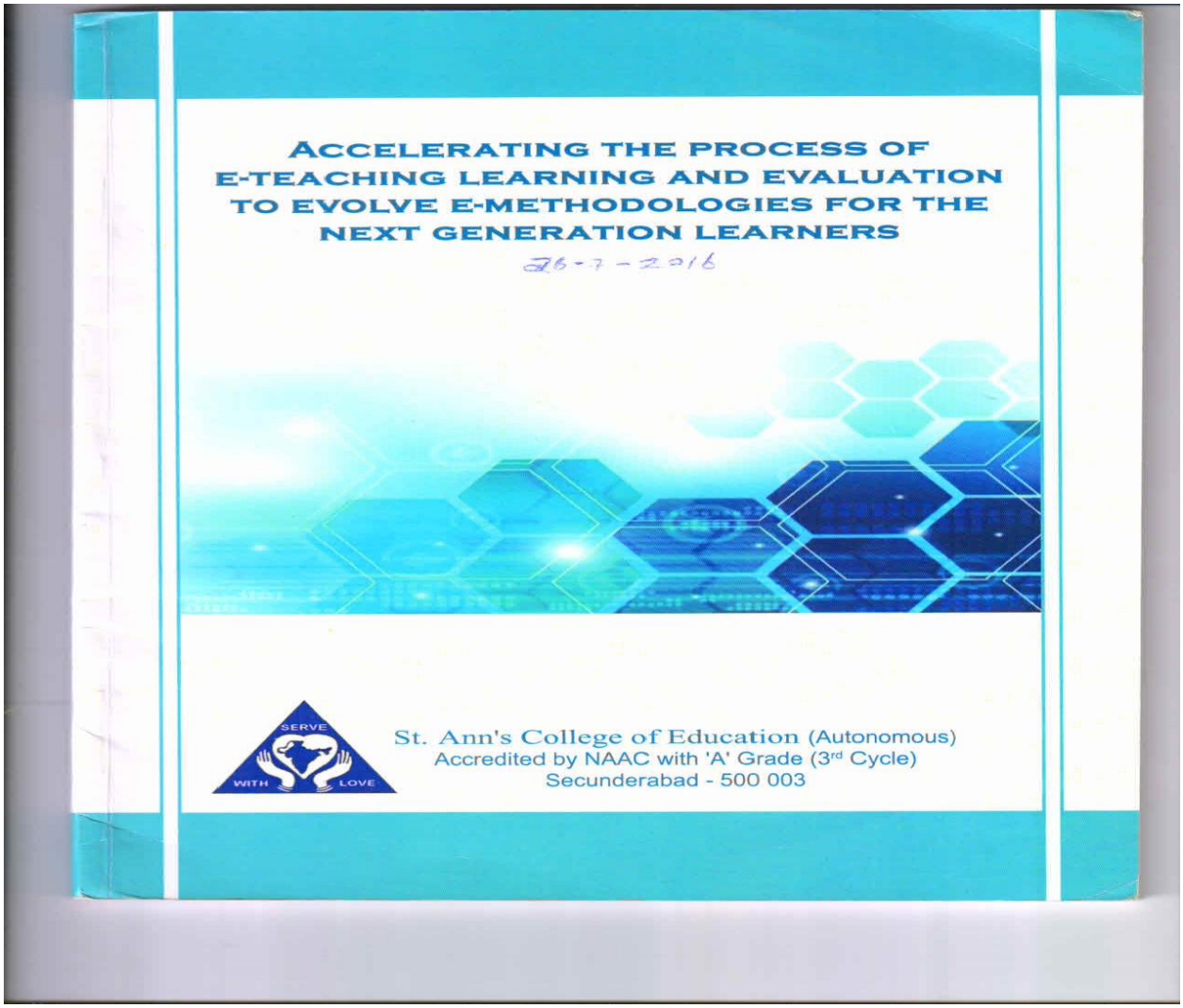
1. Published a paper titled *"Use of ICT in Enhancing the Quality of Teaching and Learning"* in the National Seminar on *"Accelerating the Process of E-Teaching Learning and Evaluation to Evolve E-Methodologies for the Next Generation Learners"* organized by St.Ann's College of Education(Autonomous), Secunderabad with ISBN 978-81-931143-3-9 on16.07.2016.



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USE OF ICT IN ENHANCING THE QUALITY OF TEACHING AND LEARNING

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Abstract

Information Communication Technology plays a great role in changing and modernizing educational systems especially in teaching and learning process. The use of ICT in the class room assists more student-centred learning and creates a learner friendly environment. ICT-driven infrastructure in Teacher and Higher education systems can ensure academic excellence, quality instruction and effective leadership in a knowledge-based society. It has opened new challenges for the teachers and students to equip themselves and to integrate technology in teaching and learning in order to make the learning effective and interesting. The innovations that ICT has brought in teaching learning process include: e-learning, e-communication, quick access to information, online student registration, online advertisement, reduced burden of keeping hardcopy, networking with resourceful persons and so on. Presently, technologies like Mobile devices, Computer-based delivery of education, Podcasting, Power Point, interactive boards, Video Conferencing and other novel techniques and methods are used in the classroom immensely to enhance the quality of teaching. The paper discusses the Importance of Using ICT in Teaching –Learning, how ICT can enhance the quality and accessibility of education, and different types of ICT tools that can be used in the classroom to improve the quality and to make the teaching and learning efficient and productive.

Keywords: Information Communication Technology, quality, teaching and learning

Introduction

In a fast changing world, basic education is essential for an individual to access and apply information. The individuals can access information easily through Information Communication Technology. ICTs by nature are tools that encourage and support independent learning and contemporary ICTs are able to provide strong support for the learners to enjoy self-learning. All the more, the use of ICT in the classroom teaching-learning is very significant as it offers opportunities for teachers and students to operate, accumulate, manipulate, and retrieve information, encourage independent and active learning, and it motivates them to take responsibility to learn after school/college hours for planning and preparing lessons, designing materials and to use many other innovative techniques that enhances their teaching-learning competence. This type of individual learning helps the students to engage themselves in instructional activities and enhances their cognitive skills to solve complex problems. According to Daniels (2002) ICTs have become within a very short time, one of the basic building blocks of modern society. Today, several countries regard

understanding of ICT and mastering the basic skills and concepts of ICT as part of the heart of education. Hence, a teacher has to move ahead and update knowledge of modern techniques to meet the demands of changing world as ICT has the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005).

Impact of Using ICT in Teaching and Learning

A number of studies argue that the use of new technologies in the classroom is essential for providing opportunities for the learners to operate and access information that help them to face the present competitive society. It is proved that the traditional educational environments do not suit to prepare the learners to function or be productive in the industry or in workplaces. Grimus (2000) claimed that organizations that do not incorporate the use of new technologies in institutions cannot seriously claim to prepare their students for life in the twenty-first century. The integration of ICT in teaching and learning always improves the efficiency in the educational process and the learners enhance their self confidence and self-esteem. Moreover, the research studies proved that the use of ICT in education can help to develop memory retention, enhance motivation and deepens understanding. It can also be used to promote collaborative learning such as role playing, group problem solving activities and articulated projects. ICT can be a great resource to establish networks of interconnections and relations between persons. In addition to it, ICT widen the technical skills of the staff and students and they can make the learning very industrious and accelerating. Many individuals value the use of ICT to bring positive changes in working environment, handling and exchanging information, teaching methods, learning approaches, scientific research, and in accessing information. Teachers could use ICT to facilitate learning, critical thinking, recording, presenting and for delivery. The main purpose of using technology in teaching and learning process is to give better skills and knowledge to students to face the computer epoch. Therefore, the teacher can amalgamate the use of technology in teaching and motivate the learners to use the technology in learning to improve their performance and employability.

The teachers can access with Universities and colleges, teacher education institutions and national organizations like UGC, NCTE, NCERT and NAAC (National Assessment and Accreditation Council) etc. with the help of ICT. It aids to access online libraries journal and research enabled individuals learning. ICT provides constant and professional development by providing courses at virtual situation and orientation and new courses through video conferencing.

ICT enhances accessibility and quality of education

According to Zhao and Cziko (2001) three conditions are necessary for teachers to introduce ICT into their classrooms: teachers should believe in the effectiveness of technology, teachers should believe that the use of technology will not cause any disturbances, and

finally teachers should believe that they have control over technology. However, research studies show that most of the teachers do not make use of the potential of ICT to contribute to the quality of learning environments, although they value this potential quite significantly (Smeets, 2005).

The flexibility of delivery of education can be increased through ICT so that learners can access knowledge from anywhere and anytime. It can influence the way students are taught and how they learn as now the processes are learner centred and not teacher centred. This would prepare the learners for lifetime learning as well as to improve the quality of learning. In concert with geographical flexibility, technology-facilitated educational programs also remove many of the temporal constraints that face learners with special needs (Moore & Kearsley, 1996). One of the most essential contributions of ICT in the field of education is- easy access to learning. The learners with the help of ICT can browse through e-books, sample examination papers, previous year papers etc. and can also have an easy access to resource persons, mentors, experts, researchers, professionals, and peers-all over the world. This flexibility has heightened the availability of just-in-time learning and provided learning opportunities for many more learners who previously were constrained by other commitments (Young, 2002). The teachers can foster better teaching and learning environment with the integration of ICT as it has the wider availability of best practices and best course material in education.

Types of ICT tools used in the classroom

ICT places new demands on both students and teachers as the use of technology in teaching and learning has become inevitable to develop the individuals to face the challenging society. The learners must be clear about their interests, strengths, and needs and be able to communicate these to their teachers and mentors. They have to be self-directed in their learning, be able to reasonably organize their own learning process, draw help from teachers, peers, or experts when needed, and be able to reflect on their progress. Teachers need to engage in continues assessment to understand each students' strengths, needs, and progress and provide learners with the resources and guidance to engage them to acquire various industrial skills like doing projects that address their needs and interests, as well as meet curricular requirements. This would encourage the students to meet present day requirements to be fit into industrial jobs.

Mobile Devices

Mobile devices, or tablets, such as the Apple iPad, Google Tablet, and HP Slate, along with cell phones, iPods, and mp3 players that students are already using, offer a range of educational affordances. The new generation of mobile devices can store digital textbooks and library books for learners to access at anytime and anywhere, run augmented reality programs, and allow students to more easily take notes and share digital resources (Johnson et al., 2010).

Computer-based delivery of education

Computer-based delivery of education is one of the fastest growing trends in educational uses of technology. Christensen et al. (2007) predict that by 2019, 50 percent of all high school classes will be taught over the Internet. However, while providers of online education believe that it is effective in reaching and serving a wide range of students, only few researches has been performed to examine its effectiveness compared to face-to-face instruction in elementary and secondary educational settings. Much of the existing evidence on the effectiveness of online learning comes from research that has focused on higher education and professional development contexts (Barbour & Reeves, 2008; Means et al., 2009; Smith, Clark, & Blomeyer, 2005).

Power Point

Power point presentation meets the needs of visual learners and the learners can comprehend and learn the application easily especially new terms and vocabularies. It is the easiest teaching and learning tool to get the attention of all the students in the classroom. Most of the students are experts in making power point presentation and teachers could easily give a topic from the lesson and ask the learners to prepare PowerPoint and present it in the classroom. This would enhance the creativity, critical thinking and individual learning.

Podcasting

A podcast is essentially the modern version of tape recording. Podcasting allows the learners to record information and turn it into an MP3 file. These MP3 files can be listened to right on the computer or uploaded to an iPod or class blog/website.

The following are some of the advantages of Podcasting;

- It is user-friendly; students can record their own podcasts with a few quick clicks of the buttons allowing the majority of this activity to be student-centered.
- Addresses the needs of auditory and kinesthetic learners
- Synthesizes information
- Assesses student knowledge orally
- Allows students to teach one another
- Great for heterogeneous groups
- Can be used to record accountable talk
- Provides opportunities for English Language Learners (ELL) or students with Speech and Language Impairments to practice speaking
- Book discussions

Interactive Boards or Smart Boards

An Interactive White Board is a touch-sensitive screen that works in conjunction with a computer and a projector. Interactive whiteboards are good replacements for traditional

whiteboards or flipcharts as they provide ways to show students everything which can be presented on a computer's desktop. It is an effective way to interact with digital content and multimedia in a multi-person learning environment and a student-centered approach to teach language. The teacher can use smart board to improve students' language skills in play way method. There are number of learning activities can be carried out by using interactive whiteboard such as, manipulating text and images, making notes in digital ink, saving notes for later review by using e-mail, the Web or print, viewing websites as a group and demonstrating the lessons. The teacher also can create digital lessons and activities like correcting the errors in the paragraphs, writing skills through stories and so interactive Boards are powerful weapons for language teaching and learning.

Video Conferencing

Video conferencing is a system where two or more participants, based in different physical locations, can see and hear each other in real time using special equipment (NCTE, 2003). It connects with experts and it is a resource of learning. Hampel (2003) views video conferencing as a dominant tool for language learning which addresses the need for interaction and negotiation of meaning in a real communicative situation. Video conferencing can promote student communicative skills in a real sense (Hampel & Hauck, 2004). Thus Video conferencing is an authentic learning tool for the learners and teachers to develop their oral and listening skills.

Conclusion

The use and integration of ICT in education have a positive impact on teaching, learning, and research. Regardless of time and geographical barriers, technology has greater flexibility of learning that learners can access the education. It would provide comfortable environment and motivation for teaching learning process which seems to have an intense impact on students' performance and achievement. The use ICT tools like Mobile Devices, Computer-based delivery of education, Power point, Podcasting, Interactive Boards or Smart Boards, Video Conferencing and other technology in the classroom teaching and learning could enhance the skills of the learners and quality of education. To sum up, ICT can foster better quality in teaching and learning and improve the academic competency of the staff and students.

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Factors Affecting Learners' Oral Communication and Coping Strategies

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Abstract : English language is widely accepted as the major language because of its demand in the current job markets and also it equips the graduates with content knowledge as well as communication skills and competencies. In the case of English in India, more than two centuries, India has been directly and indirectly had influence of English language on all the fields, such as Education, Medical Science, etc. Today success of an individual depends upon his command over English language. Learning to speak a second or foreign language requires more than knowing its grammatical and semantic rules. Learners must also acquire the knowledge of how native speakers use the language in the context of structured interpersonal exchange, in which many factors interact. Therefore, it is difficult for EFL (English as a Foreign Language) learners, especially college students those who are first generation learners, to speak the target language fluently and appropriately. In order to provide effective guidance in developing competent speakers of English, it is necessary to examine the factors affecting learners' oral communication and coping strategies to develop oral communication. This paper explores these aspects so that the teachers can effectively help the learners to develop their abilities to communicate in the target language.

Key words:

Introduction

Speaking seems to be the most important skills of all the four skills (listening, speaking, reading and writing) because people who know a language are usually referred to as speakers of that language (Ur, 1996). The major goal of all English language teaching should be to give learners the ability to use English effectively, accurately in communication (Davies & Pearse, 2000). However, not all language learners after many years studying English can communicate fluently and accurately because they lack necessary knowledge.

Speaking a language is especially difficult for foreign language learners because effective oral communication requires the ability to use the language appropriately in social interactions. Diversity in interaction involves not only verbal communication but also paralinguistic elements of speech such as pitch, stress, and intonation. In addition, non-linguistic elements such as gestures and body language/posture, facial expression, and so on may accompany speech or convey messages directly without any accompanying speech. In addition, "there is tremendous variation cross- culturally and cross- linguistically in the specific interpretations of gestures and body language" (Brown 1994:241). Furthermore, different cultural assumptions about the purposes of particular interactions and expected outcomes of encounters also affect communication. Consequently, due to minimal exposure to the target language and contact with native speakers, adult EFL learners in general are relatively poor at spoken English, especially

regarding fluency, control of idiomatic expressions, and understanding of cultural pragmatics. Few can achieve native-like proficiency in oral communication.

The importance of Speaking

Of the four language skills (listening, speaking, reading, and writing), speaking, as most researchers agree, seems the most important. Wilson (1997) claimed that children who can translate their thought and ideas into words are more likely to succeed in school. He also pointed out that speaking skill does not need to be taught as a separate subject, but the four skills can be smoothly integrated. Pattison (1992) confirms that when individuals learn a language, they aim to be able to speak that language.

The nature of speaking

The nature of speaking has been discussed by many researchers. Byrne (1986:8) states that: Oral communication is tow-way process between speaker and listener (or listeners) and involves the productive skill of speaking and the receptive skill of understanding (or o listening with understanding). For him, speaker and listener participate in oral communication process, and they use a productive skill which is speaking and receptive skill which is listening, because speaking is an interactive process of constructing meaning that involves producing, receiving and processing information. Speaking is also a multi-sensory activity because it involves paralinguistic features such as eye-contact, facial expressions, body language, tempo, pauses, voice quality changes, and pitch variation (Thornbury, 2005, p.9) which affect conversational flow. It seems that culture is integral in how speaking is constructed which has implications for how English speaking is taught and learned. Brown and Yule (1983:13) also drew a useful distinction between two basic language functions. These are the transactional function, which is primarily concerned with the transfer of information, and the interactional function, in which the primarily purpose of speech is the maintenance of social relationships.

Another basic distinction when considering the development of speaking skills: distinguishing between dialogue and monologue. The ability to give an uninterrupted oral presentation is quite distinct from interacting with one or more other speakers for transactional and interactional purposes. While all native speakers can and use language interactionally, not all native speakers have the ability to extemporize on a given subject to a group of listeners. Brown and Yule (1983:19-20) suggested that most language teaching is concerned with developing skills in short, interactional exchanges in which the learner is only required to make one or two utterances at a time.

Factors contribute to communication apprehension

A) Age or maturational constraints

The interactive behavior of Second Language learners is influenced by a number of factors. Perhaps age is one of the most commonly cited determinant factors of success or failure in L2 or foreign language learning. Krashen, Long, and Scarcella (1982) argue that acquirers who begin learning a second language in early childhood through natural exposure achieve higher proficiency than those beginning as adults. Oyama's study (1976) also shows that many adults fail to reach native-like proficiency in a second language. Their progress seems to level off at a certain stage, a phenomenon which is usually called "fossilization"-the permanent

cessation of second language development. This shows that the aging process itself may affect or limit adult learners' ability to pronounce the target language fluently with native- like pronunciation (Scarcella and Oxford 1992). Even if they can utter words and sentences with perfect pronunciation, problems with prosodic features such as intonation, stress, and other phonological nuances still cause misunderstandings or lead to communication breakdown. Adult learners do not seem to have the same innate language-specific endowment or propensity as children for acquiring fluency and naturalness in spoken language.

B) Aural medium

The central role of listening comprehension in the L2 or foreign language acquisition process is now largely accepted. And there is little doubt that listening plays an extremely important role in the development of speaking abilities. Speaking feeds on listening, that precedes it. Usually, one person speaks, and the other responds through attending by means of the listening process. In fact, during interaction, every speaker plays a double role-both as a listener and a speaker. "While listening, learners must comprehend the text by retaining information in memory, integrate it with what follows, and continually adjust their understanding of what they hear in the light of prior knowledge and of incoming information" (Mendlsohn and Rubin 1995:35). If one cannot understand what is said, one is certainly unable to respond. So, speaking is closely related or interwoven with listening, which is the basic mechanism through which the rules of language are internalized.

C) Socio-cultural factors

Many cultural characteristics of a language also affect L2 or foreign language learning. From a pragmatic perspective, language is a form of social action because linguistic communication occurs in the context of structured interpersonal exchange, and meaning is thus socially regulated (Dimitracopoulou 1990). In other words, "shared values and beliefs create the traditions and social structures that bind a community together and are expressed in their language" (Carrasquillo 1994:55). Thus, to speak a language, one must know how the language is used in a social context. It is well known that each language has its own rules of usage as to when, how, and to what degree a speaker may impose a given verbal behavior on his/her conversational partner (Berns 1990). Due to the influence or interference of their own cultural norms, it is hard for non-native speakers to choose the forms appropriate to certain situations.

In addition, oral communication involves a very powerful nonverbal communication system, which sometimes contradicts the messages provided through the verbal listening channel. Due to a lack of familiarity with the nonverbal communication system of the target language, EFL learners usually do not know how to pick up nonverbal cues. As a result, ignorance of the nonverbal message often leads to misunderstanding. The following example is a case in point. One day, when an Indian student heard, "Let's get together for lunch sometime," he immediately responded to fix a specific date without noticing the native speaker's indifferent facial expression. Undoubtedly, he was puzzled when his interlocutor left without giving him an expected answer. It is evident that the student had not understood the nonverbal message, which illustrates that

the socio-cultural factor is another aspect that affects oral communication greatly.

D) **Affective factors**

"The affective side of the learner is probably one of the most important influences on language learning success or failure" (Oxford 1990:140). The affective factors related to L2 or foreign language learning is emotions, self-esteem, empathy, anxiety, attitude, and motivation. L2 or foreign language learning is a complex task that is susceptible to human anxiety (Brown 1994), which is associated with feelings of uneasiness, frustration, self-doubt, and apprehension. Speaking a foreign language in public, especially in front of native speakers, is often anxiety-provoking. Sometimes, extreme anxiety occurs when EFL learners become tongue-tied or lost for words in an unexpected situation, which often leads to discouragement and a general sense of failure. Adults, unlike children, are concerned with how they are judged by others. They are very cautious about making errors in what they say, for making errors would be a public display of ignorance, which would be an obvious occasion of "losing face" in some cultures. Clearly, the sensitivity of adult learners to making mistakes, or fear of "losing face," has been the explanation for their inability to speak English without hesitation.

Coping strategies to develop oral communication skills

Second Language learners need to practice the language regularly inside the classroom through performing different activities. Thus, effective teacher should vary the oral activities to encourage and involve the learners in the classroom interaction. Scrievener makes an important point that supports this idea, he said that: "the aim of communicative activity in class is to get learners to use the language they are learning to interact in realistic and meaningful ways. Usually involving exchanges information or opinion." (152) There are many different activities that can be done inside the classroom and help the learners to develop their speaking skill.

The following are some of the strategies or techniques that can be used in the classroom to enhance the oral communication of the learners;

1. Group Discussion

The most common activity used in speaking classes is group discussion. This activity gives the students the opportunity to talk and share their interests, opinions, and experiences. As **Hedge** said that the discussion must be limitless i.e. free discussion, here the students can use their background knowledge about that specific subject. Students often are unwilling to give their opinions in front of the whole class. So, to avoid such problems the easiest solution is dividing the class to groups because when getting into groups, the students will exchange ideas, offer suggestions, give remedies or even ask each other about a word or expression in their target language etc.

Teachers should be careful in planning and setting up a discussion activity. First of all, the topic must be interesting, easy to talk about, and touching their real-life situations. **Celle-Marcia** stated that "students need to be clear about what they are to discuss, why they are discussing it, and what outcomes is expected" (106). Second, well grouping or pairing students is a step for a successful discussion, and finally students should be reminded that each one should participate and have a specific responsibility in the discussion in order

to make all the students speak and use the target language.

2. Role-play

It is an enjoyable activity for most of the students particularly those who like to imitate the others. Role play is an authentic technique because it encourages a large number of students especially if it is based on real-life situations; moreover, it helps them to reduce their fears in front of the whole class because usually it should be performed in pairs or groups. Thus, each student has to perform a role. In addition to that, role play activity gives the students the opportunity to practice and develop variety of socio-cultural speech acts that are appropriate to the situation and to the characters. For example, when requesting, apologizing, complaining, thanking etc. This activity can be performed from prepared scripts, student's imagination or experience. The success of the role play depends on the choice of the topics and to the teacher's motivation. Hedge (280) argues that "it will depend on the willingness and motivation of the students to change the personae".

3. Communicative tasks

Those activities are very entertaining for both students and teachers because they make a sense of humor in the classroom, in addition they are directed to achieve some extra linguistic goals. Thornbury (79) proposed that communicative activities are characterized by some features such as a) the tasks should be from real-life situations b) achieving some outcome by using language in funny way c) make the students practice and interact. These communicative tasks enable the learners speak and engage in the classroom interaction.

4. Chain story

This activity is very interesting because the teacher tries to create a story with his/her students. First of all, s/he must make their students motivated to do such activity. Then s/he will begin the story after that he gives turns to the students. Each student should create a new sentence from his imaginations and by the end they finish with a new story.

Conclusion

In conclusion, speaking is one of the central elements of communication. In Second Language teaching, it is an aspect that needs special attention and instruction. In order to provide effective instruction, it is necessary for teachers of Second Language to carefully examine the factors, conditions, and components that underlie speaking effectiveness. The importance of oral communication, the nature of oral communication; factors contribute to communication apprehension like age, aural medium, socio-cultural factors and affecting factors together with sufficient language input and speech-promotion activities like **group discussion, role play, communicative tasks and chain story would** gradually help the learners speak English fluently and appropriately

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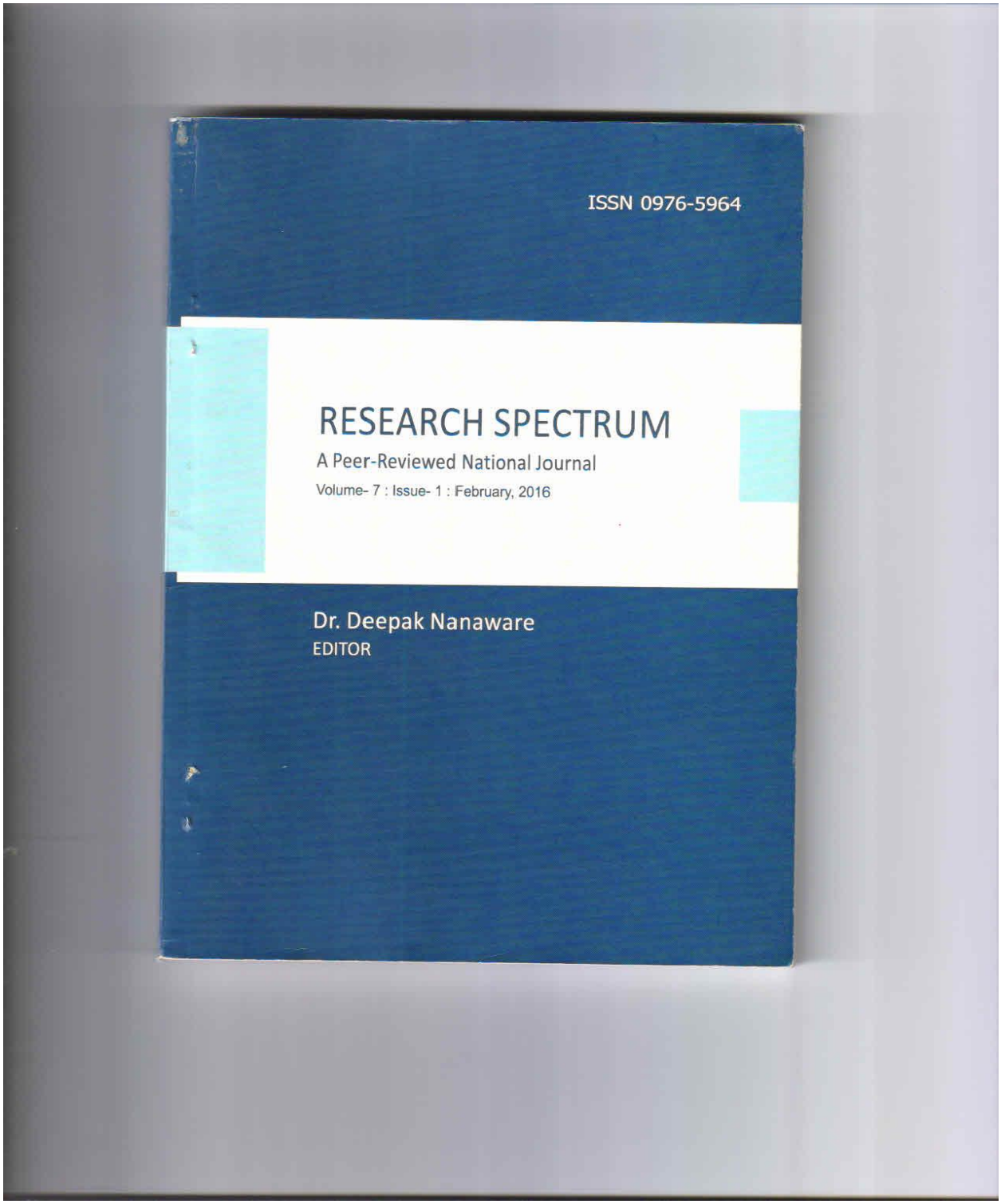

RE-READING OF FRANZ KAFKA'S *THE TRIAL* AS A PARABLE ABOUT THE HISTORY OF EUROPEAN CHRISTIANITY

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Abstract:

In the following essay an attempt has been made to examine the extent to which Franz Kafka's The Trial can be read as a parable about the history of European Christianity.

Keywords: *Franz Kafka, Ruropean Christianity, twentieth century.*

Franz Kafka (1883-1924) has inspired many of the great novelists of the twentieth century. Consequently, there is an incredible amount of literary criticism devoted to his work. The critical material discussing *The Trial* falls between two poles. On the one hand, Kafka is viewed through a psychological or religious lens that sees the tensions of his work as derived from an Oedipal complex or the heritage of the Judaic law. At the other extreme, where few tread, are the positivist approaches of Walter Benjamin, Gilles Deleuze, and Felix Guattari. This latter approach finds a new philosophy, a new politics, in Kafka that is as yet unexplored. Whatever the approach, there is general agreement that Kafka should be praised for his deft depiction of twentieth-century alienation and bureaucracy at the universal level.

The body of critical commentary on the works of Franz Kafka is huge enough to have warranted the description, "fortress Kafka," and the extant criticism on *The Trial* is no exception. Readings of the novel have spanned the range from Calvinist to postmodernist, by way of Marxism, feminism and post-

STRATEGIES TO IMPROVE LEARNERS' ORAL COMMUNICATION SKILLS

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Abstract

Oral communication skills are essential both within the classroom and society. Global competitiveness and increased knowledge sharing have accelerated the importance of oral communication skills in today's graduates. Accordingly, oral communication dominates assurance of learning standards and is frequently cited as one of the most desired graduate employability skills. English is a language that is indispensable in this modern world and in every sphere of life. This widely used global language has vast applications in any field one wants to venture. As such in this shrinking world that is getting united with the advancement in technology and communication, English oral communication skills play an important role. However, many people lack the ability to communicate in English and hence, often, suffer from inferiority complex. They fall back and lag behind others in this competitive world and often fail to reach the pinnacle of their career owing to the lack of oral communication skills. Hence, this paper explores the importance of improving oral communication for a successful career and personal effectiveness. It also presents various strategies to improve oral communication skills and principles of effective oral communication.

Introduction

Oral communication fulfills a number of general and discipline-specific academic functions. Students need to speak

well in their personal lives, future workplaces, social interactions, and political endeavors. They will have to attend meetings, make presentations, participate in discussions and arguments, and work with groups. Effective oral communication enables the learner's to build strong interpersonal, small group and large group relationships. It also improves their academic performance, increase their employment options, enhance their subsequent professional competence and improve their personal effectiveness. Employers value good oral communication skills because:

Staff needs to interact effectively and productively in, and on behalf of, the organization;

listening to and conveying information accurately is crucial;

giving instructions and explanations clearly is essential; and

engaging in constructive debate and contributing to meetings and committees is fundamental to the success of the organization.

The findings of Di Salvo, Larsen, & Seller (1974) indicate the following as the most important communication activities: listening, routine information exchange, advising, persuading, instructing and small group problem-solving. These were based on a survey of graduates of a college of business administration five years after they finished their university training. The results of the Di Salvo et al. (1974) study clearly show the significance of communication requiring strong personal contact at the interpersonal, small group and organization level. It is also a matter of fact that communication, unlike many other academic subjects, causes anxiety in students which could continue on into the organizational world.

Oral reporting skills act as a key to success in any career, especially in management. The stress on these skills has frequently

been discussed (Nelton, 1991; Francese, 1994; Lubin, 2007). A survey of 725 upper and middle managers identified presentation skills as the most important skill needed for success in today's business environment ("Critical Link," 1991). Maes, Weldy, and Icenogle (1997) also found managers mentioned oral communication skills as the top skill required.

Gail Golden, a consultant for RHR International, an executive-coaching firm, states that the skill "is really important for career success, promotions and professional credibility" (Lubin, 2007). Out of the 34 business-related skills, making effective oral presentations was ranked second by department chairs as the individual skill which they believed was most essential for graduating business students (Wardrope, 2002). Some studies suggest that new graduates of business programs are not equipped with the proper skills to orally communicate effectively (Gray, 2010). Sapp and Zhang (2009) found that in a study of 234 business supervisors over a five year period, "spoken communication skills" was cited as one of four skills of eleven where most skills development is needed by business interns in their organizations.

"Oral communication can take many forms, ranging from informal conversation that occurs spontaneously and, in most cases, for which the content cannot be planned, to participation in meetings, which occurs in a structured environment, usually with a set agenda" (Rahman, Mojibur M., 2010).

According to David Booth (1991), verbal exchange allows students to make connections between what they already know and what they are learning. Giving them the opportunity to express themselves orally in all fields reinforces the development of literacy; hence, the importance of planning continual interaction between learners, regardless of the language of instruction or the subject matter being taught. Allowing frequent pauses when

students are reading out loud, so as to give them the opportunity to paraphrase what they have heard is an example of an active listening strategy that helps students to test their comprehension and make connections. Questioning is another discussion strategy that motivates students by piquing their curiosity; it involves asking various open-ended questions to stimulate the students' different levels of reasoning. Too often, teachers ask simple questions that do not encourage students to formulate hypotheses or think critically.

Vocabulary and discussion games motivate the students and encourage them to work together. For example, asking students to formulate a sentence with as many active words as possible would force them to make connections and deepen their understanding while having fun. Learning through play also allows the teacher to observe the students' linguistic behaviour and provide them with immediate and ongoing feedback.

According to Damian Cooper (2007), a balanced assessment includes written, oral and practical tasks. Many learning objectives are assessed with writing. Almost everything that is done through writing can be done orally. Giving our students the opportunity to communicate their knowledge, skills, values and attitudes orally not only helps us reach our various learners, but also provides them with an ongoing opportunity to improve their language skills.

Oral communication is a combination of language, its use in communication, and several other skills like: audience understanding, active listening, non-verbal communication (eye contact, facial expressions, body language) style, conciseness amongst others. It is assumed that the students pursuing post-graduation are aware of the basics of the language and therefore teaching speaking skills becomes irrelevant. What they need at that stage is communication skills. The challenge for the teacher here is

to know the needs of the individual students. The best way to comprehend this is to observe and understand how the learners perform a task in the class. To acquire such skills, task-based approach appears to be the most appropriate (S, Deepa2012).

Oral communication skills is not just speaking but it includes a large set of skills that encompasses listening comprehension, understanding and producing complex language, vocabulary and word knowledge, grammatical knowledge, phonological skills, and so much more.

Strategies for Building Oral Langunge Skills

Oral communication skill is the ability to speak and listen. The following are some of the strategies to improve oral communication;

1. Dramatic Vocabulary:

The students get in a circle and the teacher has a set of cards with that week's vocabulary words on them (the students can make these cards in groups before the activity for added learning). The teacher pulls a card and gives it to one student, who must act out the vocabulary word for the other students to guess. After it is correctly guessed, the students say, spell, and write the definition of the word together on the board.

2. Debate:

A debate is a speaking situation in which opposite points of view are presented and argued. It has also been pointed out that a debate may be defined as verbal action or a form of formal argument on a topic or issue about which two groups or teams of people do not agree.

Debate allows students to share and cooperate with one another. It educates students with responsibility, encourages creativity, deepens friendships and strengthens the rapport with the teacher. The ability to speak freely also improves when students practice debate because they take part in conversations as they are

debating. As a communicative and an interactive technique, debate can be integrated into the classroom context. Just by partaking, listening and watching a debate in the classroom, students can improve their speaking skill automatically.

3. Active Listening:

Active listening is the key element of oral communication. It is a skill that can be acquired and developed with practice. It is fully concentrating on what is being said rather than just passively 'hearing' the message of the speaker or Active listening involves listening with all senses. As well as giving full attention to the speaker. Active listening enables the learners to develop their oral communication. It is proactive rather than passive. Speaking and listening are the most wide spread forms of communication.

4. Drama:

Drama can be fundamental in establishing better communication, because it shows many aspects of life and includes also elements related to creativity and fantasy. In dramatic activities, students use and examine their present knowledge in order to induce new knowledge. Bolton (1985) points out that while much school learning is an accruing of facts, drama can help students reframe their knowledge into new perspectives thus improve their oral communication. According to Dorothy Heathcote (1983), an important value of using drama in the classroom is that "in drama the complexity of living is removed temporarily into this protected ambience so that the learners not only can learn it and explore it, but also enjoy it." (p.701)

5. Extempore:

It assists students not only in thinking on their own but also in voicing their creative ideas with precision. Extempore is an impromptu speech that is delivered with little or no preparation. Even though it is spontaneous, it requires great effort to deliver an extempore successfully. Extempore stands for "off the cuff." In the

corporate setup, 'extempore' is one of the ways to evaluate a prospective employee's communication skills and thinking abilities.

6. Choice of Words:

The teachers need to train the learners to use words that are appropriate to the audience while giving a presentation. What's right for a seminar presentation to fellow students may not be right for a conference presentation. The teacher can select a few basic words that are commonly used in different situations and give practice to the learners to pronounce each word clearly and slowly. The learns need to be taught to speak slowly using appropriate expression, volume, pitch, tone and pace of their voice to impress the audience and to indicate emphasis.

7. Brainstorming

Brainstorming is an activity used to generate ideas in small groups. The purpose is to generate as many ideas as possible within a specified time-period. These ideas are not evaluated until the end and a wide range of ideas is often produced. Each idea produced does not need to be usable. Instead, initial ideas can be viewed as a starting point for more workable ideas. The principle of brainstorming is that you need lots of ideas to get good ideas.

Brainstorming enhances oral communication as learners are given opportunities to express their views and ideas. The free association nature allows learners to become involved in the selection of language used in the speaking task. Brainstorming can help students to learn to take risks. McCoy (1976) makes a strong argument in favour of learning problem-solving skills in order to reduce anxiety. There are no 'right' or 'wrong' answers in brainstorming and no danger of teacher correction. By carrying out a simple brainstorming warm-up, students can obtain a sense of competence and feel more confident in presenting their ideas. Brainstorming allows the students to create a context for the

subsequent speaking task. Relevant existing knowledge (content schema) can be called up from memory and can provide a context which supports comprehension and production in the subsequent speaking task. It helps the students to become better learners and by working in groups they learn language from each other whereby they become better communicators.

8. Group Discussion

Group discussion is an important activity to improve oral communication. It is a systematic and purposeful interactive oral process. Here the exchange of ideas, thoughts and feelings take place through oral communication. The exchange of ideas takes place in a systematic and structured way. It improves thinking, listening and speaking skills. It also promotes the confidence level of the learners.

GD skills may ensure academic success, popularity and good admission or job offer. Thus it is important to be able to take part in a GD effectively and confidently. Participants should know how to speak with confidence, how to exhibit leadership skills and how to make the group achieve the goals.

9. Enhancing vocabulary:

Vocabulary expansion is often pursued for a variety of reasons. The students increase their vocabulary to improve their communication skills, academic performance, and understanding and to face the competitive exams. The teachers need to encourage the learners to learn at least two words everyday and help them to use it in the classroom in the next day. One of the most important responsibilities of every teacher is to help students develop active vocabulary for communication. Vocabulary falls into four categories:

1. **Listening**: the words that understand when the learner hear them
2. **Speaking**: the words that the learner use when talking

3. **Reading**: the words that understand when the learner read
4. **Writing**: the words that use when writing

To develop students' vocabulary, teachers must encourage a curiosity about the meaning and use of unfamiliar words and promote the use of strategies that will help students find the meaning of unfamiliar words. Teachers can help students increase vocabulary by including powerful, difficult words in their oral language while they teach, and encouraging students to use those words in their speaking and writing.

10. Reading:

Reading is considered to be the best practice that can enhance basic oral communication skills. Reading English literature, news papers, magazines, novels, fiction, etc. improves vocabulary skills. Reading also enables the learners to develop thinking process and enhance the sharpness in gathering ideas and expressing them in English. Researchers have found that students who read just 10 minutes a day outside of school demonstrate significantly higher rates of vocabulary growth than students who do almost no reading outside of school (Nagy and Anderson 1984). Students are likely to develop vocabulary more rapidly when the books they read are not only easy enough to read fluently but also contain unfamiliar words. Most importantly, students need to read a lot to have the frequent encounters with words in different contexts that lead to true word knowledge; the sheer volume of reading matters. Find ways to increase the amount of reading that students are doing, and they inevitably will build vocabulary.

Principles of effective oral communication

Prepare

- Leave plenty of time for researching the topic;
- Take time to draft, and redraft;
- Develop slides that support, rather than summarise the presentation; and

- Narrow the topic so it is manageable in the given time.

Identify the audience

- Find out who they will be;
- Find out about their level of knowledge or experience in the topic area; and
- Decide what need to do to convince or persuade them.

Structure the presentation so it

- Flows logically;
- Proceeds through an introduction, body and conclusion;
- Hangs together, with transitions between ideas and sections;
- Builds to a strong conclusion; and
- Stays within the time limit.

Practice

- In front of a mirror;
- Into a tape recorder or onto a video; or
- Before a group of family or friends.

Engage with the audience by

- Using eye contact;
- Establishing credibility;
- Using simple words;
- Emphasizing and repeating the main points;
- Using 'signposts';
- Varying tone and pace; and
- Smiling.

Enhance your presentation with

- Well chosen and relevant slides that are clear, easy to read and attractive to look at; and
- Simple, uncluttered graphics.

Try to stay calm by

- Rehearsing the presentation in advance;
- Taking some deep breaths; and
- Remembering that everyone feels nervous in front of an

audience.

Conclusion

The ability to build communicative competence is an important element in the learning of a second language and for the success of an individual. According to David Booth (1991), verbal exchange allows students to make connections between what they already know and what they are learning. Giving them the opportunity to express themselves orally in the classroom is very essential. The language teachers need to explore different strategies and methods and give opportunities to the learners to enhance their oral communication skills. The different strategies like dramatic vocabulary, debate, active listening, drama, extempore, choice of words, brainstorming, group discussion, enhancing vocabulary and reading discussed in this paper may be used not only to enhance the oral communication skills of the learners but also to assist them in gaining confidence.

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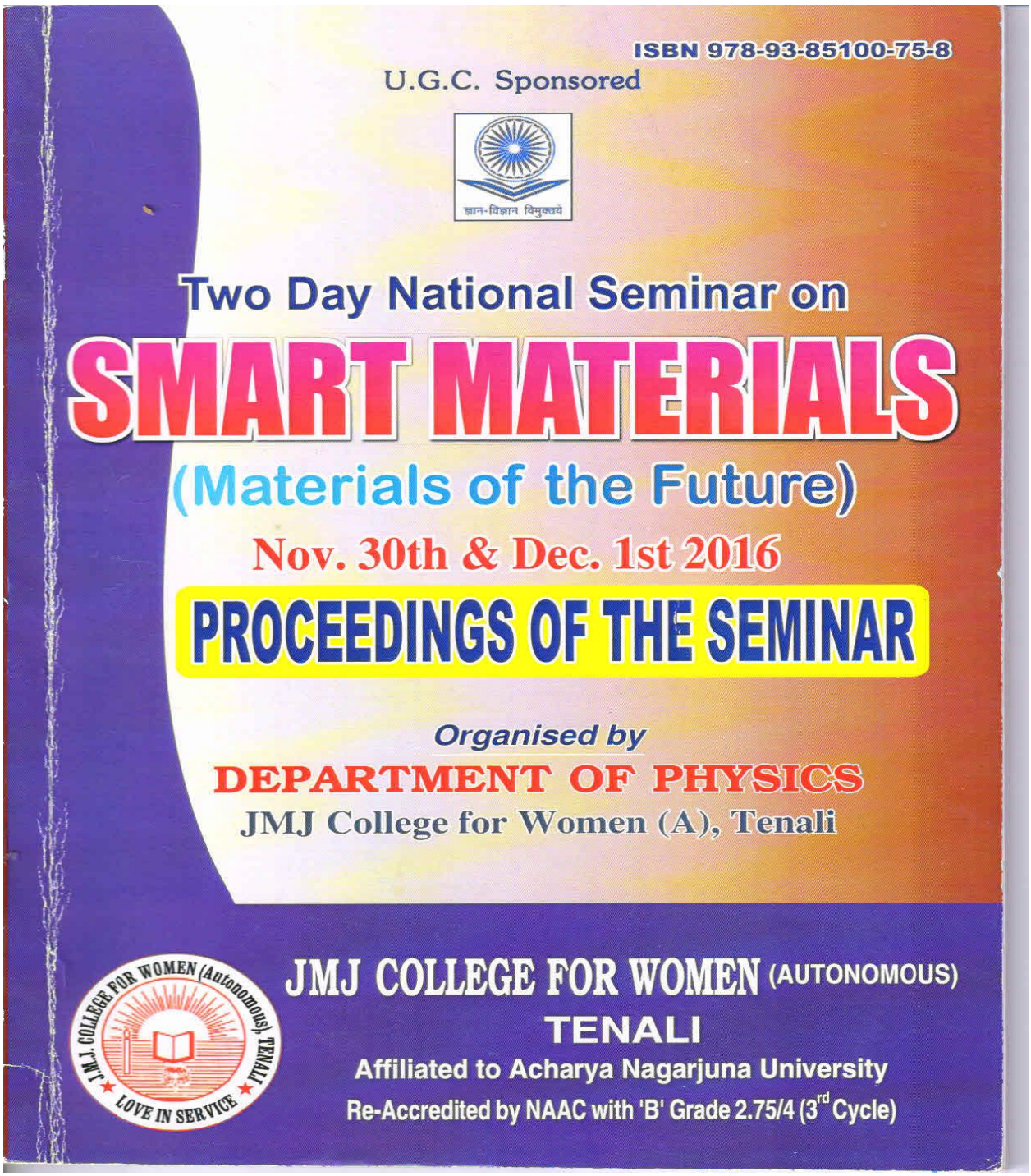

CONTENTS

SOLAR ENERGY MATERIALS AND SOLAR CELLS

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ABSTRACT

Solar Energy produces power for households and businesses through solar panels, which contain solar cells that harness energy from the sun. To produce power, solar cells require daylight. Solar cells are in continuous development, researchers push to discover ways to increase their efficiency even more, through various methods. Present day, solar cells present a great deal of advantages for homeowners and businesses that wish to benefit from them. Solar energy is the conversion of sunlight,into electricity either directly by using Photovoltaic or concentrated solar energy. It is used to make electricity and supplies power in remote places and in spaces. The use of solar energy is very essential today as World Energy Conservation predicted estimation about the rate of utilization of energy resources shows that the coal deposits will deplete within the next 200 to 300 years and petroleum deposits will deplete in next few decades. This article presents an overview of solar energy materials and solar cells, types of solar energy, and types of solar cells, advantages and disadvantages, benefits and applications.

Introduction

In 1838 - Edmund Becquerel observed materials which turn light into energy and in 1876 - 78 - William Adams, wrote the first book about Solar Energy called: AA Substitute for Fuel in Tropical Substitute for Fuel in Tropical Countries and was able to power a 2.5 horsepower steam engine. In 1860- Auguste Mouchout, used direct conversion of solar radiation into mechanical power. In 1895 - Aubrey Eneas formed the first Solar Energy Company and in 1904 - Henry Willsie built 2 huge plants in California to store generated power. He was the first to successfully use power at night after generating it during the day. In 1954 -Calvin Fuller, Gerald Pearson and Daryl Chaplin of Bell Laboratories discovered the use of silicon as a semi-conductor. which led to the construction of a solar panel with an efficiency rate of 6%. In 1956 -The first commercial solar cell was made available to the public at a very expensive $300 per watt$300 per watt. In 1958- Vanguard I the first satellite was launched that used solar energy to generate electricity. In 1970- The Energy Crisis - Solar energy history was made as the price of solar cells dropped dramatically to about $20$20 per watt. A solar cell is also known as Photovoltaic Cell or Photoelectric Cell. A solar cell is a solid state electrical device that converts energy of light directly into electricity by Photoelectric Effect. The term 'photo' comes from the Greek meaning 'light', and 'voltaic' from the name of the Italian Physicist Volta. The Photoelectric Effect was first recognized in 1839 by French Physicist A.E.Becquerel. Albert Einstein explained the Photoelectric effect in 1905 for which he received Nobel Prize in Physics in 1921. The modern Photovoltaic Cell was developed in 1954 at Bell Laboratories. Solar cells were first used in Vanguared I satellite launched in 1958.

There are two types of solar energy;

- Thermal Energy

  Electrical Energy

Thermal energy is everywhere as it lights up our days, heats the earth, our bodies and homes and it dries our clothes. Electrical energy uses the power of the sun to produce electricity through solar cells which is also known as Photovoltaic (PV). Photovoltaic cells are made of special materials called semiconductors such as silicon. An atom of silicon has 14 electrons, arranged in three different shells. The outer shell has 4 electrons. Therefore a silicon atom will always look for ways to fill up its last shell, and to do this, it will share electrons with four nearby atoms. Now we use phosphorus (with 5 electrons in its outer shell). Therefore when it combines with silicon, one electron remains free. When energy is added to pure silicon it can cause a few electrons to break free of their bonds and leave their atoms. These are called free carriers, which move randomly around the crystalline lattice looking for holes to fall into and carrying an electrical current. However, there are so few, that they aren't very useful. But our impure silicon with phosphorous atoms takes a lot less energy to knock loose one of our "extra" electrons because they aren't tied up in a bond with any neighbouring atoms. As a result, we have a lot more free carriers than we would have in pure silicon to become N-type silicon. The other part of a solar cell is doped with the element boron (with 3 electrons in its outer shell) to become P-type silicon. When this two type of silicon interact, an electric field forms at the junction which prevents more electrons to move to P-side. When photon hits solar cell, its energy breaks apart electron-hole pairs. Each photon with enough energy will normally free exactly one electron, resulting in a free hole as well. If this happens close enough to the electric field, this causes disruption of electrical neutrality, and if we provide an external current path, electrons will flow through the P side to unite with holes that the electric field sent there, doing work for us along the way. The electron flow provides the current, and the cells electric field causes. To protect the solar cell, we use antireflective coating to reduce the losses and then a glass plate to protect the cell from elements.

There are basically 3 types of solar cell technology:

Discrete Cell technology.

Integrated Thin Film technology.

Multi crystalline Silicon technology.

The very first benefit of using this technology is that solar energy is renewable. This is a 100% environment-friendly. Contrary to fossil fuels, this technology is not going to release any greenhouse gases, harmful agents, volatile material or carbon dioxide into the environment. Solar panels are highly durable and reliable. These systems don't have any moving systems and hence they don't require any replacement. We can use Solar cell technology to generate thousands of hours of electricity with minimal maintenance. Almost every energy source creates some sort of noise, but that is not the case with solar panels and cells. Solar cells provide cost effective solutions to energy problems in places where there is no mains electricity.

Application

Rural electrification: The provision of electricity to rural areas derives important social and economic benefits to remote communities throughout the world like power supply to remote houses, electrification of the health care facilities, irrigation and water supply and treatment. Many lighthouses are now powered by solar cells. And telecommunication systems i.e radio

transceivers on mountain tops are often solar powered. Solar cells are often electrically connected and encapsulated as a module. These modules often have a sheet of glass on the front (sun up) side, allowing light to pass while protecting the semiconductor wafers from climate conditions. Solar cells are also usually connected in series in modules, creating an additive voltage. Photovoltaic solar generators have been and will remain the best choice for providing electrical power to satellites in an orbit around the Earth.

Advantages of Solar Cells

Renewable energy - The energy can be used both to generate electricity and heat in the house. Renewable energy is recovered from the sun, the wind and waves - which in this case is the sun. Solar cells harness the energy from the sun and transform this into usable electricity.

Economy-friendly energy - Solar cells provide a great opportunity to create savings on your electric bill since you do not pay for the energy that you generate. At the same time you have the opportunity to monetize your photovoltaic system, if you have a solar system with a grid connected installation, you can buy and sell electricity to the collective electricity network. At the same time, you can obtain several grants for solar cells and there will be more economic benefits to be gained in the future.

Environmentally friendly energy - solar cells does not cause any pollution. The discharge of waste and pollution is unavoidable in relation to the production of solar cells, the transport of these and when we install them. However, this is a minimal fraction, compared to if one draws its energy from elsewhere.

Innovative energy - Photovoltaics is a popular topic in green energy and is considered to be a good solution to prevent climate change. Therefore, this is an innovative market under continuous research and development.

Infinite Energy - When one has the opportunity to extract energy from the sun's rays, this is a source of energy that will never be exhausted, therefore there will always be a source for electricity production.

Long term energy - PV systems often have a long life and a good durability. At the same time, there is often a guarantee of minimum 20 years on solar panels.

Selling energy - If our home has solar cells, it is often easier to sell the property at a higher price.

Disadvantages

Interior needs - Not all households that can satisfy their requirements and get the optimum out of their solar cells yet. Solar cells are very sensitive in terms of their location, which means that if there is shade on our delivery, it is difficult to exploit solar installation optimally. The solution to this is that one can be connected to the grid and hence can buy energy from others.

High investment - One-time cost of acquiring a photovoltaic system and have it installed are relatively high. However, one must bear in mind that producing energy then, is free. The solution to this drawback is that by most banks provide the opportunity to take an energy lending, which gives a low interest to us as a customer who invests in green energy.

Seasonal energy - Compared to other types of renewable energy, the solar power plant is highly seasonal. The solution to this is to grid connect solar installations and purchase energy from the public electricity network during periods where there is less energy to collect. The most important thing that is necessary is the sky should be clear so that sunlight can fall on the solar cell and we can get electricity.

Accommodation - It might be harder to install solar panels on older households, as they often have different designs that can provide shade. At the same time flat roofs where drifting snow may fall below the racks, becomes too heavy for a roof with solar cells.

Advantages of Solar Energy

The most advantage of using Solar Energy is that this is distributed over a wide geographical area, ensuring that developing regions such as India have access to electricity generation at a stable cost for the long-term future. The huge consumption of fossil fuels has caused visible damage to the environment in various forms.

Renewable Energy Source -Solar energy is a truly renewable energy source. It can be harnessed in all areas of the world and is available every day. We cannot run out of solar energy, unlike some of the other sources of energy. Solar energy will be accessible as long as we have the sun, therefore sunlight will be available to us for at least 5 billion years, when according to scientists the sun is going to die.

Reduces Electricity Bills - After the initial investment has been recovered, the energy from the sun is practically free. Since we use solar power, the electricity bills will drop. Moreover, not only we could save electricity bill, but if we generate more electricity than we use, the surplus will be exported back to the grid and we will receive bonus payments for that amount. Savings can further grow if we sell excess electricity at high rates during the day and then buy electricity from the grid during the evening when the rates are lower.

Environment friendly - It's not affected by the supply and demand of fuel and is therefore not subjected to the ever-increasing price of gasoline. Solar Energy is clean, renewable (unlike gas, oil and coal), sustainable and helping to protect our environment. As we see previously, it does no pollute air. Therefore Solar Energy does not contribute to global warming, acid rain or smog. It actively contributes to the decrease of harmful green house gas emissions. By not using any fuel, Solar Energy does not contribute to the cost and problems of the recovery and transportation of fuel or the storage of radioactive waste.

Low/ no maintenance - Solar Energy systems are virtually maintenance free and will last for decades. Once installed, there are no recurring costs. They operate silently, have no moving parts, do not release offensive smells and do not require adding any fuel. More solar panels can easily be added in the future when our family's needs grow.

Technology Development - Technology in the solar power industry is constantly advancing and improvements will intensify in the future. Innovations in quantum physics and nanotechnology can potentially increase the effectiveness of solar panels and double, or even triple, the electrical input of the solar power systems.

Disadvantages

Cost - The initial cost for purchasing a solar system is fairly high. Although the UK government has introduced some schemes for encouraging the adoption of renewable energy sources, for example the Feed-in Tariff, we have to cover the upfront costs. This includes paying for solar panels, inverter, batteries, and wiring and for the installation. Nevertheless, solar technologies are constantly developing, so it is safe to assume that prices will go down in the future.

Weather Dependent - Although solar energy can still be collected during cloudy and rainy days, the efficiency of the solar system drops. Solar panels are dependent on sunlight to effectively gather solar energy. Therefore, a few cloudy, rainy days can have a noticeable effect

on the energy system. You should also take into account that solar energy cannot be collected during the night.

Solar Energy Storage Is Expensive - Solar energy has to be used right away, or it can be stored in large batteries. These batteries, used in off-the-grid solar systems, can be charged during the day so that the energy is used at night. This is good solution for using solar energy all day long but it is also quite expensive. In most cases it is smarter to just use solar energy during the day and take energy from the grid during the night. And our energy demand is usually higher during the day so we can meet most of it with solar energy.

Uses a Lot of Space - The more electricity we want to produce, the more solar panels we need, because we want to collect as much sunlight as possible. Solar panels require a lot of space and some roofs are not big enough to fit the number of solar panels that we would like to have. An alternative is to install some of the panels in our yard but they need to have access to sunlight. Anyways, if we don't have the space for all the panels that we wanted, we can just get a few and they will still be satisfying some of our energy needs.

Associated with Pollution - Although pollution related to solar energy systems is far less compared to other sources of energy, solar energy can be associated with pollution. Transportation and installation of solar systems have been associated with the emission of greenhouse gases. There are also some toxic materials and hazardous products used during the manufacturing process of solar photovoltaics, which can indirectly affect the environment. Nevertheless, solar energy pollutes far less than the other alternative energy sources.

Conclusion

Energy helps the people to thrive and improve the quality of life. To increase energy access in off-grid areas, we need to look to new ideas. New technologies and innovative business models are constantly emerging in this dynamic sector, but knowing what works best in the long term requires research, field testing – and finance. Argument that sun provides power only during the day is countered by the fact that 70% of energy demand is during daytime hours. At night, traditional methods can be used to generate the electricity. The Goal is to decrease our dependence on fossil fuels. Solar cell light absorbing materials can be stacked to take advantage of different light absorption and charge separation mechanisms. Currently, 75% of our electrical power is generated by coal-burning and nuclear power plants. Mitigates the effects of acid rain, carbon dioxide, and other impacts of burning coal and counters risks associated with nuclear energy. Achieving cost reduction is the main challenge that would influence the future deployment of solar energy. The sun is a powerful source that can help our planet by giving us clean, reusable energy to power our world. The use of this energy is free, does not create pollution, and if used wisely can help us become less dependent on other more costly and damaging forms of power.

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Contents

STRATEGIES TO PROMOTE ETHICS AND HUMAN VALUES IN THE TEACHING PROFESSION

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Introduction

Values are developed by people to interact and lead a civilized life and to establish harmony, peace and joy in the society. The educational institutions play a vital role in preserving, promoting and transmitting values to the younger generations. Ethics are usually exhibited and enforced by teachers in relation to the students, colleagues, community and to oneself, to produce great effect on education. The very aim of education is to develop the humanity into sensible and knowledgeable human beings. Ethics can be developed by practice and commitment. A good teacher is always at the disposal of the learner, profession and the society. Teachers need to create a warm and affirming classroom environment to make the learners feel free to express their thoughts and ideas. Teachers need to spend time with the students and assist them to acquire the virtues and values like honesty, loyalty, tolerance, adjustment, understanding, trustworthiness, compassion, affection, forgiveness, caring, sharing and sensitiveness to the needs of others.

Values are the most vital objectives to realize one's own dream and development. There are a number of agencies like home, school, mass media, Government, Church which play an important role in inculcating values among the people. Home is the best and first agency where values are taught and nurtured in the children. The children imitate the behaviour of the mother, father and the elders at home. School is the second agency to promote values among the children as they observe the personality, dealings of the teachers, Head of the institutions and other people in the school. The teaching community can promote values in the children through assembly, curricular and co-curricular activities especially through games and sports. Mass media influences the youth to explore and learn good and evil things like patriotism, relationship, information, knowledge, inspiring clippings and movies and also violence, revenge, disrespect, sex, rape, killing, robbery and so on. Government is another agency to infuse value system in the people. Regularity, punctuality, justice, loyalty, hard work, environmental protection, love for the country, fighting against corruption etc. could be promoted by the Government. Church teaches the people the values of tolerance, forgiveness, service, fraternity, God's mercy, compassion and tenderness.

Strategies to Promote Ethics and Values in the Human Family

❖ **Treating the people with love, respect and compassion**

Compassion, care, love, dignity and respect for the old and young are the fundamental principles for the happy living. One must make use of every opportunity to show love and respect for one another and develop a fruitful relationship among all the great religions of the world. Teachers and learned people must be more human to promote peace, prosperity and harmony for all beings. In the New Testament the mystery of God's love is revealed: "God so loved the world that he gave his only Son" (John 3: 16). Through the heart of Jesus the fullness of God's infinite mercy appeared in the world. Marvelling at the Incarnation of God's Son, Mary exclaims that through this child Jesus, the lowly shall be lifted up, their hunger shall be satisfied, and God's mercy shall be extended to all (Luke 1: 46-56). Years later, in announcing his own ministry, Jesus sums up his life's program in the words of Isaiah: "to bring glad tidings to the poor, to proclaim liberty to captives, recovery of sight to the blind and release to prisoners, to announce a year of favour from the Lord" (Ibid. 4, 18-19). Jesus identifies himself with the poor and the righteous: whenever they gave food to the hungry, welcomed a stranger, clothed the naked, or visited the sick or imprisoned, they acted in kindness toward Jesus himself. On the other hand, those who have failed to see the needs of the disadvantaged have acted as though they have never seen Jesus. They have not followed in Christ's footsteps. (Mathew 25:31-46). Gross disparities of wealth between nations, classes and persons re-enact the Gospel parable of the rich man and the poor man Lazarus. And with the same dire consequences of which the Gospel speaks: "'My child', replied Abraham, 'remember that you were well off in your lifetime, while Lazarus was in misery. Now he has found consolation here, but you have found torment'" (Luc. 16, 25). This is the warning to the entire humanity today to show concern and love for the poor through our institutions and homes.

The mercy of God overcomes all barriers," said Pope Francis. "The hand of Jesus touched the leper," he continued, explaining that Christ does not act from a safe distance, nor does He act by proxy, but is exposed directly to the contagion of our evil. Our hearts must be free to show mercy and compassion to the destitute and marginalized as it offers us the wellspring of joy, serenity, and peace. Our salvation depends on it. Saint Thomas Aquinas' words show that God's mercy, rather than a sign of weakness, is the mark of his omnipotence.

❖ **Perform the Duties Sincerely**

The purpose of education is the full development of the potential of each individual. Society, of which teachers are a part, establishes the goals of education and the organizational framework within which formal education occurs. Teaching is a process which facilitates learning. Formal teaching activities are based on the specialized application of the learning process to meet the educational needs of the learner. Teachers have the right to expect standards of behavior necessary for maintaining an optimal learning environment and have the responsibility to use reasonable methods to achieve such standards. A compassionate and committed teacher grooms the future of the learners and the responsible and sincere students' work hard to achieve his/her goals. Sincerity is a wonderful virtue, given as a gift by the Spirit at conversion of the in the Bible. A sincere man is conscientious about conduct, recoiling from duplicity, hypocrisy, anything else which would undermine the work of the Lord and His people. Sincerity makes averse to sin and inclined to obey the Lord. Sincerity is always conscientious, the sincere person keeping his promises whether made to the Lord, to the church, or in the world, and keeping his duties and responsibilities.A sincere person finds boasting distasteful to him. He cannot put on front, or dishonestly exaggerate his accomplishments.A sincere person is far less likely to be natured or ill-tempered, because in such moods we usually see things in an exaggerated or way, and sincerity cannot do this. Sincerity, therefore, is a great protection; a foundation for the armour of sanctification. Without the girdle of sincerity the breastplate of righteousness cannot be properly attached.

❖ **Engage Students in Ethical Acts and Activities**

Creating a climate of ethical behavior begins when instructors design courses to improve students' knowledge, skills and abilities. Thus, courses should challenge students to learn, grow and develop. Instructors have an ethical responsibility to not waste students' time, effort, and money. Davis and Ludvigson (1995) argued that increases in academic dishonesty might be related to decreases in instructor standards. That is, if instructors are "watering down" or severely limiting course content, using test bank questions that do not reflect the actual coursework or assigning perfunctory assignments, then students may see no benefit to going beyond the instructors' demands and engaging in the honest and difficult work of learning.

A climate encouraging ethical behavior affects students' perceptions of how and if other students are behaving. Research has consistently demonstrated that the most important factor in whether students behave honestly is their perception of their peers' behaviors (Cagle, 2010). Syllabi should include statements encouraging ethical behaviors. However, these statements

should focus on the importance of ethical behaviors to learning and academic development (Davis & Ludvigson, 1995). They should stress the link between ethical behaviors and achieving the learning objectives of the course. The teachers also can encourage the students to share their books, pen and other materials with the poor students in the classroom. The smart students can be motivated to help the weak students and help them in their studies. All students can be engaged in clean and green programme in the campus and saving the water, electricity and tree plant drive etc. So that such activities can help the holistic development of the learners. The head of the intuitions must encourage the teachers also to be more competent, committed and to be more diligent in their words and actions. They should be involved continuously in conducting seminars, symposia and workshops on ethical and unethical behaviours and their great effect on the lives of the people.

❖ **Rewarding Ethical Behaviour like Truth and Kindness**

The teachers need to motivate and inspire the students to help others in need. They need to learn these lessons from the teachers and elders and enable them to grow as responsible citizens. We want them to learn to feel, think, and act with respect for themselves and for other people. We want them to pursue their own well-being, while also being considerate of the needs and feelings of others. oday, there is wide recognition that many of our children are not learning to act responsibly while they are young. Studies show that many children see nothing wrong with cheating on tests. Some see nothing wrong with taking things that don't belong to them. If proper attitudes and behavior are not learned early, problems can mushroom with even worse consequences when children are older. As crime has increased, teen-age offenders have shown less and less feeling for their victims. But even for the youngsters who will never commit a crime, it is better to learn responsibility when they are young, rather than when they are older and they have to change bad habits. Therefore, teachers need to appreciate the good behaviour of the students and reward them in order to encourage other students also to inculcate such spirit.

There is no righteous behaviour without understanding oneself (Krishnamurti (2001). It means educated man or woman has to have self-knowledge, otherwise he is considered ignorant. After knowing oneself he/ she should be kind to oneself and others to lead a fruitful life. And the mind which is not in a state of love is not the religious mind. It is only the religious mind that is freed from problems, and that knows the beauty of love and truth (Krishnamurti 1992). When the teachers observe and witness in the class that some students stands for the truth and other good deeds, it is his/her responsibility to appreciate and reward them. So that they grow as a free and noble individuals who can lead the society. The management also need to reward the committed and honest teachers for their hard work and achievements.

❖ **Principles of Living in the Public**

There are mainly seven principles like selflessness, integrity, objectivity, accou... openness, honesty and leadership to live in the public. Selfless service or an act is appre... all. Selflessness is sacrificing the time, talents and energy for the sake of others. Teachers ... extend selfless service to the students to enable them to learn new things every day. Int... the mother of many virtues and it is dealing justly with oneself and dealing justly with others. ... Waldo Emerson stated: "Every man takes care that his neighbour shall not cheat him. But ... comes when he begins to care that he does not cheat his neighbour. Then all goes well. (*Co... of Life*, in *The Complete Writings of Ralph Waldo Emerson*, New York: William H. Wise... Co., 1929, p. 585.) Integrity is the light that shines from a disciplined conscience. It is the ... of duty within us. Being true to oneself at times requires extraordinary strength and co... Every individual the teacher, student and the public need to acquire the virtue of integrity ... a just life. And being honest means choosing not to lie, steal, cheat, or deceive in any ... Honesty is the same as sincerity, truthfulness, integrity, objectivity, accountability, frankness, ... openness. Though some leaders don't consciously realize it, honesty includes not only telling ... truth, but also leaving the right impression. Albert Einstein said, "Whoever is careless with ... truth in small matters cannot be trusted with important matters." Of all the qualities that ... look for and admire in a leader, honesty is by far the most personal. The Head of the institu... teachers and students have their own leadership role to play and that should be carried ... effectively and sincerely.

Conclusion

Ethics and human values are perennial and produce good personalities for the soci... Whether a developed country or a developing country, ethics are indispensible and ethical educa... serves as a mainstream in the harmonious development of human beings. It is a universal com... since major parts of world communities are witnessing racial discrimination, terrorism, hum... value deterioration and hence, it is the responsibility of every individual to highlight the significa... of ethical standards of educationists as education, along with ethics brings out essential change... the personalities, communities and in the globe, promoting peace, serenity and brotherhood.

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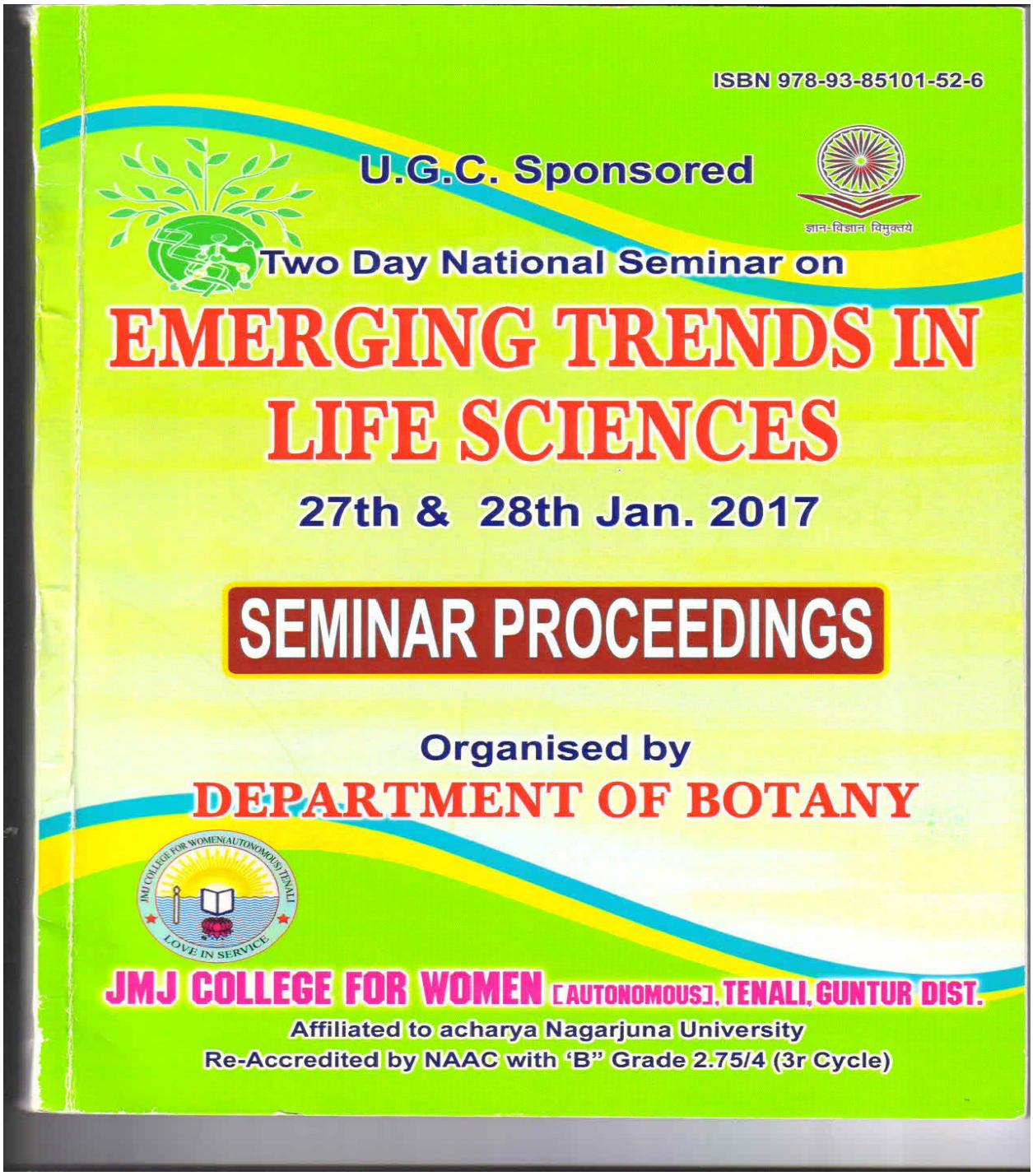

CONTENTS

BIODIVERSITY AND HUMAN WELL BEING

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ABSTRACT

The impact of human activities on ecosystems has increased rapidly in the last few decades. As society strives to transition towards more sustainable development pathways, it is important to properly conceptualize the link between biodiversity i.e. genes, traits, species and other dimensions and human well-being i.e. health, wealth, security and other dimensions. For several decades, world governments and policy bodies have been on a course of attempting to improve human well-being (HWB) through the stated intention of sustainable development, which includes improved education, health and environmental quality, although often to the exclusion of family planning and the demographic dividend (i.e. economic benefits associated with changes in age structure that occur when birth and death rates decline) in policy development. Biodiversity is most commonly defined as the variability among living organisms from all sources including taxonomic, phylogenetic, and functional diversity and the ecological complexes of which they are part. Though complex in definition, global syntheses focusing on species or other components have documented widespread loss of biodiversity. Every ecosystem features key functions such as primary production and nutrient cycling, which give rise to ecosystem services that improve HWB, such as the provisioning of clean water, fertile soils, and timber and capture fisheries. We need to improve the wellbeing of both the environment and humans. This paper discusses biodiversity's values as they relate to improving human wellbeing which is the stipulated goal of sustainable development.

INTRODUCTION

Biodiversity, ecosystem functioning, ecosystem services and human well-being are widely used terms, though how they are defined, unfortunately, varies among sectors, sometimes generating confusion. Although biodiversity has long been considered integral to this sustainable development agenda, its relationship to HWB has not been systematically explored. As Seddon et al. note, effective conservation, restoration and sustainable practice rest heavily on how clearly the science and policy spheres understand biodiversity's diverse values. Biodiversity reflects the number, variety and variability of living organisms. It includes diversity within species, between species, and among ecosystems. The concept also covers how this diversity changes from one location to another and over time. Indicators such as the number of species in a given area can help in monitoring certain aspects of biodiversity. Ecosystem services are the benefits people obtain from ecosystems. Biodiversity plays an important role in the way ecosystems function and the services they provide. Services include nutrients and water cycling, soil formation and retention, resistance against invasive species, pollination of plants, regulation of climate, as well as pest and pollution control by ecosystems.

Human wellbeing, like biodiversity, is a multidimensional construct that includes both subjective as well as objective measures. HWB (Human wellbeing) has eluded any universal definition because of this multidimensionality; it encompasses concepts of knowledge, friendship, self-expression, affiliation, bodily integrity, economic security, freedom, affection, wealth and leisure. The **Millennium Ecosystem Assessment (MA)**, for example, considered HWB to consist of five dimensions or elements: (i) basic material for a good life, (ii) security, (iii) health, (iv) social relations, and (v) freedom of choice and action.

Biodiversity and many ecosystem services are the key factors that determine human well-being. And biodiversity loss has-direct and indirect negative effects on several factors:

Food security: The availability of biodiversity is often a "safety net" that increases food security and the adaptability of some local communities to external economic and ecological disturbances. Farming practices that maintain and make use of agricultural biodiversity can also improve food security.

Vulnerability: Many communities have experienced more natural disasters over the past several decades. For example, because of the loss of mangroves and coral reefs, which are excellent natural buffers against floods and storms, coastal communities have increasingly suffered from severe floods.

Health: A balanced diet depends on the availability of a wide variety of foods, which in turn depends on the conservation of biodiversity. Moreover, greater wildlife diversity may decrease the spread of many wildlife pathogens to humans.

Energy security: Wood fuel provides more than half the energy used in developing countries. Shortage of wood fuel occurs in areas with high population density without access to alternative and affordable energy sources. In such areas, people are vulnerable to illness and malnutrition because of the lack of resources to heat homes, cook food, and boil water.

Clean water: The continued loss of forests and the destruction of watersheds reduce the quality and availability of water supplied to household use and agriculture. In the case of New York City, protecting the ecosystem to ensure continued provision of clean drinking water was far more cost-effective than building and operating a water filtration plant.

Social relations: Many cultures attach spiritual, aesthetic, recreational, and religious values to ecosystems or their components. The loss or damage to these components can harm social relations, both by reducing the bonding value of shared experience as well as by causing resentment toward groups that profit from their damage.

Freedom of choice: Loss of biodiversity, which is sometimes irreversible, often means a loss of choices. The notion of having choices available irrespective of whether any of them will be actually picked is an essential constituent of the freedom aspect of well-being.

Basic materials: Biodiversity provides various goods - such as plants and animals - that individuals need in order to earn an income and secure sustainable livelihoods. In addition to agriculture, biodiversity contributes to a range of other sectors, including "ecotourism",

pharmaceuticals, cosmetics, and fisheries. Losses of biodiversity, such as the collapse of the Newfoundland cod fishery can impose substantial costs at local and national level. Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. For example, a larger number of plant species means a greater variety of crops; greater species diversity ensures natural sustainability for all life forms; and healthy ecosystems can better withstand and recover from a variety of disasters. Human activity is leading to the extinction of species and habitats and loss of bio-diversity. Eco systems, which took millions of years to perfect, are in danger when any species population is decimating. Balance of natural processes like pollination is crucial to the survival of the eco-system and human activity threatens the same. Another example is the destruction of coral reefs in the various oceans, which support the rich marine life.

Impacts of biodiversity loss distributed geographically

The well-being of many social groups and individuals can increase when biodiversity is used, changed, or lost. However, the changes in ecosystems are harming many of the world's poorest people, who are less able to adjust to these changes and who are affected by even greater poverty, as they have limited access to substitutes or alternatives. For example, poor farmers often cannot afford using modern methods for services previously provided by biodiversity. In addition, substitution of some services, such as the reliance on toxic and persistent pesticides to control certain pests, may have negative environmental and human health effects.

Many communities depend on a range of biological products for their material welfare. In addition, the transfer of ownership or use rights to ecosystem services like timber, fishing, and mining to privileged groups by governments have also excluded local communities from the use of these ecosystem services. Provisions for ensuring the equitable distribution of monetary benefits from the use of biological products are an issue of major concern. Even in cases where equitable provisioning has been made, implementation is being impaired by weak and ineffective institutions.

Poor **people have historically disproportionately lost access to biological products and** ecosystem services **as demand for those services has grown.** Coastal habitats are often converted to other uses, frequently for aquaculture ponds or cage culturing of highly valued species such as shrimp and salmon. Despite the fact that the area is still used for food production, local residents are often displaced from their fishing grounds, and the fish produced are usually not for local consumption but for export. Coastal residents often no longer have access to cheap protein or sources of income. The development of shrimp aquaculture has displaced local fishers who are not able to enter the capital- and technology-intensive shrimp fisheries . Food security and overall well-being is much better in situations where local communities—with particular focus on the poor and the disadvantaged—were involved and made partners in the access, use, and management of biodiversity.

Changes in the equity structure of societies can have impacts on ecosystem services**. Differential access to resources may also help to explain why some people living in environmental resource-rich areas nevertheless rank low in measures of human** well-being. For example, economic liberalization in Viet Nam resulted in the development of a class of entrepreneurs with markedly greater access to capital. The poorer fishers were unable to enter

the capital and technology-intensive shrimp fishery that developed. Furthermore, the ecological changes precipitated by the expansion of shrimp aquaculture reduced the capacity of the ecosystem to support the traditional fish stocks, further exacerbating the inequity.

The increase in international trade of biological products has improved the well-being for many social groups and individuals, especially in countries with well-developed markets and trade rules and among people in developing countries who have access to the biological products. However, many groups have not benefited from such trade. Some people who live near and are dependent on biodiversity-rich areas have experienced a drop in their well-being rather than an increase. Examples include the many indigenous groups and local communities who have relied on these products and the ecosystem services they support for many of the constituents of well-being. Weak and inefficient institutional structures that oversee the equitable distribution of benefits are key reasons for the inequitable distribution of benefits at the national and local levels. In addition, structural adjustment programs played a key role in pushing the poor further into destitution and forcing many to have no choice but to further stress ecosystem services.

Conflicts between competing social groups or individuals over access to and use of biological products and ecosystem services have contributed to declines in well-being for some groups and improvements for others. Sometimes different social groups have a conflict over how a given bundle of ecosystem services or biological products ought to be used and shared. Although many such conflicts have been managed cooperatively, it is also common for one group to impose its preferred outcome on the others, leading to an improvement in well-being for one group at the expense of others. For example, if mountain communities convert forests into agricultural lands, they may reduce downstream water quality. When ecosystem change is linked to well-being change through this highly complex structure of interdependencies, there are both winners and losers. Some groups improve and other groups decline.

One of the main reasons some countries, social groups, or individuals—especially the disadvantaged—are more severely affected by biodiversity and ecosystem changes is limited access to substitutes or alternatives. When the quality of water deteriorates, the rich have the resources to buy personal water filters or imported bottled water that the poor can ill afford. Similarly, urban populations in developing countries have easier access to clean energy sources because of easy access to the electrical grid, while rural communities have fewer choices. Poor farmers often do not have the option of substituting modern methods for services provided by biodiversity because they cannot afford the alternatives. And, substitution of some services may not be sustainable, and may have negative environmental and human health effects. For example, the reliance on toxic and persistent pesticides to control certain pests can have negative effects on the provision of services by the cultivated system and other ecosystems connected to the cultivated system. Many industrial countries maintain seed banks in response to the rapid rate of loss of crop genetic diversity and to make existing genetic diversity more readily available to plant breeders. Apart from the network of seed banks maintained in developing countries by the Consultative Group on International Agricultural Research, for many developing countries creating such banks could pose a problem when electricity supplies are unreliable, fuel is costly, and there is a lack of human capacity.

Conclusion

Biodiversity contributes to various aspects of human well-being, for instance by providing raw materials and contributing to health. However, human actions often lead to irreversible losses in terms of diversity of life on Earth and these losses have been more rapid in the past fifty years than ever before in human history. We benefit from the diversity of organisms that we have learned to use for medicines, food, fibbers, and other renewable resources. In addition, biodiversity has always been an integral part of the human experience, and there are many moral reasons to preserve it for its own sake. Biodiversity influences ecosystem services, that is, the benefits provided by ecosystems to humans, which contribute to making human life both possible and worth living. Hence, it is our responsibility to preserve the services that ecosystems provide to humans, we should focus on preserving or restoring their biotic integrity in terms of species composition, relative abundance and functional organization.

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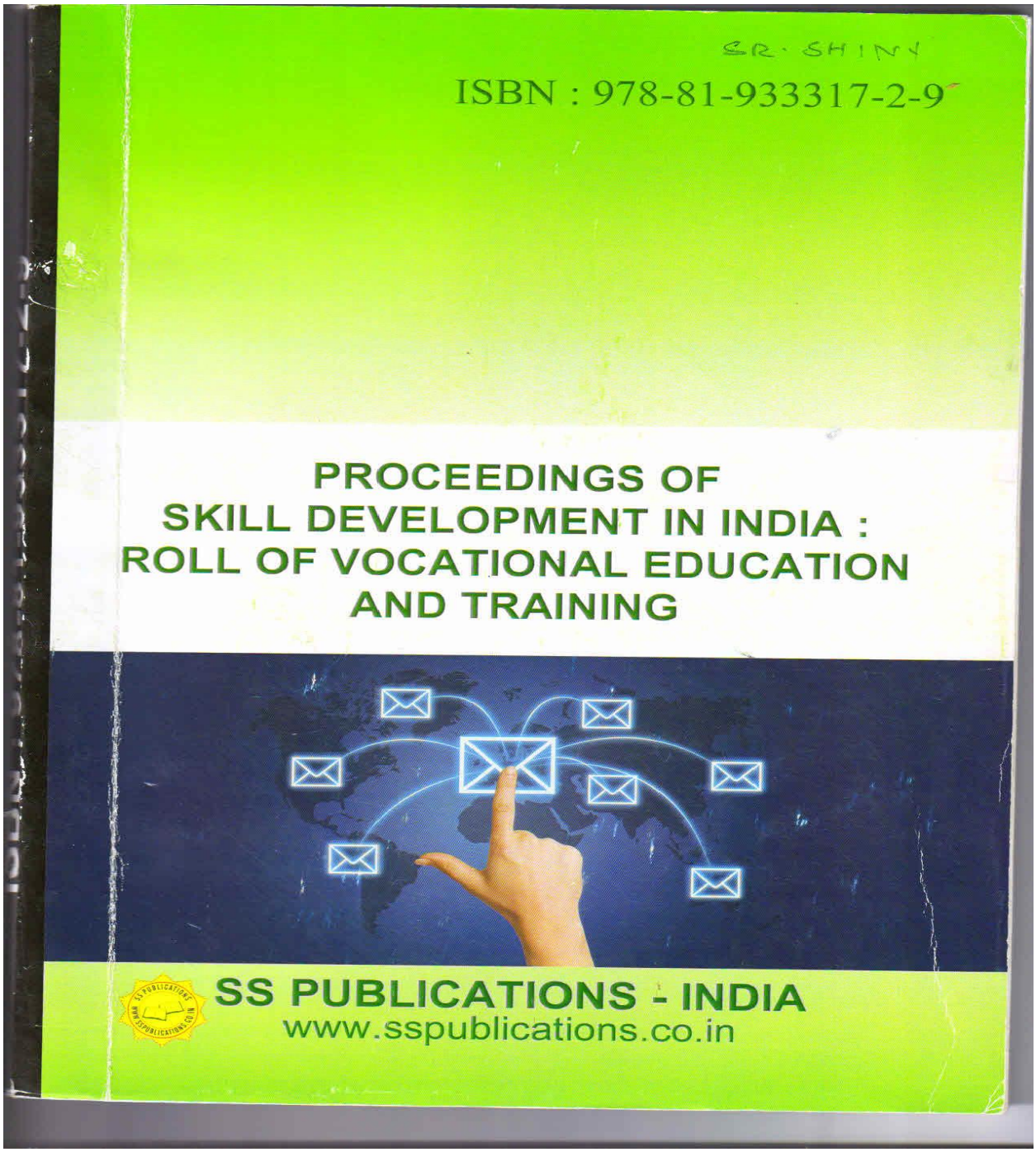

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TEACHING OF LSRW SKILLS FOR THE STUDENTS TO ENHANCE COMMUNICATION SKILLS IN ENGLISH

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Keywords: Teaching LSRW, Students, Enhance, English, Communication Skills

ABSTRACT

Communication skills have a great impact on the success of an individual. When students graduate from the college and become real professionals, they would find that communication skills are very crucial to achieve success in the modern highly competitive world. Traditionally, learning a language was mainly related to reading and writing. Importance was focused on the language in its written form and the purpose is for the student to comprehend the structure and rules of the language through the application of intellect and logical deductive reasoning. The form was of greater significance than speaking. But, in the present scenario one must be proficient in communication skills to enjoy the life and to work efficiently no matter where one is. The learners have to master the use of language skills in order to communicate effectively with others. The teachers need to provide opportunities for the students to develop communication skills combining the four language LSRW skills. For this purpose, they need to design the activities that incorporate several language skills simultaneously and provide the students with real life situations to enhance their language skills. This paper discusses the importance of English language, Skill based and Task based teaching and learning, Principles of effective communication and some of the strategies to develop LSRW skills in the classroom to enhance the communication skills of the learners.

TEACHING OF LSRW SKILLS FOR THE STUDENTS TO ENHANCE COMMUNICATION SKILLS IN ENGLISH

INTRODUCTION

Language is the primary source of communication. It's the method through which one shares ones ideas and thoughts with others. There are thousands of languages in this world. Countries have their own national languages in addition to a variety of local languages spoken and understood by their people in different regions. Some languages are spoken by millions of people, others by only a few thousand. English language is realized as a link language with global significance and also the most spread language in the world. Many writers across world agree that English is the 'queen of languages'. The United Nations Organization (UNO) has given English the status of an official language. It is not just because it is one of the most widely spoken languages, but also because the use of English has made the social and economic exchange between people of different communities and cultures practically possible. It is well recognized that English-speaking persons can be traced in all the continents of the world and is the reason for its importance in the compulsory education of many countries across the globe. It is not only used in public and private offices but also in education institutions, media, sports and business. Hence, teaching

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LSRW skills to the students is very essential in order to develop their communication skills.

Importance of English Language

There are several factors that make the English language essential to communication in our current time. First of all, it is the most common foreign language. This means that two people who come from different countries (for example, a Mexican and a Swede) usually use English as a common language to communicate. That's why everyone needs to learn the language in order to get in touch on an international level. English is also essential to the field of education. In many countries, children are taught and encouraged to learn English as a second language. Even in countries where it is not an official language, such as the Netherlands or Sweden. Because it is the dominant language in the sciences, most of the research studies are written in English. Competence in language skills such as Listening, Speaking, Reading and Writing is prerequisite to students' academic, personal, and professional success in life. Indeed, teachers deliver most instruction for classroom procedures orally to students. Students with ineffective listening skills fail to absorb much of the material to which they are exposed. Their problems are intensified when they respond incorrectly or inappropriately because of poor speaking skills.

Discussions and Strategies

Skills-based teaching

The four communication skills are identified as listening, speaking, reading and writing (LSRW). All these skills are further divided into sub skills.

text) and intensive reading (for detailed understanding of the text). Listening Skills could be enhanced by focusing on making the students listen to the sounds of that particular language. This would help them with the right pronunciation of words. Speaking skills could be enhanced by understanding para-linguistic attributes such as voice quality, volume and tone, voice modulation, articulation, pronunciation etc. This could also be further enhanced with the help of debates and discussions. Reading Skills helps the students to guess the meanings of the words in the language from the context and grasp the content and draw conclusions. This could be done by skimming texts and reading and understanding of textual materials. Writing Skills could be improved through composition and creative story writing. The writing skill also could enhance the vocabulary knowledge of the learners.

Content Based Instruction (CBI)

Inorder to design a content-based lesson, teachers should consider their linguistic, strategic, and cultural objectives. Through the class, students are supposed to improve their English skills, to learn strategies to be applied in all subject areas, and to understand the culture of English-speaking people (Richards & Rodgers, 2001, p. 211.) In this approach, the content teacher presents content to students while the language teacher brings vocabulary, grammar and subskill development to students' attention through typical exercises, all of which focus on the lexicon of the content.

Task Based Instruction (TBI)

In developing the instructional sequence, it is useful to consider Nunan's (2004 Pp.35-38) seven principles of TBI.

1. Scaffolding: Was a supporting framework (tasks, materials, instructor/peer support) provided within which the learning can happen?
2. Task dependency: Did each task grow out of and build upon the tasks that had already been completed?

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3. Recycling: Were there opportunities for learning about language use in different contexts?
4. Active learning: Did the learners get to actively use the language they are learning?
5. Integration: Were there opportunities to reintegrate form, function, and meaning?
6. Reproduction to creation: Were learners encouraged to move from reproductive to creative language use?
7. Reflection: Were learners provided opportunities to reflect on the product and process of their task performance?

Project Based Approach (PBA)

This approach concretizes the integration of not only the four skills but also language, culture, experience and learning strategies (Turnbull, 1999). With the careful selection of a final project that requires learners to demonstrate what they have learned through both oral and written production, the teacher plans backwards to identify what aspects of language, culture, experience and learning strategies are required to complete the end project.

Principles of effective communication

- **Clear pronunciation:** Clear pronunciation of message sender in the main factor or oral communication. If it is not clear, the goal of the message may not be achieved.
- **Preparation:** Before communicating orally the speaker should take preparation both physically and mentally.
- **Unity and integration:** The unity an integration of the speech of the message sender is a must for successful oral communication.
- **Precision:** Precision is needed to make oral communication effective. The meaning of the words must be specific.
- **Natural voice:** The speaker's must not be fluctuated at the time of oral communication. On the other hand artificial voice must be avoided.
- **Planning:** Organized plan is a must for effective oral communication. The speaker should take proper plan for delivering speech.
- **Simplicity:** The speaker should use simple an understandable words in oral communication. It should be easy and simple.
- **Legality:** The speaker's speech should be legal and logical at the time of oral communication.
- **Avoiding emotions:** At the time of oral discussion, excessive emotions can divert a speaker from main subject. So, the speaker should be careful about emotion. The speech must be emotionless.
- **Acting:** Many people lose concentration after listening for a few minutes. So speech must be emotionless.
- **Efficiency:** Speakers efficiency and skill is necessary for effective oral communication.
- **Vocabulary:** Words bear different meanings to different people in different situations. In oral communication, a speaker should use the most familiar words to the receiver of the message to avoid any confusion in the meaning of the words.

Wilkinson (1965) introduced the term *oracy* as a way for people to think about the role that oral language plays in literacy development, defining it as "the ability to express oneself coherently and to communicate freely with others by word of mouth." Wilkinson noted that the development of oracy would lead to

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increased skill in reading and writing as users of the language became increasingly proficient. Perhaps the greatest tools that the teacher can give to the students for succeeding, not only in their education but more generally in life, is a large, rich vocabulary and the skills for using those words. One's ability to function in today's complex social and economic worlds is mightily affected by ones language skills and word knowledge.

Strategies to develop LSRW Skills in the classroom

Second Language learners need to practice the language regularly inside the classroom through performing different activities. Thus, effective teacher should vary the oral activities to encourage and involve the learners in the classroom interaction. Scrivener (1994) makes an important point that supports this idea, he said that: "the aim of communicative activity in class is to get learners to use the language they are learning to interact in realistic and meaningful ways and usually involving exchanges information or opinion" (152). There are many different activities that can be done inside the classroom and help the learners to develop their speaking skill.

The following are some of the strategies or techniques that can be used in the classroom to enhance listening, speaking, reading and writing skills of the learners;

Listening Skills

Making the students listen to an English conversation, showing English documentaries in the classroom, broadcasting programs, reading famous sayings related to listening skills and rewarding the excellent listener after giving the students a challenging listening quiz may enthuse their interest.

Speaking Skills

- **Group Discussion**

The most common activity used in speaking classes is group discussion. This activity gives the students the opportunity to talk and share their interests, opinions, and experiences. As **Hedge (2000)** said that the discussion must be limitless i.e. free discussion, here the students can use their background knowledge about that specific subject. Students often are unwilling to give their opinions in front of the whole class. So, to avoid such problems the easiest solution is dividing the class to groups because when getting into groups, the students will exchange ideas, offer suggestions, give remedies or even ask each other about a word or expression in their target language etc.

Teachers should be careful in planning and setting up a discussion activity. First of all, the topic must be interesting, easy to talk about, and touching their real-life situations. **Celle-Marcia** (2001) stated that "students need to be clear about what they are to discuss, why they are discussing it, and what outcomes is expected" (P.106). Second, well grouping or pairing students is a step for a successful discussion, and finally students should be reminded that each one should participate and have a specific responsibility in the discussion in order to make all the students speak and use the target language.

- **Role-play**

It is an enjoyable activity for most of the students particularly those who like to imitate the others. Role play is an authentic technique because it encourages a large number of students especially if it is based on real-life situations; moreover, it helps them to reduce their fears in front of the whole class because usually it should be performed in pairs or groups. Thus, each student has to perform a role. In addition to that, role play activity gives the students the opportunity to practice and develop variety of socio-cultural speech acts that are appropriate to the situation and to the characters. For example, when requesting, apologizing, complaining, thanking etc. This activity can be performed from prepared scripts, student's imagination or experience. The success of the role play depends

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on the choice of the topics and to the teacher's motivation. Hedge (2000) argues that "it will depend on the willingness and motivation of the students to change the personae" (P.280).

❖ **Communicative tasks**

Those activities are very entertaining for both students and teachers because they make a sense of humor in the classroom. in addition they are directed to achieve some extra linguistic goals. Thornbury (2005) proposed that communicative activities are characterized by some features such as a) the tasks should be from real-life situations b) achieving some outcome by using language in funny way c) make the students practice and interact. These communicative tasks enable the learners speak and engage in the classroom interaction.

❖ **Chain story**

This activity is very interesting because the teacher tries to create a story with his/her students. First of all, s/he must make their students motivated to do such activity. Then s/he will begin the story after that he gives turns to the students. Each student should create a new sentence from his imaginations and by the end they finish with a new story.

Reading Skills

Motivating students to read lessons every day in the classroom and at home, summarizing stories and reading texts, making their own dictionaries, time for sharing and discussing the students reading, reading competitions and rewarding the best reader to encourage them.

Writing Skills

Conducting writing competitions (essays, short stories, poems, etc.) and teaching students about writing for specific purposes, and rewarding them for their good performance. And another technique is;

❖ **Three Minute Writing**

Students could be given a specific topic or title to write about it for three minutes. This practice could enhance their creative writing skill.

CONCLUSION

In the present scenario, profe... well as students certainly need effe... impressive LSRW i.e listening, spe... reading, writing skills to com... effectively. There is a great need to frame ... materials and develop methods and strate... as to enhance LSRW skills of the ... Students require LSRW skills to expre... share their experience, knowledge, ide... thoughts in an effective manner and to ha... better understanding and harmony fo... common benefit of the society. LSRW ... thus can be developed by rigorous tra... programmes, novel techniques and me... discussions and practice. The teachers ... give opportunities to the students to parti... in seminars, workshops, conferences in ... institutions and also in the classroom ... encouraging them to present papers in ... develop their oral communication skill.

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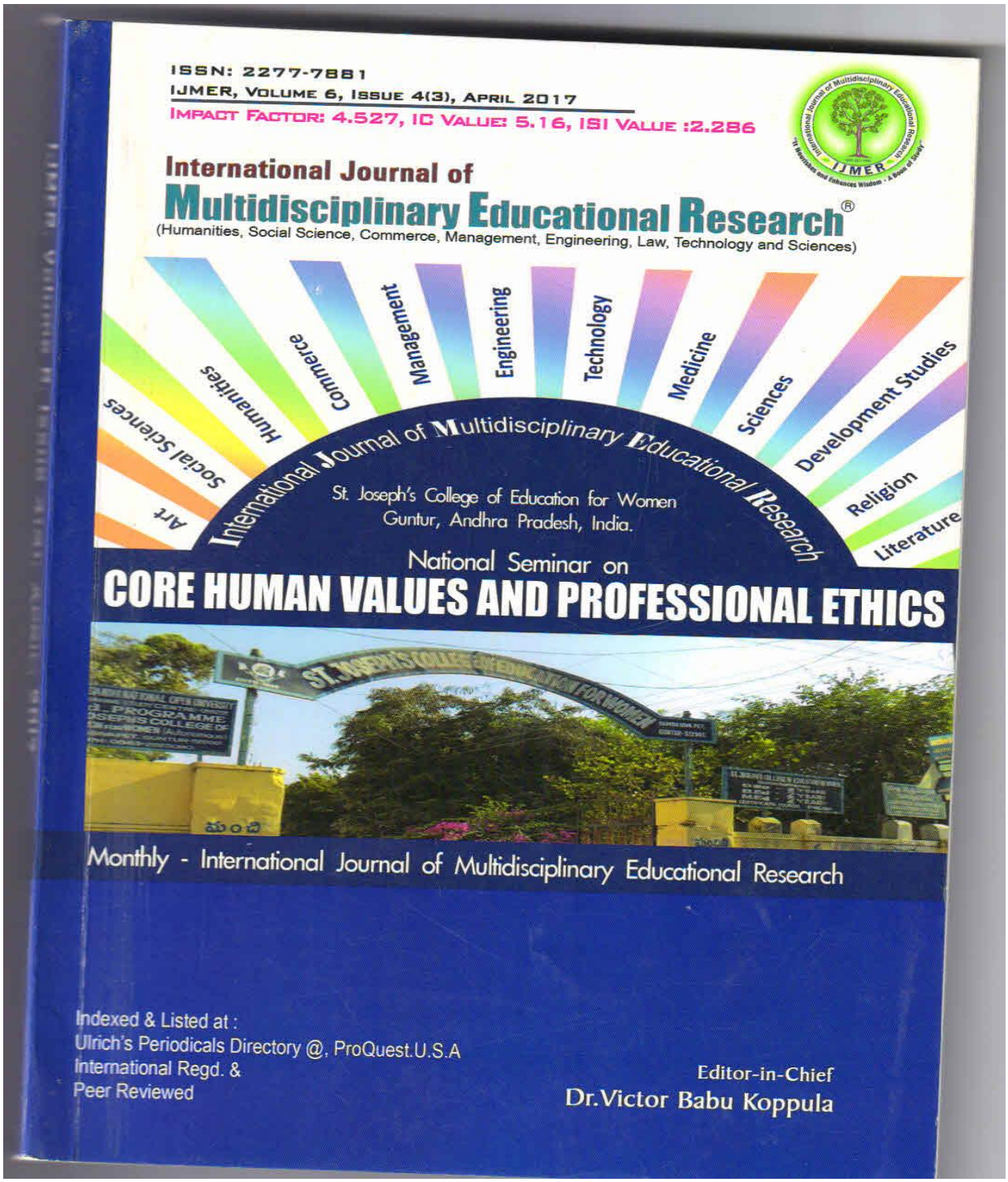

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FUNDAMENTAL HUMAN VALUES IN HUMAN RELATIONSHIPS

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INTRODUCTION

Values are **psychological** objects. Although we cannot see or touch them, they are every bit as real as any physical object. People may dedicate their entire life or even give up their lives to pursue their values, as so many loyal patriots had done fighting for values of freedom, equality and human rights. We all have values that determine our decisions and guide our lives. Those who value their individuality take responsibility, are self-reliant and act with self-respect. Those who value truthfulness cannot bring themselves to tell a lie. Those who value family or friendship sacrifice their personal interests for the good of others. Those who value goodness cannot bring themselves to do something they know is wrong. We express values in our relations with other people when we are loyal, reliable, honest, generous, trusting, trustworthy, feel a sense of responsibility for family, friends, co-workers, our organization, community or country.

Having explored the harmony in the human being, we are able to explore the harmony in the family. This enables us to understand the harmony at the level of society, nature and existence. And this is the way the harmony in our life grows. We slowly get the competence to live in harmony with all human beings. The feelings of being related to every human being leads to our participation in an undivided society. With the understanding of values in human relationships, we are able to recognize the connectedness with every individual correctly, and fulfil it. And when we get connected with the individuals, we love the nature and become one with the nature. This enables us to participate in the universal human order.

The fundamental values for human relationship are as follows;

- Trust
- Truthfulness
- Goodness

- Love
- Reverence
- Concern for Others
- Respect
- Humility
  Gratitude

Trust

Trust is the foundational value in relationship. The feeling of Trust in relationship is defined as "To be assured that each human being inherently wants oneself and the others to be happy and prosperous. When we are assured that the other is for our happiness and prosperity, we have trust in the other. When this is doubted, we lack the trust and it becomes the source of fear. In all our relationships, trust is the Foundation. A relationship without trust results in opposition, the relationship itself gets shaken. Lack of trust is what ultimately leads to extreme situations like war. Our natural acceptance is to live with a feeling of relatedness to all and this means that we have the assurance in us at all times that each and every human being wants our happiness, just like we want the happiness of other human beings. However, since we are not competent and similarly the other is also not competent, we need to work towards improving our competence and help the other improve theirs.

Truthfulness

Truthfulness implies a respect for the truth. The virtues of truth are not conventional fetishes of academic theorizing. They can be concretely addressed to everyday truths and revealed in the way that one handles everyday truths. But many of us live in a world where the truth is perverted into something that is more opinion than truth. In many ways, we are fed the pabulum of what we want to hear. We do the same to others. We live in a masked world that takes joy in rosy outlooks. Reality is way too painful. The values of beauty, truth, and goodness act as compass headings for the improvement of the human condition, regardless of the assessor's psychic location. Even though each stage of development has its own version of what is valuable, we can see how the spiral as a whole does act to define the overall

trajectory of evolving values for both the individual and the culture. Truth is like a light that illuminates the potential for progress, giving us the power to see how things really are, and thereby to improve any situation by making contact with the actual conditions. The practice of beauty involves feeling the pleasure and delicious satisfaction that result when our emotions become entrained to the vibrations of universal unity found in nature and in certain forms of human art. Beauty provides a fleeting glimpse of relative actual perfection. John Keats in his poem entitled "Ode on a Grecian Urn" states that

> Beauty is truth, truth beauty,—that is all
>
> Ye know on earth, and all ye need to know."

These lines implicitly affirm the sufficiency of human intellect, explicitly affirm the equation of beauty and truth, and pronounce this knowledge entirely sufficient to create the elegant geometry of such superb art as the urn and also the superiority of this value truth to acquire for the mankind to enjoy the beauty of life.

Goodness

Goodness is the very heart of the whole reign of moral values. It is the centre of all morality, and at the same time, it's the most sublime fruit. Goodness is experienced by people when they are in need. We hear people say that they enjoyed the goodness of their friend or family when one is disposed to help, when one is kindly, just, when one is ready to make sacrifices for others, when one pardons wrongs done by him or her, when one is generous, when one is full of compassion. All these qualities are specific forms and manifestations of love. This indicates the close connection which exists between love and goodness. Love is, as it were, flowing goodness, and goodness is the breath of love.

Love

Love is always a response to value. In love, one responds not only with a specific word, but with the gift of one's heart, with oneself. In love, one conspires with value more closely and more deeply than in any other response, such as, for example, reverence or obedience. In love, a man dwells in the values of the beloved, in a completely different way. Love, in its fullest and proper meaning, addresses itself always to persons. In love, one spiritually hastens toward the other person in order to dwell with him, to partake with him, and, on the other hand, to

cover him with a mantle of goodness, to spiritually cherish and protect him.

Reverence

Reverence is the indispensable presupposition for all deep knowledge— above all, for the capacity to grasp values. The fundamental attitude of reverence is the basis for all moral conduct toward our fellowmen and toward ourselves. Only to the man possessing reverence is revealed the full grandeur and depth of the values which are inherent in every man, as a spiritual person. The spiritual person as a conscious, free being, as a being who alone, among all the entities known to us, is capable of knowing and grasping the rest of being, and of taking a meaningful position toward it, can only be comprehended by a reverent mind. A being who is able and destined to realize in himself a rich world of values, to become a vessel of goodness, purity, and humility—this is a person. Reverence is also the soul of the correct attitude in other domains, such as purity. Reverence for the mystery of the marital union, for the depth and tenderness and the decisive and lasting validity of this most intimate abandonment of self, are the presuppositions for purity.

Concern for Others

Perhaps the single most powerful way to succeed in life is to have more concern for our fellow human beings. Normally, we are overwhelmingly concerned about our own selves, driven by our own personal motives and ambitions. However, the happiest people literally lose themselves in the feelings, thoughts, and aspirations of others.

Respect

Respect is the ability to see and celebrate the value in ourselves and others. Respecting the elders is the most important value that one should acquire to value the life of the elders who gave their life time service to the family and society. The best way to teach respect is to show respect. When a child experiences respect, they know what it feels like and begins to understand how important it is. The value of self-respect may be something we take for granted. We may discover how very important it is when our self-respect is threatened, or we lose it and have to work to regain it, or struggle to develop or maintain it in a very difficult environment. Treat others the way you want to be

treated as this is the most significant personal value every person looks at in a special, unique individual. This form of deep respect for each person has the power of generating good will, great happiness, and great achievement. Every time we meet someone, listen to their story and show and feel a great interest and respect, we also see what unique perspective, knowledge, or insight they can offer. Then be totally responsive to their interests. Make this a regular daily habit in life. When we make this value as a part of our life, we cherish it forever.

Humility

Humility is a crucial virtue for personal growth and the flourishing of a community. But it is widely misunderstood. Humility is crucial for keeping ourselves aware of our fallibility. Regardless of how much experience, knowledgeable or skill we might have in a particular field, we always need to keep a minimum of open-mindedness towards alternatives, potentially superior courses of action than the one we are currently committed to.

It's impossible to know beforehand the entire alternative means to an end. Usually the most valuable knowledge about how to do something emerges serendipitously while we try doing it. If humility is the virtue that allows us to be aware of our weaknesses and limitations, then it is a fundamental tool for self-control. Humility allows us to accept that it is impossible to control others, even when we think that our controlling them would be for their own good. Embracing radical change for positive personal and social transformation is necessarily a humbling experience.

The merits of Humility are as follows;

- Promotes the success of others
- Accepts responsibility for mistakes and failures and tries to learn from them
- Open to differing points of view
- Manages conflict and encourages others to manage in a constructive manner •
- Remains calm and helps others in adverse circumstances

Gratitude

Gratitude means thankfulness, counting our blessings, noticing simple pleasures, and acknowledging everything that we receive. It means learning to live our life as if everything were a miracle, and being aware on a continuous basis of how much we have been given. Gratitude shifts our focus from what our life lacks to the abundance that is already present. In addition, behavioral and psychological research has shown the surprising life improvements that can stem from the practice of gratitude. Giving thanks makes people happier and more resilient, it strengthens relationships, it improves health, and it reduces stress.

Notice and Appreciate Each Day's Gifts

People tend to take for granted the good that is already present in their lives. We need to start finding joy in the small things instead of holding out for big achievements—such as getting a promotion, having a comfortable house, good children, satisfaction in our profession etc. Another way to use giving thanks to appreciate life more fully is to use gratitude to help us put things in their proper perspective. When things don't go our way, we need to remember that every difficulty carries within it the seeds of an equal or greater benefit. Once we become oriented toward looking for things to be grateful for, we will find that we begin to appreciate simple pleasures and things that we previously took for granted. Gratitude should not be just a reaction to getting what we want, but an all-the-time gratitude, the kind where we notice the little things and where we constantly look for the good even in unpleasant situations.

Conclusion

Human values are thus an **inspiration for peace** and integrating them into our way of managing human relations **predisposes us** to use them as tools for peace. The values are the foundation for any viable life within the society. They build space for a drive, a movement towards one another. The fundamental values like trust, truthfulness, goodness, love, reverence, concern for other, respect, humility, gratitude and many others make our life happier and flourishing. As teachers, we need to acquire these values and impart these values to our students to mould them into responsible citizens with moral standards and to experience collective happiness and prosperity in a sustainable way.

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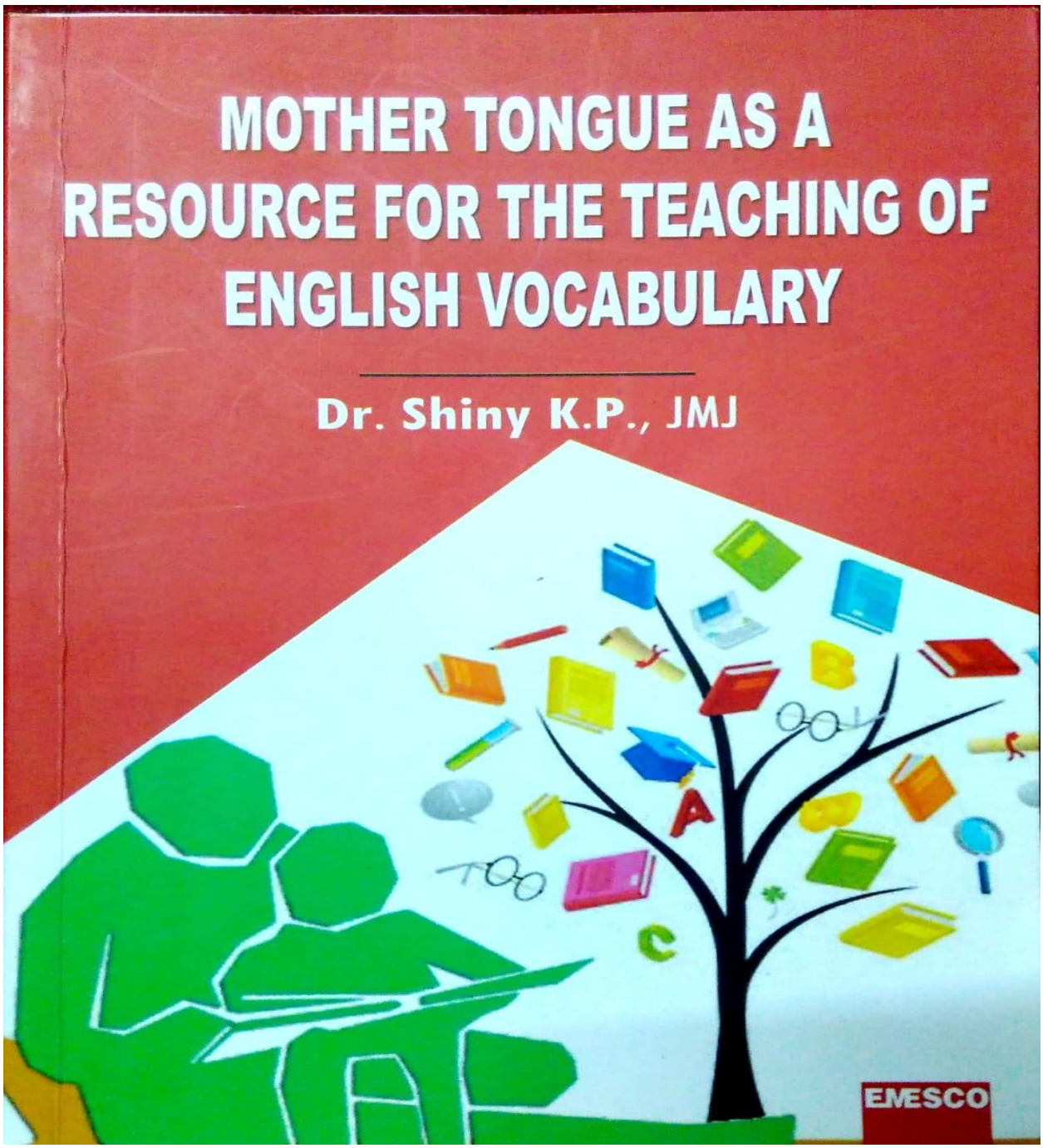

Mother Tongue as a Resource for the Teaching of English Vocabulary

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Chapter-V

Conclusion

This chapter demonstrates the findings, suggestions and implications of the current study. The findings have been organized along the aspects of the effectiveness of teaching vocabulary through Mother tongue and the effectiveness of teaching vocabulary through English, area-wise effectiveness of teaching vocabulary to Experimental and Control groups, and comparison of knowledge of vocabulary of both the groups in Pre-test and Post-test. The limitations of the research are stated. Possibilities for further study in the area are indicated. A few teaching techniques to enhance the knowledge of vocabulary of the learners are offered in this chapter.

5.1 Findings of the Study

The findings of the present research have been organized under four main categories:

i) findings related to the effectiveness of teaching vocabulary through Mother tongue,

ii) findings related to the effectiveness of teaching vocabulary through English,

iii) findings related to the area-wise effectiveness of teaching vocabulary to Experimental group and Control group,

iv) Findings related to the comparison of knowledge of vocabulary of both the groups in Pre-test and Post-test.

5.1.1 Findings Related to the Effectiveness of the use of Mother Tongue in teaching vocabulary

The present study investigated the problems, the Undergraduate students face while communicating in English particularly their lack of vocabulary for effective communication. As these students come from regional medium background and lack vocabulary, they find difficult to communicate in English. Their lack of vocabulary hampers their fluency of English language. The probable reason for the learners' lack of knowledge of vocabulary was that they were not taught basic and different components of vocabulary in course of their education so far. Therefore, the present study argues if these different areas of vocabulary are taught using a specific set of material by following a specific approach, the learners can acquire vocabulary better and then enrich their communication skills. Thus, the current study predominantly focused on improving six different areas of vocabulary using a set of materials.

In view of statistical analysis and the findings of the study, it is quite evident that Experimental and Control groups who come from regional medium background improved their vocabulary after the teaching practice for a period of thirty days. The study has focused on whether the use of Mother tongue is effective in the teaching of vocabulary in the L2 classroom. It has also proposed a set of materials to enhance the communication skills of the 2nd year Degree students who are from regional medium background. After teaching for 30 days, the Post-test was conducted and its result was analyzed, interpreted and the following conclusions are drawn.

1) The experimental study showed that on the whole, teaching vocabulary through Mother tongue is more effective for acquiring vocabulary when compared to teaching vocabulary through English.

2) The Experimental group who were taught with the help of Mother tongue showed significant superiority over Control group who were taught only through English. This significant

difference in the results of the Pre- and Post-test was due to the kind of materials used for teaching and the way the learners' interest was enhanced through authentic materials.

3) From the results of Post-test, it is evident that both groups improved in all the areas of vocabulary that was taught using specific material package.

4) In all six areas of vocabulary, the Experimental group outscored the learners' in Control group. However, both the groups did not show any improvement in the area of spelling and sounds.

5) The findings of the area-wise effectiveness of teaching vocabulary to Experimental and Control groups affirm that the learners have progressed in all the six areas of the vocabulary except in the area of spelling and sound.

6) The significant difference between the scores of Post-test of the Experimental group affirm that the Control group also could have acquired better in all the areas of vocabulary with the help of their Mother tongue.

7) The teaching materials used in the classroom proved to be effective as both Experimental and Control groups showed significant improvement in their vocabulary knowledge from Pre- to Post-test.

8) High achievers of Experimental group showed commendable progress in their vocabulary knowledge than the high achievers of Control group.

9) The percentage of high achievers is commendably high in Experimental group than in Control group.

10) The number of average students in Experimental group after the experiment is very low when compared with Control group. It implies that the experimental package was very

effective in converting average achievers to high achievers when compared with Control group.

11) The number of average students in Experimental group after the experiment is very low when compared with Control group. It implies that the experimental package was very effective in converting average achievers to high achievers when compared with Control group.

12) The significant difference between the scores of Post-test administered to the Experimental and Control group affirm that the Control group had better acquired all the areas of vocabulary if it is taught through Mother tongue.

13) Finally, it can be concluded from the findings of the Pre- and Post-tests to the Experimental and Control groups that teaching English vocabulary through Mother tongue is more effective than teaching vocabulary only through English.

5.1.2 Findings Related to the Effectiveness of Teaching Vocabulary using only English

The Post-test result showed that there is also significant effect of teaching of English vocabulary through English to the Control group. However, there is less effect of teaching vocabulary to Control group through English when compared to the Experimental group who were taught through Mother tongue. It is quite evident from the findings that in the Pre-test the mean is 32.08, standard deviation is 5.36 and the percentage of mean is 45.8, whereas in the Post-test the mean is 48.47, standard deviation is 9.071 and the percentage of mean is 69.24. The t-value is 12.14. The difference of scores in the Post-test indicates that the Control group also gained after teaching vocabulary for thirty days.

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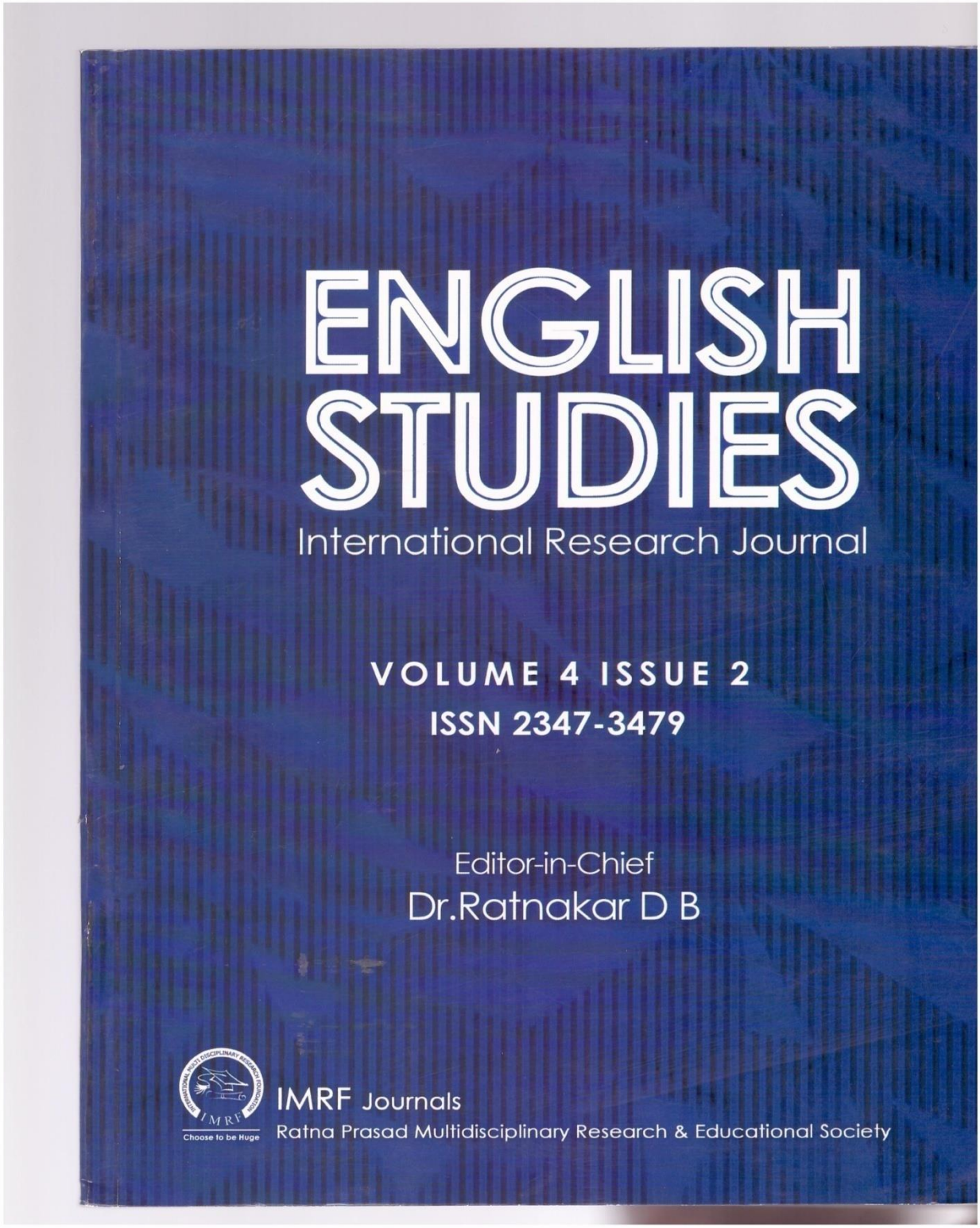
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SELF AND SOCIETY IN THE SELECT SHORT STORIES OF JHUMPA LAHIRI: A CRITICAL STUDY

N. VIMALA DEVI, DR. M. SURESH KUMAR

Abstract: A modern writer JhumpaLahiri is not only a short story writer but also a novelist of recognized ability, commendable technique of narration, and an expert in the delineation of the immigrants and diaspora problems, who has been able to take the world by surprise. She richly deserves any reward she is awarded.
JagadishBatra points out: *"The Library Journal critic finds the novel "a rich stimulating fusion of authentic emotion, ironic observation, and revealing details". Lahiri's forte is her lovable characters. In most of her works, the characters conform to a pattern. Subhash can be seen as a repetition of Ashoke of The "Namesake", in so far as innocence, geniality and good nature are concerned. We have such characters in many of her stories too confirming her faith in the goodness of human beings." (Will JhumpaLahiri overtake Salman Rushdie? – byJagadishBatra – from "The Fiction of JhumpaLahiri" – Khosla Publishing House – New Delhi, 2014 – Pages 29,30. Ed. by SumanBala).*
Her works deal with the problems of migration the pros and cons of sojourn, settlement; so as to say displacement and relocation, alienation and belonging, acculturation and assimilation; displaced lot negotiating all along with the new world. She also deals with loss of roots expatriate experience, linguistic diversity and social dislocation.

Keywords: Self –society- alienation- diasporic culture- acculturation- rootlessness- feminine style.

Introduction: Jhumpalahiri is a realistic writer who never dramatizes or sentimentalizes her characters. She employs realism of method in the homely conversations and her characters remind our next door persons. Her power of perception is keen ,fresh and sharp. Though she is a diasporicwriter,her themes represent India and its veins of culture. JhumpaLahiri (1967), born of Bengal parents, was awarded Pulitzer Prize for fiction in 2000 for her debut collection of short stories entitled *"Interpreter of Maladies"*, (1999). Her very first novel *"The Namesake"* (2003) made her more popular. Her second short story collection *"Unaccustomed Earth"* (2008) has again established her as one of the most excellent and commendable fictionists of the world. Not only a Diaspora writer of Indian origin, but she can also be called an American writer, because of her constant obsession with the American way of life. Her narrative world shuttles between India and the U.S.A. The imbibing of influences of various past or contemporary authors and her excellent narrative technique establish her as one of the towering figures in the World Literature.

A transposition of a subjectvised experience, Lahiri's*The Namesake* is a narrative which evaluates the nuances of American social life and the attempts by the migrants to replace the same on a par with their native or 'root' culture. Within the framework of familial lives of Bengali immigrants in the U.S, the novel explores and exposes the deep schisms behind the veneer of equality and uniformity in America, marked by its shopping malls, suburban housing, etc to a more poignant and startling cultural depths – a hiatus too wide to bridge. However, it is in *The Namesake*, her first novel that a sustained attempt is made to deal with these concerns of two generations of an immigrant Indian family. What emerges at the end of this deeply psychological study is the hybridity and luminal existence of the diasporic community, what with the ubiquitous conflict between strong ethnic ties and a matching resolve to settle down in the New World. In the process, the feeling of 'neither there nor here' spills over into the lives of the second generation also. It is a deeply moving and finely wrought family drama centred around the Ganguli couple, first generation Indian immigrants, whose experiences in the U.S. are pitted against those of their children, complicated further by the choice of name for their son--all of which leads to the clash of cultures resolving into a sense of hybridity and in-betweenness.

JhumpaLahiri is the kind of writer who makes you want to grab the next person you see and say *"Read this!"* She is a dazzling story teller with a distinct voice, an eye for nuance and an ear for irony, She is one of the finest short story writers, who is able to draw her readers into the story not only through her details and descriptions but also by making them feel the emotional, physical and mental needs of the characters. She has a rare gift for tucking away memories and observations in the back of her literary mind and churning them into a mixture of sensitive and thought-provoking stories.

ShilpiAhuja says: "The stories are on-the-face direct and embrace you in their warm folds without you even being aware of it. She has helped in throwing clearer light on the Indian's perspective of life in an alien land. However, the book does not reek of ethnocentricity--it

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has a universal flavor and appeal that an immigrant from any corner of the world would be able to relate to". (JhumpaLahiri's style of writing in ***Interpreter of Maladies*** *-- from FORM AND STYLE IN ENGLISH FICTION – Prestige – New Delhi, 2001 page 148. ed.byJagdishBatra)*

For example *"A Temporary Matter"* deals with the relationship between the Indian couple Shoba and Shukumar begins to break up after Shoba delivered a stillborn child. There is incompatibility between them and they try to avoid each other. She is very busy with her work while Shukumar neglects his Ph.D work sleeping most of the day. They discuss and debate on certain serious events in their life. They find or seek to find consolation in the dark when the scheduled power cuts occur between 8 to 9 PM. *"He wondered what Shoba would tell him in the dark. The worst possibilities had an affair. That she did not respect him for being thirty-five and still a student.... I cheated on my Oriental Civilization exam in college.... It had happened over fifteen years ago. He felt relief now, having told her."*(IM-PP-16-17). The couple wept together, for the things they now knew. It was indeed a small temporary matter that brought about the crisis and the resolution.

Lahiri as a Diaspora writer deals with the multicultural society both from *inside* and *outside*, seeking to find her native identity as well as the new identity in the adopted country. This brings in a clash of cultures and dislocation and displacement. It is the predicament of people in Diaspora that the fictionist attempts to analyze through her oeuvre of fiction writing.

She has become internationally famous. Her works portray the lives of Indians in exile, of people navigating and negotiating between ethnic culture and traditional culture they have inherited. They have to encounter everyday a baffling new world without any bias. Her thematic concerns include physical and emotional displacement, assimilation, loneliness, rootlessness, linguistic barriers, failed relationships, marital difficulties and misunderstandings. With a remarkable perception and insight, she delves deep into the psychological depths of her characters and reveals the inner world.

The Namesake describes the story of an individual named Gogol who detests and fails in accepting his peculiar name. He endeavours to be detached from the ultimate reality, a fact of his life. JhumpaLahiri takes a complete new approach to present the identity clash of that character and manages to trap the person in his own name. Gogol realizes that his name is not an Indian, where his parents belonged, nor American, where he was born. When he finds that he was named after a Russian writer Nikolai Gogol, who was an eccentric genius, deeply paranoid, frustrated man. The detail of his namesake disturbs him a lot and suddenly he starts hating his name more than anything else. He then realizes that Gogol was the last name of Nikolai Gogol and even he was not having the name of Gogol. The more he knows about Gogol the more he feels betrayed by his parents. Here the parents act according to Bengali tradition. Over their pet name had a function to play. JhumpaLahiriwrites:*"Pet names are a persistent remnant of childhood, a reminder that life is not always so serious, so formal, so complicated. They are a reminder too, that one is not at all things to all people." (26)* This clearly shows that an individual's identity changes from person to person and one is not the same individual to everyone. The parents feel that their son Gogol leads a bohemian life.

Ashima regrets that her concern is not understood by her son. Maxine's attitude affects Ashima's sentiment seriously and this violates the cultural ethics of the Gangulis. She apprehends that this violation would affect the ethics of family life and marriage between an Indian and an American. This proves the ego of Indian immigrant Bengalis. They have a deep sense of pride in their socio-cultural concepts and practices. In celebration of their culture, the first generation Bengalis seem to be more honest, sincere and loyal to their cultural past. But for the second generation things fall apart and the centre cannot hold them as they have been more contaminated/accultured in the cultural practices of America. They become habituated to Christian customs. SmitaMohanty points out: *"In love and marriage they think (the young lovers) their parents are more tabooed and demonstrate physical affection publicly in 'uncelebrated' and 'depressing' manner. Gogol's affairs with Ruth a hippie girl and Maxine the Manhattan girl, is not liked by his parents on moral grounds since in Indian context love and marriage are taken as a sacred bond... Maxine confesses her affairs with her ex-boyfriends before Gogol."(The Namesake: An Exegesis of Ethical Consciousness- by SmitaMohanty – from "Dynamics of Culture and Diaspora in JhumpaLahiri" P58 Adhyayan-New Delhi).*

In Lahiri's*Unaccustomed Earth*, the first generation migrants remain clustered together, showing their collective memory, vision or myth about their original homeland. Though they left it for the possibility of distinctive life in a tolerant host country, yet they know that they are not accepted by their host society and therefore feel isolated from it. For this insecurity they are constantly on the look-out for people belonging to their own community, searching for epidermic and cultural similarities. In order to avoid undesirable conflict with the norms of the host country the Diaspora, especially the men who are compelled to enter the mainstream through their jobs try to camouflage. In *"Unaccustomed*

*Earth"*Ruma's father manages to look like an American.

We realize that in their emotional displacement, the border between home and world becomes confused Lahiri's first collection of stories; *"Interpreter of Maladies"* is subtitled as *"Stories of Bengal, Boston and Beyond"*. The present collection of study *Unaccustomed Earth* delineates the beyond. It goes beyond physical and psychological borders. These stories describe life as a whole and various relationships which are part and parcel of one's life. Lahiri has shown clearly that these bondages and vicissitudes one comes across in life makes the person a complete social being. The protagonists and other characters in these stories represent the diasporic struggle as well as journey of the self in quest of the lost identity. The meaning of one's existence lies not only within him but also related to the world and the fellow beings. This awareness makes one *"strike roots into Unaccustomed Earth"*

Even many of her short stories are about exile and movement--people leaving and returning. They are people caught between two cultures, two countries two worlds. In her writing Lahiri is interested in transition. She explores the shifting of people from one location to another, examining the reasons why people leave--for jobs, for educational opportunities, because of health or family dynamics. Most of her characters struggle in adapting to these new environments, not knowing what parts their home culture to embrace. Thus Lahiri is a writer par excellence.

A.J. Sebastian points out: *"Lahiri as the omniscient observer applies the predicament of her characters to interpret the maladies gnawing into their immigrant life. She also attempts to cope with the dynamics of culture as well as Diaspora in each situation. Her stories, thereby, provide a powerful healing touch to immigrants caught in alienation, exile and isolation." (JhumpaLahiri "Interpreting Maladies" – an article by A.J.Sebastian, published in the book entitled "Dynamics of Culture and Diaspora in JhumpaLahiri – edited by Nigamannanda Das, Adhyayan Publishers, New Delhi, 2010, P8)*

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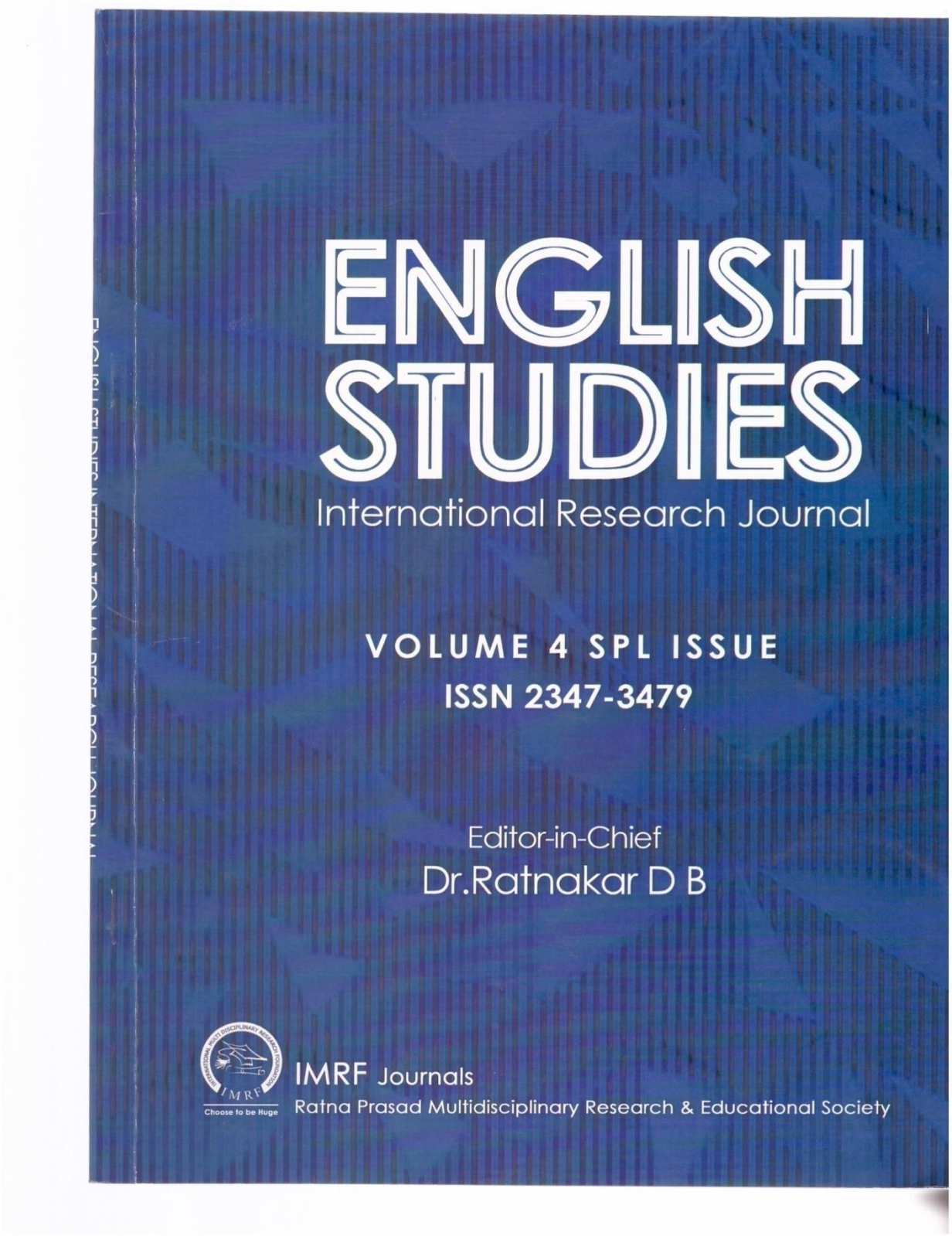
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CONTENTS

WOMEN IN THE SELECT WORKS OF SHASHIDESHPONDE, MANJUKAPUR, AND ARUNDHATI ROY: A CRITICAL STUDY

DR. M. SURESH KUMAR, N. VIMALA DEVI

Abstract: Shashi Deshponde, Manju Kapur, and Arundhati Roy and Bharati Mukherjee are the most accomplished diasporic writers. Manju Kapur is one of the latest writers in the field of diasporic literature. With her few literary writings, she has been able to carve a niche for herself in the literary world. Her writing is characterized by cross cultural conflicts. She attempts to explore the nuances of Diasporic consciousness by the picturesque portrayal of women characters. Arudhati Roy is a prominent author of the Indian Writings in English who has induced the study of feminism in her writings. She is widely eulogized as the finest of her cohort of Indian writers in English. This paper aims to highlight the female protagonists of these writers who are insightful, anxious, luminous and inventive. Initially fatalities of self denial they are in conflict with their internal selves because they ignore their real stance. Their major concern as creative writers is to find and preserve women's identity as daughter, wife, mother and most important of all as human beings. Concerns related to women are central to the vision of their novels. The paper aims to discuss the victimization of women and their traumatic experience undergone in their works. The condition of women has gradually changed globally and the docile female has succumbed place to the enlightened woman. The position of women in India has been subjected to many great changes over the past few centuries.

Keywords: Women, Diaspora, Trauma, victims, conflict.

Introduction: 'Women' – the term itself is mesmerizing and captivating. Women are compared to the most eye-catching things in the nature. The characters of Sita, Savitrietc are outstanding examples to show the potentialities in women. The modern women like Chanda Kochhar or Sikha Sharma, Deepa Karmakar, P.V. Sindhu are able to compete with men by placing them in the most prominent positions in the fields of business and sports. We are already aware of the women like Indira Gandhi and freedom fighters like Jhansi Lakshmi Bai, Durga Bai Deshmukhetc who established their own image in politics. Though women have reached to the superior positions equal to men, they are suppressed by men and the patriarchal societies. The atrocities against women are increasing day by day in the technologically advanced modern and civilized society. Writers like Manju Kapur ,jhumpa Lahiri, Arundhathi Roy, Shashi Deshponde, Anita Rao Badami, Kirandesai have set their foot on the right framework of feminism focusing on the aspects where women are suppressed and not valued by the male dominating society. Sarah Grimke rightly points out "Man has subjugated woman to his will, used her as a means to promote his selfish gratification, to minister to his sensual pleasure, to be instrumental in promoting his comfort, but never has he desired to elevate her to that rank she was created to fill. He has done all he could do to debase and enslave her mind."(1970: 10). Women are equal to men in many aspects; of course KalpanaChawla could reach space. The role of women continued to flourish in all the fields including literature. India is fortunate to have handful feminist writers, who are raising their voice on the suppression of women.

Contemporary Indo-English literature reflects the continuing and inherent tension between the reinforcing of traditions and the resistance to recurrent cultural patterns. Some critics of Indo-English literature like Shantha Krishnaswamy, have sought to trace and affirm the Indianness of women protagonists and to see them largely in the context of their relationship to men. Her work *The Woman in Indian Fiction in English* (1950-1980), like Meena Shirwadkar's *Earlier Image of Womanin the Indo-Anglian Novel*, considers women a separate category but sees them strictly in relationship to men. The sacralization of motherhood is inherently problematic. Mahasweta Devi's short story "*Stanadayani*" is a brilliant indictment of the glorification of the abstract idea of motherhood while ignoring the position of real mothers. Githa Hariharan's *The Thousand Faces of Night* and Sahashi Deshpande's *The Binding Vine* both indicate that for an older generation of women, often the only legitimate way out of imprisoning gender roles, be they of sacred motherhood or dutiful wives, was to follow in the itinerant footsteps of Mira Bai, the Bhakti poet who renounced the world for her god. Kamal Das's autobiography *My Story* was considered controversial and, more recently, Roy's *The God ofSmall Things*, faced legal action on charges of phonography. Roy's case shows how the appeal to tradition justifies attempts to proscribe women's writing in the public sphere.

Society has undergone a great change since 1960s. No longer do women writers have to assume

pseudonyms, as in the case of George Eliot, to shield her identity. Women writers today enjoy a relatively greater measure of freedom and do not hesitate to explore regions of experience which were earlier considered taboo. Shashi Deshpande, Manju Kapur and Arundati Roy occupy a significant place among the contemporary women novelists who concern themselves with the problems of women and their quest for identity. Their attempt to give an honest portrayal of their sufferings, disappointments and frustrations make their novels susceptible to treatment from the feminist angle.

Shashi Deshpande: Shashi Deshpande, born in 1938 in Dharwad, Karnataka, India, is an award-winning Indian novelist. She is the second daughter of famous Kannada dramatist and writer Sriranga. She was born in Karnataka and, educated in Bombay and Bangalore. She won the Sahitya Akademi Award for the novel *That Long Silence'* in 1990 and the Padma Shri Award in 2009.ShashiDeshpande has written four children's books, a number of short stories, and ten novels, besides several perceptive essays, now available in a volume entitled *Writing from theMargin and Other Essays*. Her books include: *The Dark Holds No Terrors* (1980), *If I DieToday*(1982), *Come Up and Be Dead* (1983), *Roots and Shadows* (1983) *That LongSilence*(1989), *Small Remedies*, (2000), *A Matter of Time* (2001), *The Binding Vine* (2002), *Moving On* (2004) and *In the Country of Deceit* (2008).

To capture the interest of the reader, Deshpande avoids the simple technique of straightforward narration, and instead employs the flashback method. While the first chapter deals with the present, the later chapters move backwards in time, culminating in the final chapter which again ends in the present. This convoluted narration has come in for some criticism by reviewers who feel that it has only contributed to creating confusion in the minds of readers. For this novel chronological clarity is essential, as the reader already has to cope with an abundance of characters and their complex interactions. The first person narration also allows the author to probe deep into the mind of the protagonist, exposing her fears and frustrations with admirable candor. Shashi Despande is not a feminist in an aggressive and militant sense, for she does not make any assault on the male or masculine world. She has been maintaining and developing a very balanced kind of vision, a vision that is positive and creative and sustaining in nature. She does not believe in any kind of visible or invisible war between the sexes, and her whole attitude rests upon the fact that home is where one starts from, and that the happiest kind of home is one which rests upon liberal or liberalized domesticity.

Manju Kapur: Manju Kapur is an Indian novelist. Manju Kapur was born in 1948 in Amritsar. She graduated from the Miranda House University College for women and went on to take an MA at Dalhousie University in Halifax, Nova Scotia, and an M.Phil. at Delhi University. Manju Kapur is a professor of English where she is a teacher of English literature at her alma mater Miranda House College, Delhi. She has three daughters. Her first novel, *Difficult Daughters*, won the 1999 Commonwealth Writers' Prize, best first book, Europe and South Asia. Manju Kapur's debut novel *Difficult Daughters* earned her substantial success, both commercially and critically, in India as well as abroad. She teaches English at Delhi University under the name Manju Kapur Dalmia. She studied and received an M.A. in 1972 from Dalhousie University in Halifax, Canada, and an M. Phil from Delhi University. A Feministic tradition is strongly apparent in her novels. The search for control over one's destiny is the key theme. Manju Kapur speaks for the middle-class and even has been earned several comparisons with Jane Austen for her sharp-eyed, finely turned character portraits that are caught in tricky situations. She has written five novels: *Difficult Daughters* (1998), *A Married Woman* (2003), *Home* (2006), *The Immigrant* (2009) and *Custody* (2011).

The portrayal of woman in Indian English fiction as the silent victim and up holder of the tradition and traditional values of family and society has undergone a tremendous change and is no longer presented as a passive character. However, Mrs. Kapur seems aware of the fact that the women of India have indeed achieved their success in sixty years of independence, but if there is to be a true female independence, too much remains to be done. We see the emergence of new women in Manju Kapur's heroines, who do not want to be rubber doll for others to move as they will. Defying patriarchal notions that enforce women towards domesticity, they assert their individuality and aspire self reliance through education. They nurture the desire of being independent and leading lives of their own. They want to shoulder responsibilities that go beyond husband and children. They are not silent rebels but are bold, outspoken, determined and action oriented. The protagonists know she can not depend on others to sort out the domestic situation and proceed to tackle it on her own. In spite of getting education and freedom the woman protagonist of Manju Kapur's novel does not blossom into new woman in the real sense. Though she dare to cross one patriarchal threshold, they are caught into another, where their free spirits are curbed and all they do is adjust, compromise and adapt. More than half of the population of the world is made of woman but she is not treated on par with man despite innumerable evolutions and revolutions. She has the same mental and moral power, yet she is notrecognized as his equal. In such conditions, the

question of searching her identity is justified. Actually in this male dominated society, she is wife, mother, sister and home maker. She is expected to serve, sacrifice, submit and tolerate each ill against her peacefully. Her individual self has very little recognition in the patriarchal society and so self-effacement is her normal way of life.

The illustration of Sita, Savitri and Gandhari are always expected to be followed by her. But the noticeable point is that these ideal women existed only in epics, they were princesses and queens and much far from the pains and sufferings in modern world in which modern woman has no identity of her own. She lives for others and breathes for others. And the situation becomes more deadly when we take it in Indian context where women must defer to her husband and make the marital home pleasant for him. In this context, Indian women novelists are gaining grounds worldwide and winning critical appraisal and international recognition. Now their work is no more considered as something derogatory, melodramatic or sub-stuff. The glaring cause of their success as novelist lies in the fact that they are born story-teller and they are endowed with the gift of delving deep into the workings of human mind and heart with sympathy, sensitivity and understanding. But there is also the common element of conflict of values and fighting between different ways of life. Although, the quest for self, especially in the life of woman has become a much debatable phenomena, as long as this term is growing old, it is losing its authenticity. It is occasionally misinterpreted by literati of the world. No one can deny the fact that women are treated as no entity several times in their life, their sentiments and emotions are mostly ignored but as far as their honesty to themselves is concerned they must be vigilant for their chastity and responsibilities.

The novels of Manju Kapur voice well the sentiments of women and their self-introspections. Virmati, (*Difficult Daughters*) Astha, (*A Married Woman*), Nisha, (*Home*) Nina,(*The Immigrant*) and Shagun, (*Custody*) all are searching for their grounds interestingly from a wrong threshold. All of them fall in love first, and the search for the self-identity becomes the second thought. The facts raised by Manju Kapur are worth research and inquiry and through (Nisha, Shakuntala and Rupa) the exemplary figures, she presents an ideal image of women who amid all thick and thins maintain their chastity and humanity and do not leave anyone destitute. Manju Kapur's novels present the readers her deep understanding of human characters and her maturity as a novelist. Manju Kapur's novels reveal the life of women, their struggle for basic rights, quest for identity and survival. Manju Kapur's fiction stresses on the woman's need for self-realization. Displaying a mature understanding of the female psyche, Kapur beautifully explores the various issues of women in her political, sexual and domestic milieu. There is a transition of the image of woman from "suffering women to the assertive ones, redefining self and defying traditional roles....." The image of the 'New Woman' and her quest for identity, her determination to realize personality and to achieve self-definition through life, growth and experience, is portrayed convincingly and vey forcefully by her. Like some of the other novelists, partition and history of the country becomes the base to lay upon the narrative. Kapur's *Difficult Daughters* (1998) imaginatively reconstructs the historical events around the time of partition. If *Difficult Daughters* has Gandhi's Satyagrah Movement and partition as the backdrop of say the orbit of narration, *A MarriedWoman* (2002) has the issue of Babri Masjid Ram Janmabhoomi and the frenzied reaction of the people as the focal point.

Suzanna Arundhati Roy: Suzanna Arundhati Roy (born 24 November 1961) is an Indian author and political activist who is best known for the 1998 Man Booker Prize for Fiction-winning novel The God of Small Things(1997) and for her involvement in human rights and environmental causes. Roy's novel became the biggest-selling book by a non-expatriate Indian author.

The God of Small Things by Arundhati Roy is a novel with autobiographical traits. There are a lot of similarities between the author and one of her characters, namely Rahel. Both of them spent their childhood in Ayemenem and later studied architecture in Delhi. Another parallel exists concerning the parents. Both their mothers lived in Ayemenem and were Christians while their fathers were Hindus and worked on tea plantations. Roy's origin is reflected as well by the free use of Malayalam words as enrichment to the English language which she plays with in her own way. *The God of Small Things* pretty well fits into a feminist text foregrounding many invisible barriers. Patriarchy has continued to rise in women's way to gain parity with men. One of the key issues which very often figures in contemporary feministic discourse is the patriarchal powers within the household, the society and the economy. The novel is a truthful portrayal of the plight of women in society and their marathon struggle for seeking the sense of 'identity' in a male-dominated conservative framework. They are twenty-one chapters in this novel with the subdivisions of some chapters. We note a disorder in the occurrence of the events where the narration moves frequently into past and future. It is a fine recollection of past memories and present facts. The traditional rules of grammar have been broken by the author for the sake of the enhancement of readers' attention. The readers

have been made to think about the future of the characters which gives a challenge to the readers' ability to judge them. The extraordinary narrative style gives an opportunity to the reader to see in the past and the future too.

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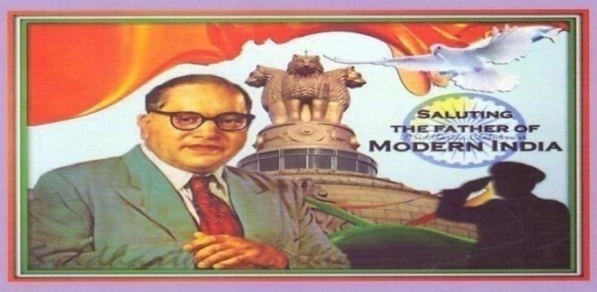
IMPACT OF AMBEDKARISM ON INDIAN REALITY



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portrayal of her theme of Sarojini Naidu in her poem "Indian weavers ". The weavers weave at the break of the day, "a garment so gay ", at the fall of night, " a garment so bright", and in the moonlight chill " a dead man's funeral shroud " .

The robes of the new born child, the bright garment like the plumes of a peacock , purple and green for a bride and the garment white as a cloud , the dead man's funeral shroud...all these are the inseparable phases of human life. It's one of the wonderful and memorable poems by Sarojini Naidu

Sarojini Naidu's poetry and her expression about the Simple Lives of the Indian weavers, Coromandel Fishers, Snake Charmers, Palanquin bearers, Bangle Sellers is unique. The stream of simple lives is splendidly described by the Poet by way of wooing the snake by the snake charmer, by the rising call of the Coromandel Fishers to their fellow fisher men, by addressing the joys and sorrows of life in their weaving by the Indian weavers, by their loyalty and faith to their Masters by the palanquin bearers.

This kind of thought process goes unending in Sarojini Naidu's poetry.

A literary trend is set by the Poets or authors by their prominent expressions or repetitive Literary choices in their works. The kind of choice towards the themes of simple lives of the people around us in our society, from the past is vividly described by the Sarojini Naidu. If a literary trend is a repetitive occurrence of the poet's choice, undoubtedly Sarojini Naidu is a trend setting poet of the Fourth world Literature.

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Self –Identity and Emancipation in Manju Kapur's *Difficult Daughters*

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Dr. B.R. Ambedkar association with the grand political streams such as liberal, .ethical and religious. Social morality is the central to his political philosophy. He is neither fierce individualist nor conservative communitarian. His conceptions of democracy internalize the principles of equality, liberty, and fraternity in its true spirit.

Dr. B. R Ambedkar has emerged as a major political philosopher with the rise of Dalit movement in contemporary times. Feminism in India is a topic debated upon as there are multiple interpretations of the word feminism and its theories. To understand feminism in the context of Dalit women's rights we have to focus on Dalit women's articulation of self, the current socio-economic and political status and emerging issues of Dalit women's rights. Dalit is a word derived from Sanskrit means "the oppressed". The third world feminists have used a definition of feminism to mean an awareness of women's oppression and exploitation within the family, at work, and in the society and conscious action by woman and men to change this situation.

This paper explores the plight of women in male chauvinistic society as depicted in Manju Kapur's novel *Difficult Daughters*. The novel portrays the precarious position, the miserable hard hitting lives of several women characters like Kasthuri, Virmati, Ida,Swarna. They are exploited, bruised, maimed both physically and psychologically.

Manju Kapur's debut novel, *Difficult Daughters,* was published in (1998) and it has been winning several accolades since then. It was short-listed for the Cross word Book Award in India and also earned the prestigious 1999 Common wealth Writer's Prize for the Best First Book category in the Eurasia region. Nira Gupta Casale interpreted "a novel about female desire and entrapment, about compromise and compliance". (2003:173)

Satish Barbuddhe opines that, 'The novel evokes some concern over the problems of women in a male-dominated society where laws for women are made by men in its social matrix and a husband stands as a 'sheltering tree' under which a woman proves her strength through her suffering.' (2000:71-78)

Virmati, the epitome of modernity, has tried to break the trammels of traditions that have been binding her and obstructing her to cross the boundaries of customs and Samskras that have been prescribed by men and imposed by male-dominated society. The struggle with male-dominated society, the assertion of self-identity, the defiance of male-dominance and the protest against family and society are also a sort of clash against traditions by a modern and new woman.

The Clash of tradition and modernity continues in three generation of Kasturi-Virmiti's mother, Virmati,- Ida - Virmati's daughter. The novel also depicts the story of a courageous lady who is beautifully portrayed by the novelist.

The Central theme of Manju Kapur's novel, *Difficult Daughters* is 'Struggle for freedom' on the one hand it is the freedom for one's country, the back drip of the novel on which it is set and on the other it is the freedom for one's self. It is the story of a woman, narrated by another woman, who is Criss - Crossed by contradictory and conflicting concepts, ripped by two disjunctive (doctrines/dogmas) structure that systematize the human life. Virmati the *Difficult Daughters* is caught between the dilemma of obedience to traditional family duty to keep up the family prestige and subjugation or surrender to self -sensuous desires. It is praise worthy and commendable to have a passionate longing for freedom of one's a legitimate and laudable passion. Whereas a passionate longing for freedom for fulfilling filial desires with a married Professor of English is illegitimate, unethical and everyone considers it a sin, a reprehensible and repressive affair in the traditionally bound patriarchal society. At the time, the novel is set, there was the conflict of partition of large British Indian nation into India and Pakistan and the consequent rift prevailed them among the people. This conflict is a symbolic implication of the split of one's heart and soul between sensitive and sensuous tradition and temptation, filial relation and fair passion. Manju Kapur's skill and ability is vivid in her effort to narrate the contradictory and conflicting modes of an individual's sensitive situation at the back drip of the country's freedom struggle underlining the transformation of the Indian women's search for self-identity and raising their voice in protest of male chauvinism claiming freedom for physical and passionate as well as

sensitive and sensuous. The author also makes an effort to reflect the theme of discriminating socio-political resistance in the gender perspective.

Difficult Daughters by Manju Kapur, It is an issue based on the crisis in the value system of the modern society and we cannot just shrug it off. The novel brings forth the issue of gender discrimination and the struggle of the suffering Indian women under the oppressive mechanism of a closed society.

One is sensitively struck by the skillful narrative technique adopted by the adorable native author with a fine fabrication of fiction and facts reflecting the distinctive feminist aspect. It is the story of a woman, Virmati, narrated by another woman, Ida, Virmati's daughter Ida under an emotional trance after her mother's death, opens up an entire genealogy of narrative and filial relationships of her mother in trying to know her past.

As the novel goes on, various contradictory aspects of two oppositional factors of female and male, individual and society and to say broadly between feminism and patriarchy. Virmati the protagonist of the novel was born and brought up in a family which is orthodoxically bound under the impact of patriarchal domination. As she grows, she struggles with the oppositional aspects of domination and resistance as well as freedom and bondage. She finds her space, in which she struggles to negotiates, compelled to accept but ultimately defies, transgresses and revolts to the patriarchal norms of family and the oppressive norms of the family and society. The story of Virmati is of transgression committed at diversified levels.

Yet her story has many similarities with the stories of other characters of Kasturi, Ida Lajwanti, Shakuntala, Inder, Swarna Latha and Ganga as well as other unimportant female characters. All of these characters may be marked as *Difficult Daughters* in general as well as individual ways. The common similarity among these characters that one can find is their subjugation and resistance to the patriarchal norms to which they are compelled to yield particularly to the male chauvinism despite being messed up with the social havoc in their relationship, there is commonness in their sufferings under the oppressive patriarchal shackles cuffed by men. Almost all of these characters have borne their suffering in silence. It is only their silences have spoken rather than their voices that are articulated by the male chauvinistic values. But, in this story, the relationship between mothers and daughters is found to be more interesting in which the subjugation of women under men is implied. This kind of relationship has become distressed with scorching opinions and crippled at different dimensions it interrogates the fallacies of feminism but continues to have an alliance with it, as it intersects the patriarchal domain and the particularity of women's experience.

She was forced to habituate this silence since her young age and retained it till her end. But in her heart of hearts she longed for freedom, yearned for identity and vainly craved for love and affection from her mother, when could not find, sought it in the illicit embrace of Harish, a married Professor, which made her life more and more miserable.

The social changes of the time also alter something deep inside the individual and the Kapur tries to express. Her novel touches myriad issues like revolt against deep-rooted family tradition, the search for selfhood, woman's rights. Marriage and the battle for independence on both fronts-personal and national. The novel depicts the triumph of the spirit, the longing to be the odds. To conquer weakness and to move forward. What it seems to assert is that the forces of love and life are greater and more powerful than those of hatred and death.yet, Kasturi says "Study means developing the mind for the benefit of the family." Virmati was thrilled passionately attracted and drawn towards her cousin, Shakuntala that evening the cousins were sharing their views during their evening walk. Virmati was greatly inspired by the words of Shakuntala. Who stated..." How much satisfaction there can be in leading your own life, in being independent" . This talk accelerated Virmati's intuition and ambition to be independent and made her say with determination-" I want to be like you, Pehnji; " If there are two of us then they will not mind so much". At this Shakuntala affectionately caressed Virmati's flushed cheek and said "It was useless looking for answers inside the home. One had to look outside. To education, to

of Lahore colleges". Shakuntala's visit planted the seeds of aspiration in ... of Shakuntala's leaving for Lahore Virmati burst out in tears and said ,"May ... day come to Lahore, Pehnji". Patting her back soothingly and inspired her ... changing, and women are moving out of the house, so why not you?." Virmati ... the ideals of Shakuntala's who "had gone about tasting the wine of freedom", ... that "It was possible to be something other than a wife".

... chooses to honor family tradition, she will have to forgo education and marry the ... bridegroom chosen by her family, which means saying goodbye forever to her ... freedom. On the contrary, if she insists on going to Lahore for further studies and ... engagement she will bring shame upon the family and ruin the marriage chances ... waiting in turn. There was an uncontrolled mental struggle tearing her mind and ... traditions and aspiration for freedom.

... and Virmati reached the conference Hall, which was packed with many women. ... explained "how freedom was necessary for the development of the human ... suddenly she thought "Am I free". I came here to be free but I am not like these ... she was wasting his time being in love with Harish while all the other women ... participating in various activities. Her mind was not accepting and observing the ... began to feel stifled... she felt out of place an outcast amongst all these women. ... understand that Virmati was living in waking dreams In the mask of pursuing freedom ... for education through which she wished to achieve self-identity, freedom and ... In her pursuit she lost her chastity and modest and induced passion in Harish and got ... by him to be his illicit wife or a secret wife. She presents that it is a woman who ... patriarchy though she is the woman support the tradition. Manju Kapur criticizes the ... not the individual. She presents the social system as the villain, not the characters as ... of ridicule. So it is the reflection of the changing times through the life of the ... like Virmati tries to assert herself. She is in search of her identify. It may be the ... of the suppressed emotions. Virmati undergoes the transformation from innocence to ... It is the feminist idea treating growth in consciousness as the end of literary work.

The novelist scrutinizes a pertinent and persuasive subject like self-affirmation, man- ... relationship, and family-feud and above all the mother-daughter conflict and ... The novel without any literary snobbery deals with a daughter's reorganization of ... and fragmented past hinging on her mother's story.

Thus Manju Kapur has written with immense concern and understanding for her female ... particularly Virmati. The suppressed and subjugated world of Indian women comes to ... in the character of her protagonist. She dexterously delineates all kinds of visible and ... pressure that kept Indian women suffocated for long.

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...KARISM AND HIS ECONOMIC, HISTORICAL AS WELL AS POLITICAL PERSPECTIVE

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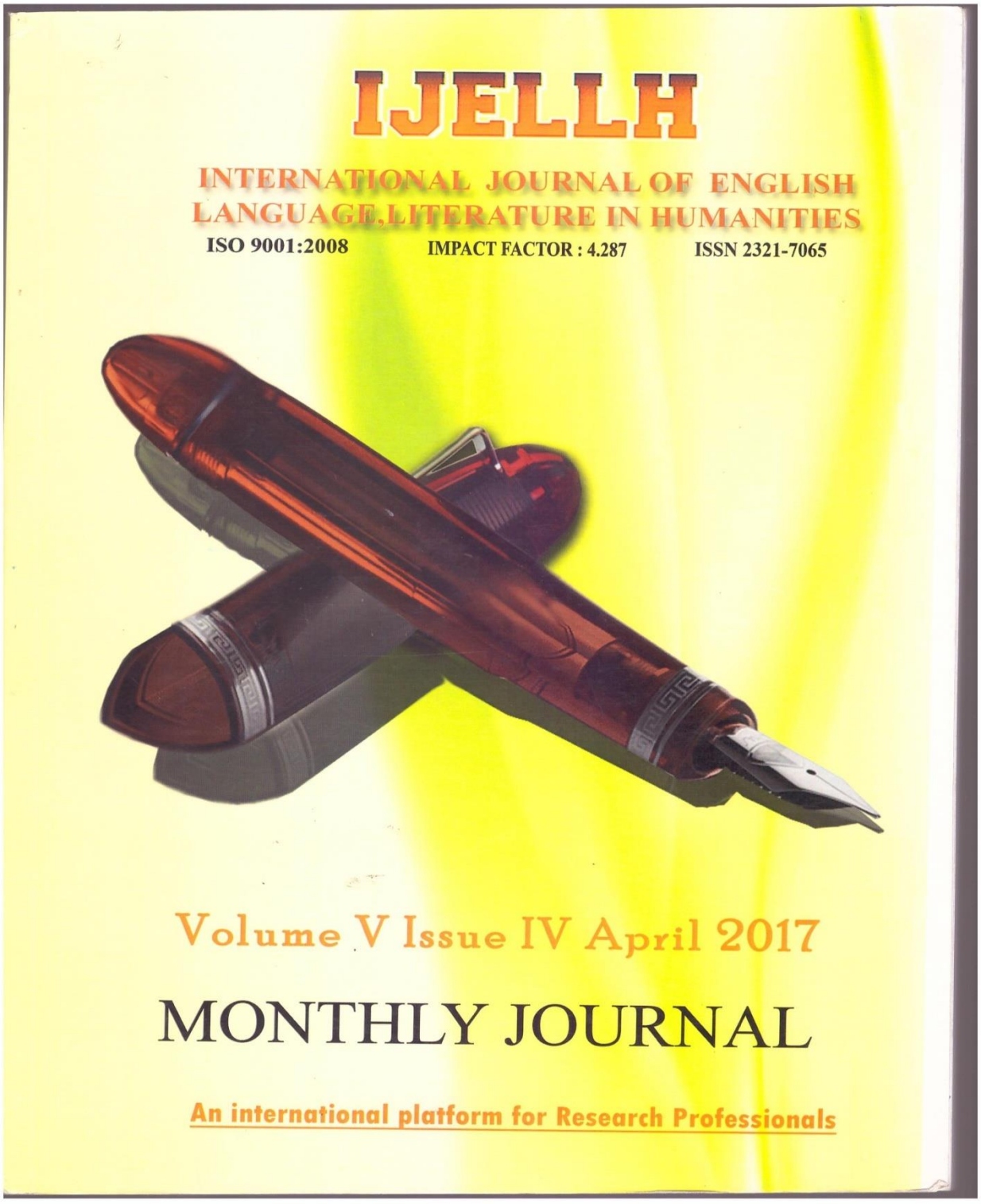
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MANJU KAPUR'S *DIFFICULT DAUGHTERS*

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Abstract:

Indian Women novelists have been portraying women in various manifestations. But recently, during the Post-Colonial period a remarkable and tremendous change has been brought by the great Indian women novelists such as Kamala Markandaya, Nayanthara Sehgal, Anitha Desai, Shashi Deshpande, Bharathi Mukherjee, Manju Kapur, Githa Hariharan and so on. They have portrayed the women characters as individuals who fight against suppression and oppression of women by the patriarchal society. They portray women as rebelling against the traditional role, breaking the shackles of exploitation and oppression, awakening with search for identity, to assert their individuality. Manju Kapur is one of the prominent new voices making her presence felt. Her novels speak about women's frustration, refusals, retaliations, and their breach of conventional expectations. She raises the voice against male chauvinism to claim the rights of economic independence of women. The present paper explores the utmost excitement and anguish of the protagonist Virmati of *Difficult Daughters* in her quest for Self-Identity and Emancipation and protest against the blind dogmas of socio-cultural as well as patriarchal clutches guised as traditional customs.

Key Words: Self-Identity, Oppression, Emancipation, Exploitation.

Manju Kapur's debut novel, *Difficult Daughters,* was published *in* (1998) and it has been winning several accolades since then. It was short-listed for the Cross word Book Award in India and also earned the prestigious Common Wealth Writer's Prize for the Best First Book category in the Eurasia region in 1999. The novel is set at the time when India was to face the struggle for independence and the holocaust that followed in the wake of the partition of the country in 1947. The turbulent days that preceded and followed the partition of British India as India and Pakistan, were fraught with political hatred and violence, with passions which had seized people in a communal frenzy. Meenakshi Mukarjee in her article, "Readability of Manju Kapur's *Difficult Daughters"* (1998) states that it has been hailed as "an impressive novel" and Nira Gupta Casale also calls it "a novel about female desire and entrapment, about compromise and compliance". (2003:173)

The Central theme of Manju Kapur's novel, *Difficult Daughters* is Struggle for Freedom. On the one hand it is the freedom for one's country, the back drop of the novel on which it is set and on the other it is the freedom for one's self. It is the story of a woman, narrated by another woman, who is criss-crossed by contradictory and conflicting concepts, ripped by two disjunctive (doctrines/dogmas) structure that systematize the human life. Virmati in the *Difficult Daughters* is caught between the dilemma of obedience to traditional family duty to keep up the family prestige and subjugation or surrender to self - sensuous desires. It is praise worthy and admirable to have a passionate longing for freedom of one's a legitimate and laudable passion. Whereas a passionate longing for freedom for fulfilling filial desires with a married Professor of English is illegitimate, unethical and everyone considers it a sin, a reprehensible and repressive affair in the traditionally bound patriarchal society. At the time, the novel is set, there was the conflict of partition of large British Indian nation into India and Pakistan and the consequent rift prevailed among the people. This conflict is a symbolic implication of the split of one's heart and soul between sensitive and sensuous tradition and temptation, filial relation and fair relation. Manju Kapur's skill and ability is vivid in her effort to narrate the contradictory and conflicting modes of an individual's sensitive situation at the back drop of the country's freedom struggle underlining the transformation of the Indian women's search for self-identity and raising their voice in protest of male chauvinism, claiming freedom for physical and passionate as well as sensitive

and sensuous. The author also makes an effort to reflect the theme of discriminating socio-political resistance in the gender perspective.

Difficult Daughters, brings forth the issue of gender discrimination and the struggle of the suffering Indian women under the oppressive mechanism of a closed society. It is an issue based on the crisis in the value system of the modern society and we cannot just shrug it off.

Virmati, the protagonist of the novel is shown to have been brought up under the care of an educated and cultured family she has grown to be a responsible girl, looking after her younger siblings as a surrogate mother due to her mother's successive pregnancies and consequent sickness. She is portrayed as a woman totally in control of her body and mind despite her exasperating physical and emotional rifts. However, during and in the end, she realizes that her reactions to those rifts and the remedies. She ransoms have rendered further emotional rift between herseif and others related to and surrounding her. Interestingly, it is her daughter Ida's quest to trace her mother's past that brings out the intrinsic struggle to attain selfhood and the realisation of the ultimate fact of her life, that everything in this world is relative, nothing or nobody can stand apart on his/her, own, however strong or weak he/she might be.

One is sensitively struck by the skillful narrative technique adopted by the adorable native author with a fine fabrication of fiction and facts reflecting the distinctive feminist aspect. It is the story of a woman, Virmati, narrated by another woman, Ida, Virmati's daughter. Ida under an emotional trance after her mother's death, opens up an entire genealogy of narrative and filial relationships of her mother in trying to know her past. However, her search doesn't provide her to find the facts that she wants as she claims: "My relatives gave me one view of my mother, I wanted another" (5) it can be understood that the other side of the story that Ida wanted has been lost in the reluctant informative views revealed by the relatives. Ida, not being content with the views of the relatives about her mother, makes further efforts to reconstruct her mother's story. The novelist has been able to maintain authorial distance, as the story of Virmati also relates to the narrator's life in some aspects. So, Ida as the interpreter of her mother's story creates a problematic relationship between the author and the reader. This relationship is problematic because in a sense it facilitates one with understanding of a woman's way of experiencing another woman's life.

The paper depicts that a critique of mother-daughter relationship, tracing it through three successive generations. We see that each succeeding generation of daughters takes a step further to conflicts between them. Further she remarks that the novel is a pointer to how a mother's influence could be unsettling to the daughter under different circumstances; how a mother, traditionally an epitome of sacrifice and goodness, could become a symbol of selfishness and resentment to her children. (2001:58-65)

As the novel moves on, various contradictory aspects of two oppositional factors of female and male, individual and society and to say broadly, between feminism and patriarchy. Virmati the protagonist of the novel was born and brought up in a family which is orthodoxically bound to patriarchal domination. As she grows, she struggles with the oppositional aspects of domination and resistance as well as freedom and bondage. She finds her space, in which she struggles to negotiates, compelled to accept but ultimately defies, transgresses and revolts to the patriarchal norms of family and the oppressive norms of the family and society. The story of Virmati is of transgression committed at diversified levels. But her story has many similarities with the stories of other characters of Kasturi, Ida, Lajwanti, Shakuntala, Inder, Swarna Latha and Ganga as well as other female characters. All of these women may be marked as *Difficult Daughters* in general as well as individual ways. The common similarity among these characters that one can find is their subjugation and resistance to the patriarchal norms to which they are compelled to yield, particularly to the male chauvinism. Despite being messed up with the social havoc in their relationship, there is commonness in their sufferings under the oppressive patriarchal shackles cuffed by men. Almost all of these characters have borne their suffering in silence. It is only their silences have spoken rather than their voices that are articulated by the male chauvinistic values. The relationship between mothers and daughters is found to be more interesting in which the subjugation of women by men is implied. This kind of relationship has become distressed with scorching opinions and crippled at different dimensions. It interrogates the fallacies of feminism that continues to have an alliance with it, as it intersects the patriarchal domain and the particularity of women's experience.

Virmati having attained the age of seventeen looks attractive with her long face. Lala Nihal Chand, her grandfather tells his widowed sister, who thought "Marriages are in the hands of God" (23) meanwhile, their fortunes were getting deteriorated and the family was

compelled to ration their expenditure on observing festivals and on new clothes. Lajwanti, Kasturi's co-daughter – in - law who thinks that Kastrui, "is no better than a dog or cat in the season". (24) disagrees with her father-in-law's statement and further remarks, Kasturi's children bring "raunaq in the house" (25). Consequently, Lajwanti thinks that their needs were limited and so she wanted him to divide the properties of the family. She is more discontent because Kasturi who had more children would have a lion's share while she had only two children her share would be less. This feeling of discontent made Lala bewildered, puzzled with her thought. Lala firmly says. "As long as I was alive, everybody would be provided for. But with each new child Kasturi produced, the murmurs of discontent became louder and more persistent." (27) Then Lala's eldest son and Lajwanti's husband, Chander Prakash did have the same discontent. He tells his father-" Baoji, they are eleven, and we are two. How will everything be equal-equal?" (28). having understood the agony of his son, Lala ultimately gives in.

After long discussions and arguments among them, it was decided to construct a new house at Lepel Griffin Road. All the members of the family moved to the new house. Somnath, Chander Prakash and Lajwanti's son get a tenant to the house, He thought "even the best families in Lahore take tenants" (35). The new tenant was an England returned professor of English by name Harish. It is revealed that he unwillingly returned to India but, being the only son, he was compelled, by his mother to return to India. Otherwise, he felt- "Her death would be on his head if he did not come back" (36) Very soon the families became friends and the Professor's wife become Virmati's bosom friend and Virmati frequently visits the Professor's house followed by her shadow, Paro. They go shopping together and enjoyed each other's company. When his wife introduces Virmati to him, the Professor sensed that, "This girl has potential he found himself thinking", (39). He is impressed and get attracted to her, while listening to the music at professors house. "She was dreaming more intensely than she ever had of her fiancé." (39). She too sensed that the Professor was paying attention to her and the very thought of her own wedding was at the back of Virmati's mind. It was rather splitting her into two unacceptable pieces. She considered, "it was very noble of the Professor to try and teach his wife. It showed that he really cared for women's education, just like her grandfather" (39). But the Professor's wife was not able to learn. The professor's efforts to make his wife learned were of no use. His

[illegible] his views on literature and others and to have discussions with his wife [illegible] be fulfilled. He was longing for a companion with whom he could share and [illegible] literary knowledge, and Virmati was found to suitable. Meanwhile there is an [illegible] on education versus marriage to quench his thirst for literature.

In Virmati,one finds the incipient 'New Woman' who is conscious, introspective, [illegible] and wants to carve out a life for herself. Virmati's desire for establishing self-[illegible] is "A value changed, almost a charismatic term, with its secured achievement [illegible] as equivalent to personal salvation" (1970: 77). And her quest for identity is the [illegible] of the modern man who has lost his social and spiritual moorings and who [illegible] to seek his roots.

Virmati having born and brought up in an orthodox educated and cultured Arya Samaj [illegible] should not have committed this sin of loving a married person. It's nothing but [illegible] her own family, particularly her parents who complete trust her. Moreover when [illegible] been engaged to some other person, chosen by her grandfather and parents. She [illegible] to marry that' Canal Engineer' as she had sensually yielded to the professor who [illegible] tried to induce her. This is nothing but her voluptuousness, her passion for mundane [illegible] her quest to quench her physical lust at the cost of her family reputation and at the risk [illegible] life, denying the traditions and ethics.

She longing for her mother love and affection, her craving to be loved by someone in [illegible] to share her views and feelings draw her towards Prof. Harish, who shows more [illegible] and interest in her with his alluring looks and words. The incessant inducing words [illegible] Professor make her yield to him and ultimately succumb to his and her physical and [illegible] lust. She loses her morality, tradition, wisdom and at last her complete self to her [illegible] Professor's lust although she knows that it was an illicit and immoral as well as [illegible] and unethical love affair. This is all because of the communication gap between [illegible] and her mother, who always reminded her of her responsibilities and burdened her [illegible] of taking care of younger siblings.

Virmati is rejected as a cult and impugns the set taboos imposed on women in male [illegible] Indian society. Manju Kapur has successfully presented this metamorphosis by [illegible] a parallel between Virmati's struggle for self-liberation and the freedom movement [illegible] prevalent during that then. The suppressed and subjugated world of Indian women

comes to full light in the character of her protagonist Virmati. She dexterously delineates all kinds of visible and invisible pressure that kept Indian women suffocated for long.

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FIGHTING FOR FREEDOM FROM THE SHAKLES OF PATRIARCHY

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Author's Introduction:

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Abstract:

Manju Kapur's A Married Woman deals with feminism and Lesbianism also. The writer depicts lesbianism using the character Astha and Pipee. These two women like each other and want to be free from the male dominated society. Manju Kapur pointed out the inner feelings of middle class Indian women. A Man can't send his sister or wife with another man but able to send her wife with another woman. The protagonist of the novel, Astha is Kapur's new woman "conscious, introspective, educated, wants to carve a life for herself, to some extent she even conveys a personal vision of woman hood by violating current social codes "(Malik,2012:171) Astha physical relationship with Pipee is treated as lesbian bonding between two woman. Astha is attracted by the love and affection of Pipee. she is bored with her husband's absence. The gender discrimination in her home provoked her to have sexual pleasure with Pipee. the exhausted Astha finally breaks patriarchal love laws that canon a heterosexual relationship within the principle of marriage. This paper presents the conflict between the tradition and modernity was beautifully portrayed by Manju Kapur in her novel A Married Woman.

Keywords*: Tradition, Modernity, Gender-bias, Discrimination, Independent, Oppression, Agony, Identity.*

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Introduction:

Manju Kapur a well - known name in modern Anglo-Indian Literature is widely known as the Jane Austen of India. Her novels deal with everything that is related to the modern family and the patriarchal society. Her novels present the contemporary picture of today's woman who is eager to break free from the domestic walls of their house to build a world of their own. Her novels present before us a new woman who wants an identity for herself. By the late seventies and eighties many women writers emerged with the issues related to woman dealing with their family problems, domestic violence, the law, the household, health care, education, their work and their working conditions. Manju Kapur is one novelist who takes her protagonists one step ahead of the others with the burning issues of modern world varying from lesbianism, infidelity, infertility, divorce, adoption etc. The present paper aims to bring out the feministic views of Manju Kapur's in her novel A Married Woman. With her five critically acclaimed novels to her credit- Difficult Daughters, A Married Woman, Home, The Immigrant, and Custody, she stands out from the rest of the writers of her age.

Any genre of literature reflects the men and manners, culture, heritage, society and so on, since it is the outcome of the writer's inner and intense mind. Further the subject and themes will get changed as per the changing conditions that occur from time to time reflecting the writers' response and reaction to the changing scenario of socio-political and economic as well as cultural Spheres. Similarly the Indian English novel does get changed from time to time depicting the changes of the age, content, perception and responses of the writer. In the same vein, the women writers of the contemporary times do not confine their writing to the mere feminine issues and protests only but their scope of interest has also delved into topical issues such as, history, nation, Diaspora, corruption and politics. It is through their works they try to expose the evils of the contemporary society and express their deep discontent and strong protest against the issues they discussed and dramatized /narrated/ picturized in their writings. Manju Kapur's novels do portray female protagonists who fight for freedom from the shackles of patriarchy and express with utmost excitement and anguish their quest for self- identity emancipation and protest against the blind dogmas of socio-cultural as well as patriarchal clutches guised as traditional customs.

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Manju Kapur's A Married Woman has a lesbian relationship at the heart of its narrative. But instead of gendering a defiant sexual model, she seems to endorse the kind of social order that Weininger talks about. By maintaining the heterosexual balance she keeps all trouble out of her gender politics. One of the main agendas of second wave feminists activism was focusing on women as a social group and the need for the sexual autonomy of the female body.

Manju Kapur's novels are continuously looking for freedom from social and moral constraints and cast a look on woman's quest for having their identity. Through her novel A Married Woman, (2002) the novelists fully strives to undo this title and distorted image of woman whose cries for freedom and equally have gone and still go unheard in patriarchal world, a malist culture. Manju Kapur's novels offer a fascinating glimpse into working of a woman's mind as she struggles to come to terms with her identity in a patriarchal world.

Self - identity and emancipation of women doesn't mean to lose chastity or modesty or betraying husband and longing for extra marital relationship. Or that it is not developing unnatural sensual and mundane relationship with other women having lesbian relationship. It is only trying (and struggling) for self-identity and freedom within the well - structured traditions and having physical or sensual relationship between the two opposite sexes within the well - established pious family system.

Astha, the prime character of the novel, around whom the whole story of the novel is finely fabricated, was born and brought under the care, love and affection of middle class parents, who thought that they were bringing up their only daughter properly, but never thought that she had been brought up with large supplements of fear and were satisfied with that, the characteristic of the middle class parents, who never think of the other side of the life in society.

Feministic Perspectives in Manju Kapur's A Married Woman comments that, as opposed to her mother's more spiritual ones of attaining salvation,

> *"You know what the Shastras say, if parents die without getting their daughters married, they will be condemned to perpetual rebirth"*

Being in her adolescent age, the age which makes the young girls dream waking dreams, only the

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> *"delicious images of a romantic somewhat shadowy young man holding her in his strong manly embrace".*

Appeared before her closed eyes. This can be taken as 'flirting' with the opposite sex (her man) who is though unknown, mentally, to say, intensely,

> *"She has indulged herself in adulteration psychologically" (Biblical Quotation).*

After one month, a bit older boy by name Rohan who was in his final year was introduced to Astha by her friends at the university college house. As a common nature among the teenage young, Astha and the boy gazed through the tables in the college house. Soon they become close, closer next and very soon the closest cronies. "Frailty thy name is woman.

Missing classes, going out for cinemas and restaurants, coming home late and telling lies to parents had become their routine activities. Astha felt extremely thrilled. She felt she was hovering in the air, her mind full of fantasies not knowing whither their relationship would lead them particularly her. They had been sensuous and voluptuous towards each other. They were passionate they wanted to have an isolated place and time to spend and lay one in other's lap. Looking to each other alluringly passionately as if they were eager to enjoy and quench their voluptuous lust.

Is this woman struggling for self-identity, longing for autonomist and for emancipation? Does it mean losing chastity and modesty or does it yielding to passionate physical lust or does indulging in mundane sensuality or does it mean to have pre- marital or extra-marital , to say immoral or illegitimate man and woman relationship? Oh! Freedom, how you mean to man / human beings / us. When Astha was in her final year of M.A. Hemant, an MBA, foreign returned was proposed. Marriage was grandly arranged and they went on a pleasure trip to Kashmir to enjoy their honey moon, where their consummation took place.

She submerges herself in the role of daughter-in-law and wife, experimenting in the kitchen, arranging and reordering her life, neatly fitting into the pattern of another. Her time is spent visiting and shopping in the morning and more particularly with the memory of night past and the night to come insulating her from any tedium she might otherwise have felt. Wrapped in marital bliss and glorying in the satisfaction that can give her husband, she spends years sinking into oblivion. But soon the dullness and monotony start tainting her new life. She seeks permission to teach to overcome the

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restlessness. The job that she had never considered with interest now seemed to be the ideal one, at least to overcome the restless hours.

Here two issues may be discussed, Hemant being a conventional Indian man believes in the virginity of women, his wife. Having brought up by a conventional patents under the extreme patriarchal, hegemony, to have such notion, is a common similarly, as a common Indian man he desires to have a virgin as his wife, to use her as a vessel to quench his physical and sensual thirst and Lust, without considering and caring the feelings of the other fair partner. He doesn't recognize the importance of 'self-identity' and freedom believes in her virginity, he won't. Since he firmly happy that he had married a virgin, blindly thinking that his wife was pious and had not indulged in pre-marital sex.

Here Kapur describes the heterosexuality which is given the most prominently sanctified consummation of the opposite sexes who were married within the patriarchal norms. The dominating patriarchal feelings, emotions, blind belief are explicitly explored by Kapur.

She has not been given much/required freedom for which she had almost felt a prison like home. Here, Kapur explores the frivolous patriarchal love and care towards the female children in the Indian conventional middle class family. The middle class parents, not knowing or understanding the tender feelings and intense emotions of their daughters feel proud to bring up their daughters with all fears not revealing the infinite ways in which she could be harmed. Astha, taking it as a parent's dictatorship, longed for freedom. As Kapur describe Astha find self-identity and freedom in sexuality and flirting, which so-called orthodox moral thinkers say, it is illicit, illegitimate and mundane.

With this new diversion, the margins of her world stretched further and it was no surprise that she started desiring more. And therefore with the entry of Aijaz Akhtar, Khan, her well-led plans soon went awry and the pedestal on which she has ensconced her husband was dismantled. As she could not nurture her relationship with her husband she failed to make it beautiful and the result is her isolation.

It was early in the year 1987, on the invitation of the Principal, Aijaz Aktar Khan; the founder of the founder of 'The Street Theatre Group' came to hold a workshop on school premises. The principal wanted the teachers to take part

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in this work ship and requested Astha to lead.

During the interaction and discussions on the script, in some way Astha was fascinated towards Aijaz, his knowledge, his keen observation and even his tempting personality, this somehow disturbed her sanctity.

> *"At night, lying in bed, she drifted off to sleep with thoughts of Aijaz and the days ahead. Astha loved looking at Aijaz on stage, allowing herself frequent covert glances".*

A Married Woman, being brought up in a conventional middle class family and educated is not supposed to have such feelings 'A fickle mindedness' that ruins or spoils the sanctity of the inviolable nuptial knot. Later Pipeelika a woman got married Aijaz who was burnt alive along with his troupe member when he enacted the play on Ramajanmabhoomi and Babri Masjid issue.

One may doubt if this is women struggling for freedom from patriarchal drudgery. It is craving to quench their lust under the mask of seeking freedom from male domination. Freedom doesn't mean betraying her husband and enjoying mundane copulation with another, man, towards whom she had been sensually passionate.

Later, that woman came to Astha and introduced herself, as Pipelika. The next day both met and walked through the small town visiting temples and so on. Pipee commented,

> *"The usual female trap, you are not alone, we all experience it one way or another" (217).*

Saying this Pipee pressed Astha's hand gently that night Astha thought more of Pipee, about whom she wanted know more. They began to meet more often, which made Astha addicted to Pipee. When their meetings had become excessive beyond the normal interaction Astha started to lie. Consequently, their relationship led their illicit character. Pipee wanted to meet Astha anywhere else except Astha's house. One day she happened to meet at Astha's home. Both sat in Astha's bedroom on their marital bed. Pipee started to induce lesbian instinct into Astha and to séduce her. Fickle mind of the women (Astha) yielded to the unnatural, unethical and irrational voluptuousness. Their indecent, illicit, immoral relationship had been continued.

However, she was a girl brought with certain morals, ethics, traditions and customs laid down by the conventional patriarchal society. In her writing Manju Kapur has emphasized on the issues in the context of patriarchay, interreligious

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marriage, family bond, male-female bond, co-existence of past and present in the socio-political facts. She has narrated her woman protagonist as a victim of biology, gender, domestic violence and circumstances.

The traditional bound brought up and the standard conventional dynamics and most of all the ethics and moral sensibility she had imbibed made her honour the immortal bond to which she had been bound, . besides her ethical sense made her realise the divine values having been pricked by her inner conscience. And that was the why she argued with Pipee, who she had deeply loved, though it was immoral and irrational and told her with a strong determination that she could not leave her husband and children.

On hearing all this explanation Pipee got irritated. She was anguished and her anguish made her threaten Astha, remarking that it was the trouble with the married people and told her that she should think of other women who would be free.

Finally, it may be hoped /expected Astha returned to home, a home of peace, serenity and more importantly the home for her to be pious, to keep her sanctity without obscenity. Thus, ultimately good won over evil, piousness over obscenity, purity of heart over betrayal. Astha reunited with all her bliss with her family in the heartfelt and loving embrace of her husband.

A Married Woman sings the quest for Astha's self-identity- her coming to terms with her own self and her similar self. It is the story of the problems in the relationship of an urban educated (and foreign returned) man and woman in the post-colonial Society.

Manju Kapur depicts both, the diversity of women and the diversity within each woman, rather than limiting their lives to one ideal. Her women protagonists are not physically tortured or abused by their husbands or in-laws. She is seen in each of her novel as pro-woman and not basically anti-man. Her women characters are conscious-conscious of their rights and respect and even though they are rooted in traditional background, yet they always evolve and emerge as strong personalities at the end of the novel. They are shown to win their battles at the end-no matter how big or small the victory is for them. Her protagonists grow up intellectually and most important of all psychologically. The movement is always shown from imprisonment to liberation-on both mental and spiritual ground. Manju Kapur explores the inner vents of her protagonists mind in every novel.

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In this paper Manju Kapur has suggested that change in norms of traditional patriarchal system is essential for women's right and their identity. Inter caste and inter religious marriage relieves the women from traditional cons traditional constraints. They are always in search of their identity.

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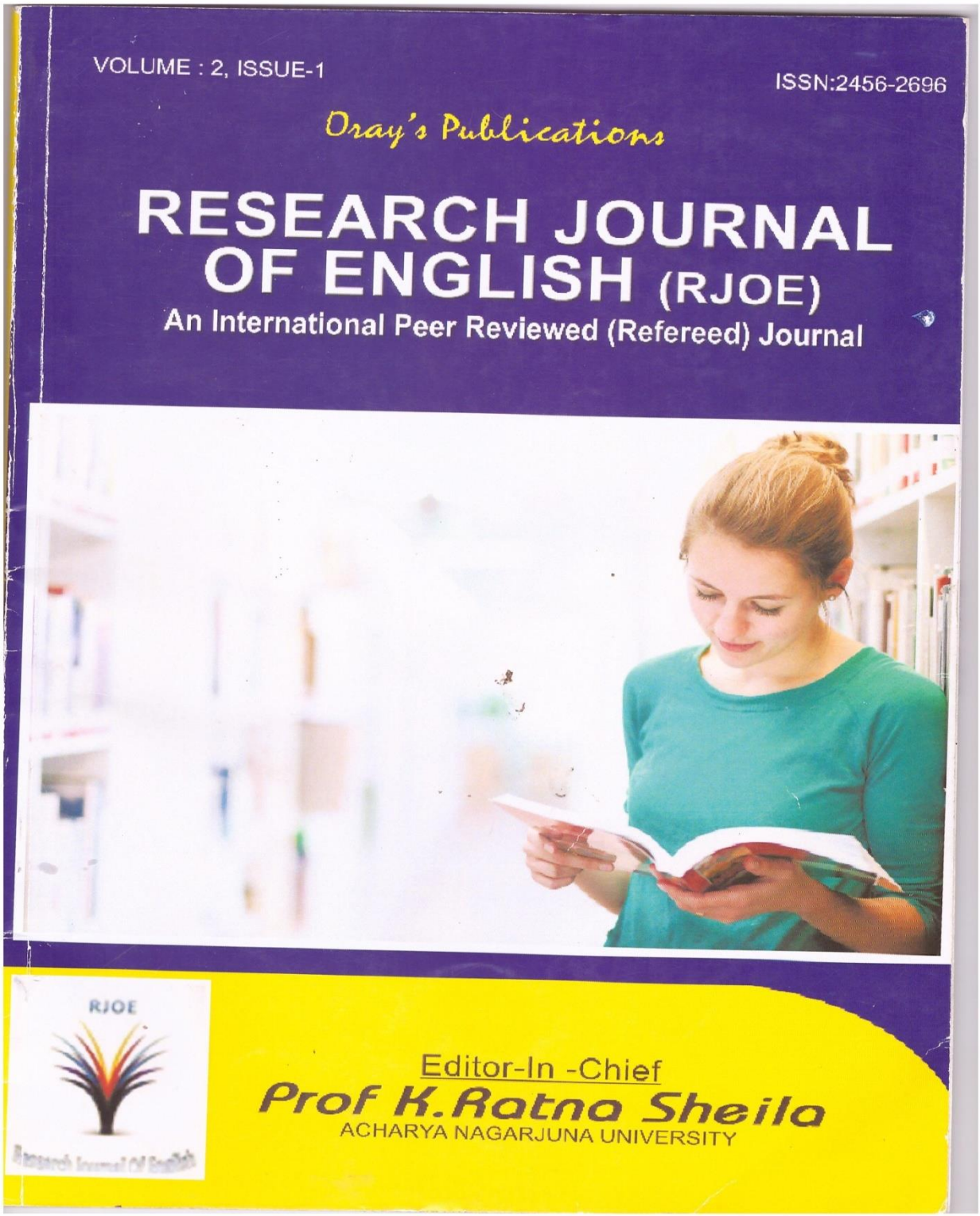
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COMMUNICATIVE APPORACHES THROUGH ICT

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ABSTRACT:

In the 21st Century, the importance of English has risen to such a level that everyone needs to become a master in English Language in order to succeed. Computers and English Language teaching have walked hand to and for a long time and contributed as teaching tools in the second language classroom. With the spread of development of English around the world. As the number of English learners is increasing, different teaching methods have been implemented to test the effectiveness of the teaching process. Technology has revolutionized the way we think, work, and play. Technology, when integrated into the curriculum, revolutionizes the learning process. It is true that these technologies have proved that successful in replacing the traditional teaching. More and more students show that technology integration in the curriculum improves students' learning processes and outcomes. Like mother tongue, even the other languages should be learnt at a subconscious level i.e., by Internalizing a language (effortlessly using the language) by gaining through Reading, Listening and presenting through Speaking and Writing. Language can be acquired through a teacher, yet his role is limited. They move from a behavioral approach to a more constructivist approach. Students are required to put their best foot forward to learn more and more conventions of language to convey correct sense. To fulfill this purpose a wide range of multimedia resources can be used. This paper focuses on the usage of multimedia resources like Internet, Newspaper, Television, Radio and games like treasure hunt, word builder, and practicing activities etc., for academic purposes. Even the social networking sites like Skype, Viber, Facebook etc., can be used as tools for language learning. Usage of multimedia materials generates enthusiasm among teachers, learners thus motivating and energizing students' lives. Different multimedia materials can serve and solve varieties of needs of learners. This paper suggests the use of these materials from KG to PG. These types of activities can be used based on the abilities of learners.

Key Words: Innovation, acceptable behavior, Oral skills, Mobile Technology, iPhones.ELT, Multimedia, Usage, Methods and techniques, Internet

Albert Einstein once said, "I never teach my pupils, I provide only conditions in which they learn". Communicative approach is the knowledge that enables to speak and understand a language. Students from vernacular background feel it difficult to analyze and express their ideas in English due to lack of competence. Communication skills are recognized by academics, employers, professional groups and graduates as key ingredients of successful professional practice. Communication technology involves the learner is self-directed,interactive,dynamic learning experience.we are living in a world of digital technologies that have made such rapid inroads into our personal space that we should upgrade ourselves constantly to keep pace with the latest. Once revolutionary technologies like transistor radio,tape-recorder, etc, have been consigned to history. Faster and better appliances like iPhones,iPads etc,crop up day by day for use,thus revolutionizing the life of our 'knowledge Society'. The rapid rising and development of information technology has offered a better pattern to explore the new teaching model.

Technology is an inherent part of our society as it has intended for it the wide diversity of social demands of the people in the society attributes a major challenges for technological designs and that investigates the researchers to apply their skills that to cause current social changes. We need to consider not only the technology but also the people who adopt the technology to the social actions. People are well knit by the networks featuring Digital spaces, Web blogs, Clips and phot sharing, U-tube for videos, face book and Whatsapp on their day today lives. Technology explore the effectiveness of multimedia assisted methods in English language Teaching. It also tries to analyze the necessity of multimedia technology in teaching communication skills and further brings out the problem faced by using these technologies.

English is the only valid language that can be understood by everyone all around the world. It is well known fact that communication competence is an essential aspect of both technical and management education and a prerequisite for gaining in employment. Competitiveness in the globalized world particularly in corporate sectors hassled to this increased emphasis on employability. We, the English fraternity,esp. in engineering colleges, have been training our students with mixed abilities to cater the demands of MNCs. The era of small phones and World Wide Web have brought drastic changes even in education system where E-Learning classrooms arereplaced with Virtual Classrooms.

Novel teaching methods should be evolved to make the students think laterally,creatively,keeping in mind the global competition and the extensive use of the internet services. Rajaji once Said, "English is the window through which we can see the world". Pronunciation training is an important aspect of learning a new language in general and English language in particular. Computer Assisted Language Learning has become popular tool to train pronunciation in the second language (L2)

because it offers extra learning time and authentic material as well as the possibility to practice in a stress free environment.

English curriculum can be improved to enhance the learning of all four languages skills for effective communication.it supports collaboration, creativity, independent learning and reflection in CLL classrooms. ICT in English teaching enhances interest in learning, promote self-learning in and outside classrooms, makes teachers more employable by improving their range of skills, empowers both the teacher and the learner and provides access to authentic materials and firsthand information.

The Language Lab is a technological break for imparting skills in English.It offers an exclusive result oriented and efficient to enrich the English language learning process. The digital Language Lab motivates students learning attitudes, providing an interactive learning environment. English language enhances the employability of students and job aspirants. It enriches a high-degree of proficiency in English languages. It is the language of opportunities.

Employability skills are general skills that are needed to get most jobs, it also helps stay in a job and to reach higher Cader or the top position in an organization. There will be some job- specific skills and general skills that an employer is looking for in their employees. Apart from, academic, and technical skills ,they are looking for professional and employability skills. Unlike occupational or technical skills, employability skills are generic in nature rather than job specific and cut across all industry types, business sizes, and job levels from the entry-level worker to the senior – most position. It enables the students to expedite the process of improving learning skills, with the advent of IT,ITES JAM, GDs, Mock Press, Mock Parliament, Pyramid Discussion are in the globalization tools in the 20^{th} and 21^{st} centuries. The 21^{st}century literacy-oriented teaching offers additional benefits to students, allowing them to incorporate the technology they increasingly use in their everyday lives, and which they will master in order to find success in tomorrow's workplace.

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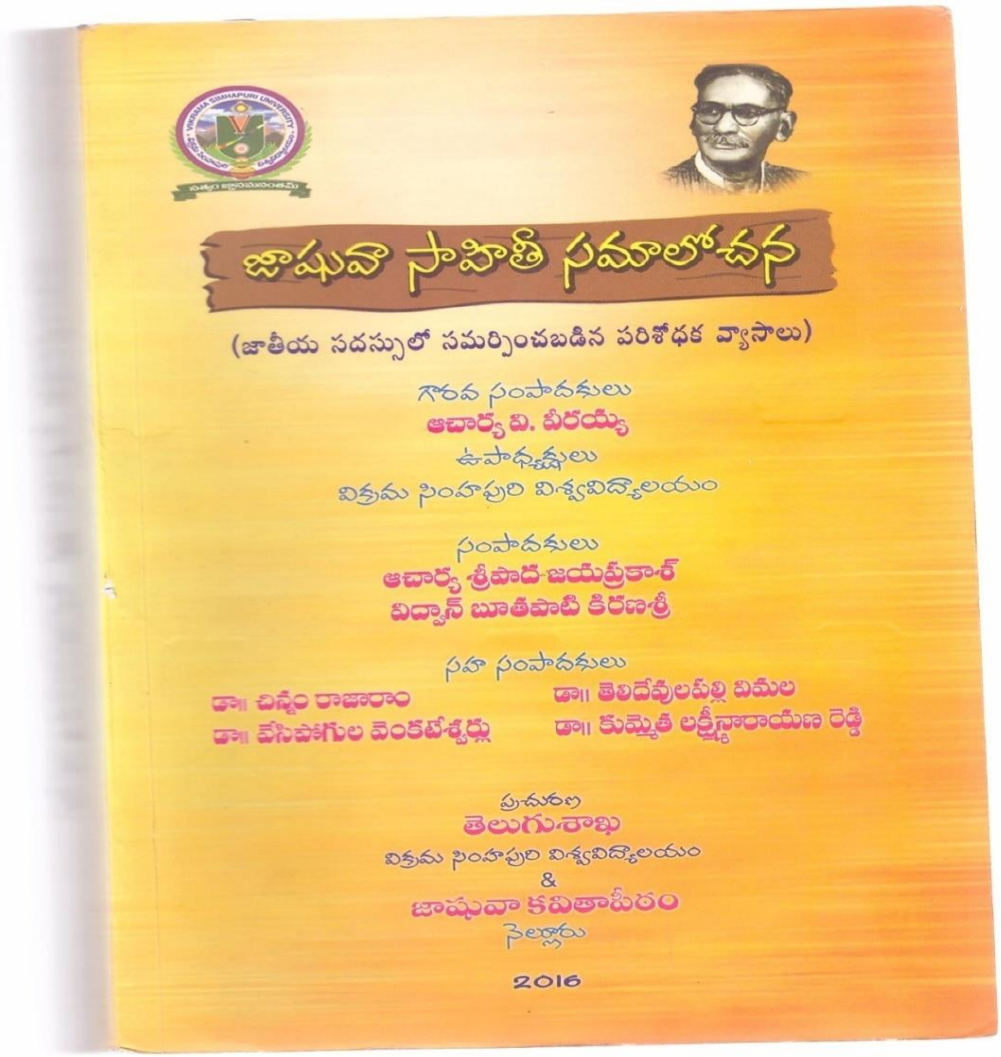


శ్రీ. జాషువా మానవతా వాదం

బి. మేరికుమారి,

"కుల మతాలు గీసుకొన్న గీతల జొచ్చి
పంజరాన గట్టువడను నేను
నిఖిలలోక మెట్లు నిర్ణయించిన నాకు
తరుగలేదు విశ్వనరుడనేను"

అని ధ్వంగా చెప్పిన జాషువా భావకవిత్వం ఉద్ధతంగా ఉన్న రోజులలో తనదైన భావ వ్యక్తీకరణకు పద్యాన్ని సాధనంగా తీసుకుని ఛంద సామ్రాజ్యాన్ని పాలించిన నవయుగ కవి చక్రవర్తి జాషువా. ఆయన జీవితాన్ని, కవిత్వాన్ని విడదీసి చూడలేము. అనుభూతి ఆవేదనల వ్యక్తీకరణమే జాషువా కవిత్వం.

ప్రకృతిలోని అతి సామాన్యమైన వస్తువుల్ని కవితా వస్తువులుగా స్వీకరించిన రచన చేసిన ఘనత జాషువాకే దక్కుతుంది. గిజిగాడు, సాలీడు, గొల్లభామ, తేనెటీగ మొదలైన అల్ప ప్రాణుల్ని సైతం ప్రతిభావంతంగా వర్ణించిన ఉదాత్త భావుక సంపన్నుడు జాషువా.

శిశువు:- ఆంధ్ర సాహిత్యంలో కవులు 'శిశువు' తీరును వర్ణించిన సందర్భాలు చాలా తక్కువగా ఉన్నాయి. శిశువు బాల్య చేష్టలను కవితా వస్తువుగా స్వీకరించారు, కాని శిశువు తీరును వర్ణించిన ప్రశస్తి జాషువాకే దక్కుతుంది. ఆయన ఊహ, లోకవృత్త పరిశీలన, ఆలోచనా సరళి అభివ్యక్తమౌతాయి.

శిశువు బొటనవ్రేలు నోటిలో పెట్టుకొని ముల్లోకాల తీరు తెన్నుల్ని గమనిస్తూ యోగభ్యాసం చేస్తూ లోపల ఆనందం అనుభవిస్తున్నాడని చెప్పడం సమంజసంగా ఉంది. తల్లిదండ్రుల శరీరాలనే తీగలకు తొమ్మిది నెలల పండుగా శిశువు జన్మించాడని చెప్పటం క్రొత్తదనంగా వుంది.

శిశువుకు అమృతం, విషం అనే తేడా తెలియదు. దేనినైనా ఆస్వాదించటానికి సిద్ధపడతాడు. అతడు వెఱ్ఱిబాగులవాడని చేలికి దొరికిన ప్రతి వస్తువును తినటానికి ఊబలాట పడతాడని చెప్తాడు. శిశువుకు మాటలు రావు, కేవలం పాలే త్రాగుతాడు, బాగా నిద్రపోతాడు. ఏ దేశమో తెలియదు. మొన్న మొన్ననే ఈ భూమి మీదకు వచ్చాడని అంటాడు. శిశువు యొక్క ప్రతి కదలికను గ్రహించి ఆకళింపు చేసుకున్న రచయితగా దర్శనమిస్తాడు.

నిద్రపోయే సమయంలో శిశువు అమ్మకౌగిలి అనే పంజరంలో చిలుక లాంటి వాడని, చిలుక పంజరంలో ఉన్నట్లే శిశువు కూడా తల్లి కౌగిలి అనే పంజరంలో ఉంటాడు అంటాడు. అతని లేత కండలు, వస్తాదుల కండలలా మెలి తిరిగి ఉబ్బి ఉంటాయని అందువల్ల అతడు చిన్ని వస్తాదు అంటాడు. మాటలు నేర్చిన తర్వాత ఈ భూమి మీదకు ఎందుకు వచ్చాడో అడగాలి అంటాడు. ప్రస్తుతానికి అతనికి ఏ పాపము తెలియదు అని అతని అమాయకత్వాన్ని తెలియజేస్తున్నాడు.

కేవలం జానెడు నిడివి, చీకట్లు కమ్ముకొని కడుపులో నిద్రించి లేచిన నిర్గుణుడు. నున్నని చెక్కిళ్ళతో బోసినోటి నవ్వులతో ముద్దులు మూటకట్టే అందగాడు అంటాడు. తల్లిపాలు అనే తేనె ధారల్ని అన్నంగా తెచ్చుకొన్న అతిధి అంటాడు. అతిధి అన్నం తెచ్చుకోడు, కాని ఈ అతిధి అన్నం తెచ్చుకున్నాడని చమత్కరించటం గమనించవచ్చు. బట్టలు కట్టుకోడు అయినా సిగ్గుపడడు. ప్రకృతి అనే స్త్రీ ఆకలి, నిద్ర నేర్పింది అంటాడు. భూమి అనే పాఠశాల వర్ణన అద్భుతంగా ఉంది.

తల్లితో అతనికున్న సంబంధం ఎంత గాఢమైందో కాని, ఏడ్చి మరి సేవలు చేయించుకుంటాడు. భగవంతుడు ఏమి సరసాలు ఆడతాడో కాని పెద్దగా చప్పట్లు కొట్టుకొంటాడు. తల్లి "నా బంగారుకొండ, నా రత్నమా" అని పిలుస్తుంది. పెరిగి పెద్దయి చదువు సంధ్యలు నేర్చుకొని తల్లి పలుకుల్ని నిలుపుతాడో లేదో అని కవి తన అనుమానమును వ్యక్తం చేస్తున్నాడు. ఇప్పటి యువత తల్లిదండ్రుల పట్ల చూపిస్తున్న నిరాదరణ కవి ఆనాడే తన కవిత్వంలో తెలియజేశాడు. చేతిలోని గిలక్కాయతో ఆడుకొంటూ అది పలకటం లేదని కోపపడతాడు, పొరుగావిడ తన దగ్గరకురాగా ఆమె ఇతర అనే భావాన్ని ప్రకటిస్తాడు. పెద్ద పెద్ద శబ్దాలకు వణికిపోయి తల్లి కౌగిలిలో దాక్కుంటాడు. చిన్నప్పుడు తల్లిని వదలుకుండా ఉండి, పెద్దయ్యాక ఆ తల్లిని మరిచి పోవటం ఏమి న్యాయం, ఈ అంశాన్ని నేటి యువతరం గుర్తించాలి.

గబ్బిలం:- జాషువా కలం నుంచి జాలువారిన కావ్యాలలో గబ్బిలము ముఖ్యమైనది. ఇది కల్పిత కావ్యం అరుంధతీ సుతుని అశ్రు సందేశంతో కూడిన కావ్యం. కుల వివక్ష వల్ల, అస్పృశ్యత వల్ల, పేదరికం వల్ల, మత మౌఢ్యం వల్ల జాషువ పడిన బాధలు, ఆవేదనలు అవమానాలకు అక్షరరూపమే ఈ కావ్యం.

ఈ లోకంలో పంచముడుగా పుట్టిన మనిషి సమాజం నుంచి వెలివేయబడ్డాడు. ఇతనిని ఉన్నత వర్ణాలవారు దగ్గరకు రానీయరు. శూద్రులు కూడా వీళ్ళను అసహ్యించుకుంటారు. పంచముడు ఏ వర్ణానికి చెందక ఉభయ భ్రష్టత్వం పొందుతాడు.

గబ్బిలం కూడా పక్షిజాతికి, జంతుజాతికి చెందక, మృగపక్షి ధర్మాలతో ఉండి అరుందతీ సుతుని సందేశాన్ని అందించటానికి సాధన మౌతుంది. గబ్బిలం ప్రవేశించిన గృహం నివాసయోగ్యం ఎలా కాదో అలాగు అరుంధతి సుతుడు కూడా సమాజానికి అంటరానివానిగా కవి వర్ణించాడు.

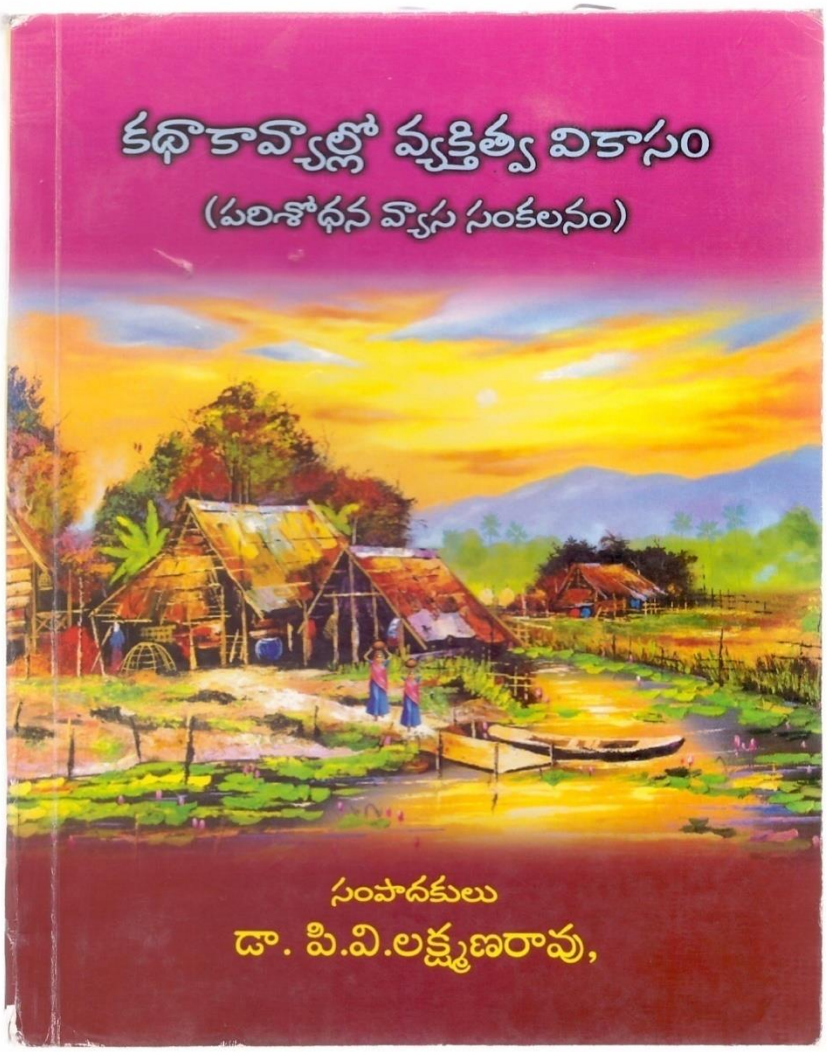
భరతమాత కడగొట్టు బిడ్డగా ఇతడు జన్మించాడు. ఇతడు తనకు లభించిన ధనంతోనే సంతృప్తి పతడాడు. ఏరకంగా తనను హింసించినా చెప్పులు కుట్టటం అనే తన వృత్తిని కొనసాగిస్తాడు. ఇతని సేవకు లోకం ఋణపడి ఉంది. తనకు తిండి లేకపోయినా లోకానికి తిండి పెట్టే శ్రామిక మూర్తి అరుంధతి సుతుడు. ఇతని తలమీద వున్న బురదను కడగటానికి గంగాజలం కూడా కడగలేకుండా పోయింది. ఇతడు దేవునికి నైవేద్యం పెడితే త్రిమూర్తులకు కూడా నైవేద్యం ఉండదు. పాముకు పాలు, చీమకు పంచదార పెట్టి సంతృప్తిపడే లోకం మనది. అంటరానివాడు వున్నచోట ధర్మదేవత కూడా నిలబడదు. దీనినిబట్టి అంటరానివానికి న్యాయం దక్కదని భావం.

అంటరానివానిని ఉద్ధరించడానికి భగవంతుడే పూనుకోలేదు. ఇక మనిషి అతన్ని ఎలా ఉద్ధరిస్తాడు. పుట్టు బానిస అయిన తనకు పెండ్లి ఎందుకు అని పెండ్లే మానుకున్నాడు. తన ఇంట్లో ప్రవేశించి దయ్యపు పిల్లలా తిరుగుతున్న గబ్బిలంతో తన వృత్తాంతాన్ని తెలియజేస్తాడు. నీవు దేవాలయాలలో తిరుగుతూ మాలాంటి వ్యక్తులకు లేని గౌరవాన్ని పొందుతున్నావు అని అంటాడు. ఈ ప్రశ్న అరుంధతి సుతునిచే కవి పల్కించటం సామాజిక స్థితిని తెలియజేస్తుంది. భూ ప్రపంచం గాఢనిద్రలో ఉన్న సమయంలో నా ఇంటిలో దేనికోసం వెతుకుతున్నావు. ఇక్కడ నీకు ఆనందం లేశమైనా లభించదు. హృదయంలేని లోకం ఇది. ఇక్కడ ధర్మధేనువులు పిదికే పాలు పేదలకు లభించవు. ధనవంతుడు ఆజ్ఞాపిస్తే బ్రహ్మాది దేవతలు కూడా నోరు విప్పరని చెప్పటం ద్వారా ధనవంతులకు ఉన్న ప్రాముఖ్యాన్ని గుర్తించవచ్చు.

ఈ లోకంలో విగ్రహాల వివాహాలు చేయడానికి వందలు వేలు ఖర్చుపెడతారే గాని పేదలైన బిక్షకుల పాత్రల్లో మెతుకును కూడా విదిల్చరు. ముప్పై మూడు కోట్ల దేవతలు ఈ దేశం మీద ఎగబడ్డారని దరిద్రుల ఆకలి ఎప్పటికి తీరని సమస్యగా ఉండిపోతుందన్నాడు. దేవతార్చన కంటే మానవత్వం ముఖ్యమని తెలియజేశాడు.

తల్లిదండ్రుల ప్రేమను మరచిపోయి వారిని వృద్ధాశ్రమాలలో ఉంచుతూ మానవత్వం మరచిపోయిందని కవి నేటి యువతరం గురించి ఆవేదన వ్యక్తం చేశాడు. అలాగే ఈనాటి సమాజం మానవత్వం మరచి బీదవానిని ఆకలి రాకాసి నుండి కాపాడలేకపోతున్నారని తెలియజేశాడు.

17.



విక్రమార్కుని కథల్లో వ్యక్తిత్వం

- బి. మేరికుమారి,
జె.యం.జె. కళాశాల, తెనాలి.

తెలుగు సాహిత్యంలో కథకు ప్రత్యేకమైన స్థానం ఉంది. ఈ కథలు మానవ జీవనంలో ప్రముఖపాత్ర పోషిస్తాయి. మనిషి మనోల్లాసానికి, వ్యక్తిత్వ వికాసానికి, జీవితాన్ని తీర్చిదిద్దుకునేందుకు కథలు ఎంతగానో ఉపయోగ పడతాయి.

విక్రమార్కుని దానవితరణ: విక్రమార్కుడు వినోదం కోసం ముకుందవనమనే ఉద్యాన వనానికి తన పరివారంతో వెళ్ళాడు. ఆ సమయంలో భూదేవుడనే వృద్ధుడు అక్కడికి వచ్చి రాజా నేను చాలా సంవత్సరాలు దుర్గను గురించి తపస్సు చేశాను. దేవి ప్రత్యక్షమై ఇలా చెప్పింది. కొంతకాలం తర్వాత విహారార్థం విక్రమార్కుడు ఇక్కడికి వస్తాడు. నీకేం కావాలో అతన్నడుగు. అతను తీరుస్తాడు అని చెప్పి మాయ మైంది. అమ్మకు నా ఎదురుచూపు ఫలించింది అన్నాడు వినయంతో. విప్రవర్యా! మీ కోరిక ఏమిటో తెలియచేయండి అన్నాడు విక్రమార్కుడు. రాజా! ఈ వనానికి దగ్గరలో ఒక నగరం నిర్మించు. దానికి చండికాపురం అనే పేరు పెట్టి దానికి రాజుగా నన్నుచేసి కొంతకాలం దానిని పాలించే అధికారం ఇవ్వమని తన మనో వాంఛను తెలియ చేశాడు. విక్రమార్కుడు అలాగేనని మాటిచ్చి నెల దినములు అక్కడనే ఉండి నగరాన్ని నిర్మించిదానికి చండికాపురమనే పేరుపెట్టాడు. బ్రాహ్మణుడికి పట్టం కట్టాడు. చతురంగబలాలను కూర్చి కోశాగారాన్ని కోట్లాది ధనరాశులతో నింపాడు. బ్రాహ్మణ

దంపతులుకు తగిన వస్త్రాలను, అలంకారాలనీ కానుకలుగా ఇచ్చి తనరాజ్యంలో కొంతభాగాన్ని సుఖంగా పాలించుకోమన్నాడు.

విక్రమార్కుని ఔదార్యం: విక్రమార్కుడు ప్రజారంజకంగా పాలన చేస్తుండగా ఒ రోజు భటులతనికి ఒక విచిత్రమైన విషయం చెప్పారు. ప్రభూ! చిత్రకూట పర్వతం దగ్గర ఒకే ఒక్క దేవాలయం ఉంది. ఆ దేవాలయానికి ఎదురుగా బ్రాహ్మణుడు ప్ర దినం హోమం చేస్తున్నాడు. అతను చేసే హోమం యొక్క బూడిద పర్వతం కం ఎత్తైన రాశిగా చూస్తున్న వారికి విస్మయం కలిగిస్తుందని చెప్పగా రాజు కూ స్వయంగా ఆ వింతను చూడాలనుకున్నాడు. కొంతమంది భటులను వెంట బెట్టుకు పర్వతప్రాంతానికి వెళ్ళాడు. హోమం చేస్తున్న బ్రాహ్మణునికి మనస్కరించి అయ మీరీవిధంగా చిరకాలం నుండీ హోమం చేయడానికి కారణం ఏమిటి అని అడిగా దానికి బ్రాహ్మణుడు ఈ విధంగా చెప్పాడు. నాకు కొన్ని కోరికలున్నాయి. కాళీ దేవిని మెప్పించి ఆమె అనుగ్రహంవలన నా కోర్కెలు తీర్చుకోవాలనుకుంటున్నాను

కాని నేటివరకు ఆమెకు నాపై దయ కలగలేదు అన్నాడు. రాజుకతనిమీ జాలివేసి బ్రాహ్మణోత్తమా మీరు విశ్రాంతి తీసుకుంటూ కూర్చోండి మీకు బదులు నేను ఆ హోమం చేసి కాళికాదేవిని మెప్పించి మీకోర్కెలు తీరుస్తాను అన్నా విక్రమార్కుడు కోనేటిలో ఉన్న నీటిలో స్నానమాడి పరిశుద్ధుడై వచ్చాడు. గరిష్ఠతతో కాళికాదేవిని స్తుతిస్తూ హోమాది కార్యక్రమాలను చేశాడు. కాళిమా ప్రత్యక్షం కాలేదు. విసుగొచ్చిన విక్రమార్కుడు మొలనున్న కత్తిని తీసి జగన్మాతా ! తలను నేనే ఖండించుకొని నీకు బలియిచ్చుకుంటున్నాను. అప్పుడైనా నీ అనుగ్ర కలుగుతుందేమో అంటూ తలని నరుక్కునేందుకు కత్తిని పైకెత్తాడు. అప్పుడు కా దేవి ప్రత్యక్షమై రాజా నీ సాహసానికి మెచ్చాను నీకు కావలసిన వరం కోరుకో కరుణించింది.

అమ్మా! ఈ విప్రుడు నీకృపకోరి ఎంతో కాలం నుండి శ్రమాదులకో హోమాది కార్యక్రమాలు చేస్తున్నాడు అతని కోర్కెలు తీర్చుటే నీనుండి నేను కో

దంపతులుకు తగిన వస్త్రాలను, అలంకారాలని కానుకలుగా ఇచ్చి తనరాజ్యంలో
కొంతభాగాన్ని సుఖంగా పాలించుకోమన్నాడు.

విక్రమార్కుని ఔదార్యం: విక్రమార్కుడు ప్రజారంజకంగా పాలన చేస్తుండగా ఒక
రోజు భటులతనికి ఒక విచిత్రమైన విషయం చెప్పారు. ప్రభూ! చిత్రకూట పర్వత
దగ్గర ఒకే ఒక్క దేవాలయం ఉంది. ఆ దేవాలయానికి ఎదురుగా బ్రాహ్మణుడు ప్ర
దినం హోమం చేస్తున్నాడు. అతను చేసే హోమం యొక్క బూడిద పర్వతం కం
ఎత్తైన రాశిగా చూస్తున్న వారికి విస్మయం కలిగిస్తుందని చెప్పగా రాజు కూ
స్వయంగా ఆ వింతను చూడాలనుకున్నాడు. కొంతమంది భటులను వెంట బెట్టుక
పర్వతప్రాంతానికి వెళ్ళాడు. హోమం చేస్తున్న బ్రాహ్మణునికి మనస్కరించి అయ్
మీరీవిధంగా చిరకాలం నుండీ హోమం చేయడానికి కారణం ఏమిటి అని అడిగాడు.
దానికి బ్రాహ్మణుడు ఈ విధంగా చెప్పాడు. నాకు కొన్ని కోరికలున్నాయి. కాళీ
దేవిని మెప్పించి ఆమె అనుగ్రహంవలన నా కోర్కెలు తీర్చుకోవాలనుకుంటున్నాను.

కాని నేటివరకు ఆమెకు నాపై దయ కలగలేదు అన్నాడు. రాజుకతనిమీ
జాలివేసి బ్రాహ్మణోత్తమా మీరు విశ్రాంతి తీసుకుంటూ కూర్చోండి మీకు బదులుగా
నేను ఆ హోమం చేసి కాళికాదేవిని మెప్పించి మీకోర్కెలు తీరుస్తాను అన్నాడు.
విక్రమార్కుడు కోనేటిలో ఉన్న నీటిలో స్నానమాడి పరిశుద్ధుడై వచ్చాడు. నిష్
గరిష్ఠతతో కాళికాదేవిని స్తుతిస్తూ హోమాది కార్యక్రమాలను చేశాడు. కాళిమా
ప్రత్యక్షం కాలేదు. విసుగొచ్చిన విక్రమార్కుడు మొలనున్న కత్తిని తీసి జగన్మాతా ! నా
తలను నేనే ఖండించుకొని నీకు బలియిచ్చుకుంటున్నాను. అప్పుడైనా నీ అనుగ్రహ
కలుగుతుందేమో అంటూ తలని నరుక్కునేందుకు కత్తిని పైకెత్తాడు. అప్పుడు కాళీ
దేవి ప్రత్యక్షమై రాజా నీ సాహసానికి మెచ్చాను నీకు కావలసిన వరం కోరుకో అ
కరుణించింది.

అమ్మా! ఈ విప్రుడు నీకృపకోరి ఎంతో కాలం నుండి శ్రమాదులకో
హోమాది కార్యక్రమాలు చేస్తున్నాడు అతని కోర్కెలు తీర్చుటే నీనుండి నేను కో

[illegible] అన్నాడు విక్రమార్కుడు. విప్రుని కోరికలు విన్న కాళికాదేవి అనుగ్రహించింది. విక్రమార్కుని ఔదార్యాన్ని, త్యాగగుణాన్ని అభినందించింది. అందుకు విక్రమార్కుడు తల్లీ! నాదొక సందేహం ఈ బ్రాహ్మణుడు ఎంతోకాలం నుండి నిన్ను అర్థిస్తున్నాడు కదా! అతనికి ఎందుకు ప్రత్యక్షం కాలేదు. అతని కోరికలు ఎందుకు తీర్చలేదు అని అడిగాడు. ఈ బ్రాహ్మణుడు చపలచిత్తుడు, నా యందు భక్తికంటే కోరికలే ఎక్కువ అని కారణం తెలిపి కాళి అంతర్ధానమయ్యింది.

న్యాయసూక్ష్మం: విక్రమార్కుడు ఒకరోజు కొలువుతీరి ఉండగా ఇద్దరు స్త్రీలు వచ్చారు. ఒకామె చేతిలో శిశువు వుంది. రెండో ఆమె మహారాజా! ఈ అన్యయం చూడండి. ఈ [illegible] నా పిల్లను ఎత్తుకు పోతుందని ఆమెను పట్టుకుని ఇక్కడకి తెచ్చాను అంది ఏడుస్తూ. అందుకు రెండో ఆమె అంగీకరించక ఆమె మాటలు అబద్ధాలు ప్రభూ ఈ బిడ్డ నాబిడ్డ ఆమె చెబుతున్నదంతా వట్టి కల్పన అంది. రాజు ముందే వారిద్దరు నాబిడ్డ, నాబిడ్డ అని వాదులకు దిగారు. రాజు వారిని నిశ్శబ్దంగా ఉండమని వారిద్దరిని తీక్షణంగా పరిశీలనగా చూసాడు.

ఇద్దరిదీ మాతృత్వానికర్హమయిన వయసే. ఆ పాపచేత తన తల్లెవరో చెప్పిద్దామంటే ఆ పాపది తల్లిని గుర్తించలేనంతగా రోజుల వయసు. ఈ పాపమీదే అని చెప్పిడానికి మీదగ్గరే మయినా ఆధారాలు న్నాయా అని అడిగాడు రాజు. దానికి వారిద్దరూ మాదీ దేశం కాదు, మాకు తెలిసిన వారెవరూ ఇక్కడలేరు అని చెప్పారు. విక్రమార్కుడు దీర్ఘా లోచనలో పడ్డాడు. ఈ సమస్యను ఎలా పరిష్కరించాలని ఇద్దరి ముఖాలు చూశాడు. నేరస్థులను పట్టు కునేందుకు ఏ ఆధారమూ కనిపించలేదు. దాంతో జరిగినదేమిటే ఒకరి తరువాత ఒకరుచెప్పండి అని ఆదేశించాడు రాజు.

మొదటావిడ నేను నా బిడ్డను ఎత్తుకొని వస్తుంటే ఈమె నాచేతిలోని బిడ్డను లాక్కోబోయింది. ప్రాణాన్నయినా వదులుకుంటాను కాని నాబిడ్డను వదులు కుంటానా? దాంతో ఈమె నన్నిక్కడకు లాక్కొచ్చింది అని చెప్పింది. రెండో ఆమెవైపు చూడగా నేను మంచి నీళ్ళు లాగుదామని బిడ్డని పట్టుకోమని ఈమె చేతికిచ్చాను

ప్రభూ! అంతే బిడ్డ నాదే అంటూ పారిపోబోయింది తమరు ధర్మమూర్తులని న్యాయం చేయగలరని ఆశతో ఇక్కడికి లాక్కొచ్చాను అని నమస్కరించింది. వాళ్ళ మాటలలో రాజుకు నిజం దొరకలేదు. దానితో హఠాత్తుగా భటుడ్ని పిలిచి ఆ పసిపాపను తెచ్చి ఈ వేదికమీద పడుకోబెట్టు అన్నాడు. భటుడు అలాగే చేశాడు.

ఆ స్త్రీలిద్దరి వైపు ఓసారి చూసి ఈ పాప ఎవరి శిశువో తేలేట్లులేదు అందుచేత ఈ శిశువును రెండుముక్కలుగా చేసి మీఇద్దరికి పంచేస్తాను అంటూ నరుకబోతున్నట్లు కత్తి పాప మీదికెత్తాడు. అంతలో ఒకామె కంగారుగా రాజు కత్తికడ్డు పడింది. మీతగవు తీరాలంటే ఇంతేచేయాలి అన్నాడు. వద్దు ప్రభూ! నాకళ్ళముందే నాబిడ్డను నరికివేయడం నేను చూడలేను, ఎక్కడో ఒకచోట నాబిడ్డ క్షేమంగా ఉండటమే నాకు కావల్సింది. ఆవిడకే నాబిడ్డను ఇవ్వండంటూ బోరున ఏడ్చింది. రెండో ఆమె ఆనందంగా ఉంది. రాజు ఆమె ముఖం చూసి పాపను దొంగిలించినేరానికి ఆమెను చెరసాలలో పెట్టండి అని భటులకి చెప్పి ఏడుస్తున్న స్త్రీకి పాపనీవే తీసుకో అని చెప్పాడు. ఆమె రాజు పాదాలకు నమస్కరించి పాపను ఎత్తుకుంది. ఆశ్చర్యంగా చూస్తున్న సభికులకు విక్రమార్కుడు ఈ విధంగా చెప్పాడు. నిజంగా బిడ్డనుకన్నతల్లి తన ప్రాణంపోయినా బిడ్డను మరణించనివ్వదు. మాతృత్వం గొప్పతనమది. కన్నతల్లి కనుక తన పాపను రెండు ముక్కలుగా చేయడం సహించలేక అడ్డుకుంది. రెండో ఆమెకు ఆ పాపతో రక్తసంబంధంలేదు కనుక పాపని ఖండించబోతున్నా కిమ్మనలేదు అని చెప్పాడు. అక్కడున్న వారందరూ విక్రమార్కుని కుశల బుద్ధిని మెచ్చుకున్నారు.

విక్రమార్కుని సాహస ఔన్నత్యం: విక్రమార్కుని పద్దనున్న మంత్రుల్లో ఒకరికి సంతానం లేదు. ఎన్ని పూజలు చేసినా దానధర్మాలు చేసినా ఫలితం కనిపించలేదు. దేవాలయాలు దర్శించి ఆధ్యాత్మిక చింతనలో కాలం గడుపుచూ వుండగా కొంత కాలానికి అతని భార్య ప్రసవించి పండంటి కుమారుడ్ని ప్రసవించింది. అతనికి తల్లిదండ్రులు దేవదత్తుడని పెరుపెట్టారు. గారాబంతో దేవదత్తుడు పెరగడంవల్ల

ని న్యాయం
మాటలలో
పను తెచ్చి

లేదు అందు
టూ నరక
కత్తికడ్డం
కళ్ళముందే
క్షేమంగా
ఏడ్చింది.
ంగిలించిన
కి పాపనీదే
ఎత్తుకుంది.
. నిజంగా
త్యం గొప్ప
హించలేక
ఖండించ
ని కుశల

ఒకరికి
ంచలేదు.
కొంత
నికి తల్లి
గదంవల్ల

ంకలనం

మూఢుడుగా, జ్ఞానశూన్యుడిగా తయారయ్యాడు. బుద్ధిలేని అమాయక దేవదత్తుని చూచి ప్రజలు పరిహసించేవారు. ఈ అవమానాన్ని తట్టుకోలేక దేవదత్తుడు ఎవ్వరికీ చెప్పక ఇల్లు విడిచి వెళ్ళిపోయాడు.

తల్లిదండ్రులు వెదికినా అతని జాడ కనిపించ లేదు. దేవదత్తుడు అడవిలో ఒక శివాలయాన్ని దాని చెంత మరుగుతున్న నీరుకల కోనేటిని చూచి ఆశ్చర్య పోయాడు. సూర్యాస్తమయానికి ఎనిమిదిమంది వనితలెక్కడి నుండో వచ్చి మరుగు తున్న కోనేటిలో స్నానంచేసి శివాలయంలో అర్చనలు చేసి పోతూ మూలనున్న దేవదత్తుని చూసి అతడొక అమాయకుడని ఎంచి ఓ దేవదత్తా! మేము అప్సరసలము మీవిక్కడకు రాకూడదు, ఎవ్వడైనా సాహసించి వస్తే భస్మీ పటలం కావలసిందే కాని నీ తల్లిదండ్రుల పుణ్యము వల్ల, నీవు అమాయకుడవగుట వలన నిన్ను మన్నించి నీకొక ఉపకారము చేయ సంకల్పించాము. అని చెప్పి దేవదత్తుని మహాజ్ఞానిగా చేసి తమ్మయినికి పంపించారు.

దేవదత్తుని పాండిత్యానికి ఆశ్చర్యపోయి విక్రమార్కుడు ఏమి జరిగినదని అడుగగా జరిగినదంతా చెప్పాడు. విక్రమార్కుడు దేవదత్తుని తీసుకొని అక్కడికి వెళ్ళి అతనిని దూరంగా నిలిపి తాను ఆలయంలో కాపుకాసెను. వాడుక ప్రకారం అప్సరసలు వచ్చి కోనేటిలో స్నానంచేసి శివాలయంలో పూజించిపోవుచుండగా విక్రమార్కుడు కూడా వారిని అనుసరించి వేడికోనేటిలో మునగగా కాళీమాత భక్తుడు కావుక ఏమీ కాకుండానే ఆ యువతులతో సమానంగా ఉద్యానవనంలోని భవనం లోనికి వెళ్ళాడు. అక్కడ ఎనిమిదిమంది దివ్యపురుషులు తపస్సు చేసుకుంటూ కనబడ్డారు. విక్రమార్కుడు వారికి నమస్కరించి వారి పక్కన నిలబడ్డాడు. వారు అతనిని విక్రమార్కునిగా గుర్తించి దైవాంశసంభూతుడని సన్మానించి కొన్ని మంత్రాలను బహూకరించారు. కొలనునీరు వేడిగా ఉండుటకు కారణమేమని ప్రశ్నించగా ఈశ్వరుని జటాజూటము నుండి జారిన బిందువులు తలపైనుండి భూదేవతము మీదుగా క్రిందికి జాలువారి వేడిగా ఉన్నాయని తెలియచేశారు. ఆ

కొలనులో పడినవారు ఆవిరైపోతారని, కాళీ భక్తుడివగుటవల్ల నీకు ఆ ఉష్ణం
అంటలేదని చెప్తారు. విక్రమార్కుడు తిరిగివచ్చి తనకోసం వేచియున్న దేవదత్తు
కలిసి తను సంపాదించిన వెలలేని రత్నములను అతనికిచ్చాడు.

విక్రమార్కుడు పరోపకారము, ధైర్యము, సూక్ష్మపరిశీలన, విచక్ష
సమాజకాంక్ష, వినయము, సాహసము, తెగింపు వంటి ఉత్తమగుణాలుకలి
రాజుగా అనేకమందికి ఆదర్శనీయుడిగా ఈ కథల వల్ల కన్పిస్తాడు.

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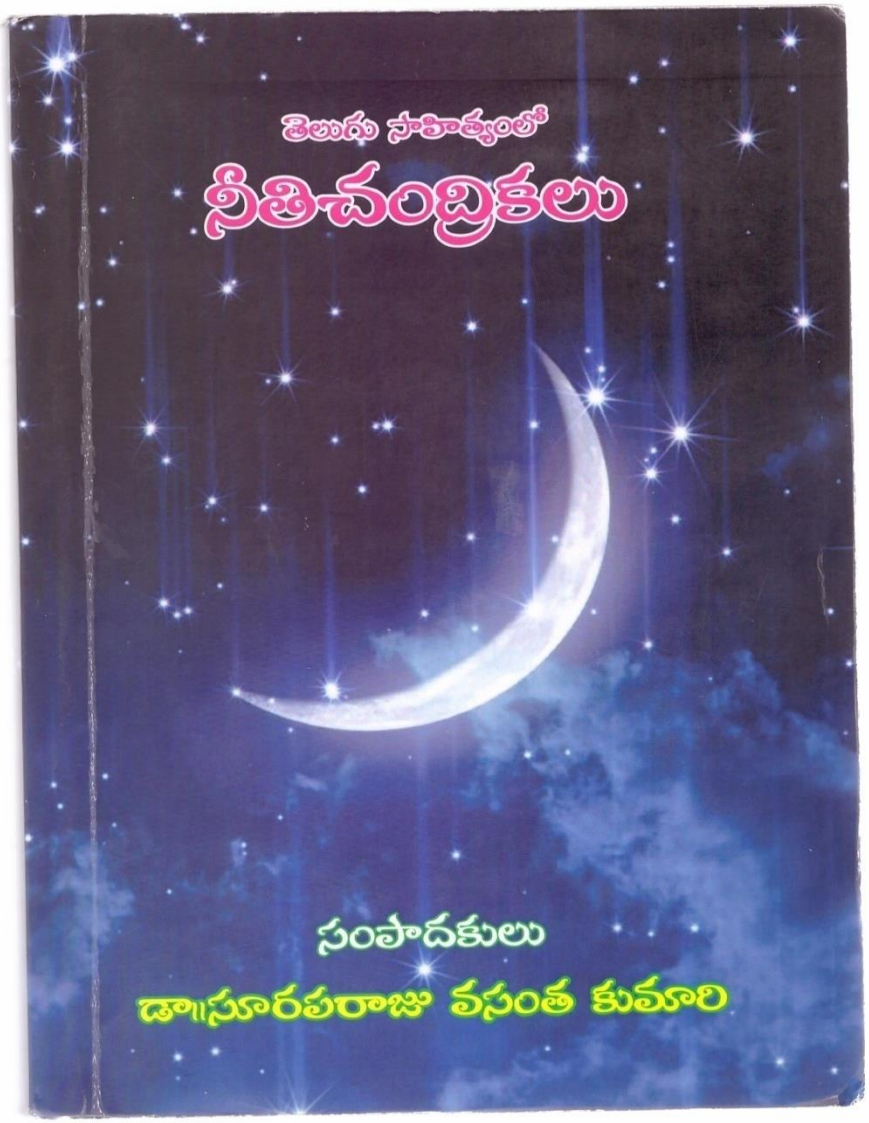
18.



తెలుగు సాహిత్యంలో

నీతిచంద్రికలు

సంపాదకులు

డా॥ సూరపరాజు వసంత కుమారి

లోకమిత్ర ప్రచురణలు

తిరుపతి

2016

11. సత్యం వద - నీతి సుధ

బి. మేరికుమారి,
తెలుగు అధ్యాపకురాలు
జె.యం.జె.కళాశాల, తెనాలి

నేటి కాలములో సత్యము అనే పదానికున్న అర్థము పూర్తిగా మారిపో
ఇది మనుషుల ప్రవర్తన వల్ల కావచ్చు, లేక మారుతున్న సంప్రదాయం
కనుమరుగౌతున్న మానవతా విలువల వల్లైన కావచ్చు. సత్యానికి కట్టుబడిన జీవి
చరిత్రపుటలలో ఆచంద్రార్కం నిలిచి ఉంటాయన్న నీతిని తాము ఆచరించి చూ
ఈలోకానికి మార్గ నిర్దేశ్యం చేసిన మహనీయుల జీవిత చరిత్రలు
పరిశీలింపబడినది.

శిబిచక్రవర్తి :- విష్ణువు వంశంలో పుట్టిన ఉశీనరుని కుమారుడే శిబిచక్రవర్తి
కీర్తి ముల్లోకాలలో వ్యాపించింది ఇతని కీర్తిని పరీక్షించాలని అగ్ని, ఇం
మారువేషంలో ఒకరు పావురంగా రెండోవారు డేగగా వచ్చారు. డేగ పా
తన్నుకుంటూ వస్తున్న సమయంలో పావురం వచ్చి శిబి తొడపై కూర్చుంది.
అని శిబి అడుగగా నేను పావుర రూపంలో ఉన్న మునిని నన్ను డేగ తన్నుకొ
రక్షించమని వేడుకుంటుంది. రక్షిస్తానని శిబి చక్రవర్తి మాట ఇస్తాడు. డేగ
పావురం నా ఆహారం దాన్ని వదలమని అడుగగా శిబి దానికి అంగీకరించక
బరువుకు సమానమైన మాంసం నేను ఇస్తానని చెప్పగా అందుకు డేగ అం
నీ కుడి తొడ మాంసమే కావాలని అడిగింది. తర్వాత శిబి తన తొడ నుండి
కోసి తూచగా అది ఎంతకు సమానము కాకపోవటంతో శిబి చక్రవర్తే
కూర్చోగ వారు తమ రూపాన్ని ధరించి నిన్ను పరీక్షించటానికి ఈరూపము ధరిం
నీలాంటి వాడు ఎవ్వరూ లేరంటారు. తాను రక్షిస్తానని పావురానికి ఇచ్చిన

కోసం తన మాంసాన్నే కాదు ప్రాణాలు సైతం ఇవ్వడానికి సిద్ధపడి శిబి చక్రవర్తి ప్రాణాలు పోయినా ఆడిన మాటకు కట్టుబడి వుండాలనే నీతిని బోధించాడు.

హరిశ్చంద్రుడు :- ఇతడు సూర్యవంశపు రాజుల్లో గొప్పవాడు. ఆడి తప్పని వ్యక్తిగా పేరుపొందాడు. వశిష్ఠ, విశ్వామిత్రులు ఇంద్ర లోకమున ఉండగా, భూలోకములో అందరికంటే ఎక్కువ సత్యసంధుడు ఎవరని చర్చకు రాగ, వశిష్ఠుడు హరిశ్చంద్రుడని చెప్పాడు. విశ్వామిత్రునికి హరిశ్చంద్రుని మీద కోపంకంటే వశిష్ఠునిపై వున్న కోపంతో పగపూని తన యజ్ఞానికి కావల్సిన ధనాన్ని ఇవ్వమని కోరాడు హరిశ్చంద్రుడు ఇస్తానన్నాడు. విశ్వామిత్రునికి ఇచ్చినమాట కోసము తన రాజ్యాన్ని పణంగా పెట్టాడు. అయినా అతను కోరినంత ధనము రాలేదు. భార్యను అమ్మి కొంత ధనం తీర్చాడు, సరిపోలేదు. ఇంకా అప్పు మిగలగా చండాలుడి వద్ద సేవకుడిగా చేరి స్మశానంలో కాపలాదారుడిగా జీవించాడు. కుమారుడి మరణం, భార్య దొంగ అనే అపవాదుతో రాజు ఆమె శిరస్సును ఖండించమన్న శిక్ష తన చేతుల మీదుగా అమలు చేయాల్సి వచ్చినా తాను ఆడిన మాటను తప్పలేదు. చివరకు త్రిమూర్తులు ప్రత్యక్షమై అతడికి ఎన్నో వరాలిచ్చారు. సత్యమేవ జయతి అన్న నీతిని హరిశ్చంద్రుడు తన జీవన విధానంతో సమాజానికి బోధించాడు.

శకుంతల :-శకుంతలను పక్షులు రక్షించుట వలన ఈమెకు కణ్వ మహర్షి శకుంతల అను పేరు పెట్టాడు. ఈమె పేరు పెట్టటలోనే ఆయన ఆలోచన వైఖరి అర్థమౌతుంది. దుష్యంతుని వలన పుత్రుని పొందిన శకుంతలతో కణ్వమహర్షి ఎంతటి ఉత్తమ స్త్రీలకైన పుట్టినింటిలో ఎక్కువ కాలము ఉండుట న్యాయము కాదు, భర్త భార్యదగ్గర ఉండుట ఉచితము స్త్రీకి భర్తే సమస్తము అని భార్య భర్తల బంధములోని స్త్రీ, పురుషుల ప్రాముఖ్యతను తెలియజేస్తాడు కణ్వ మహర్షి

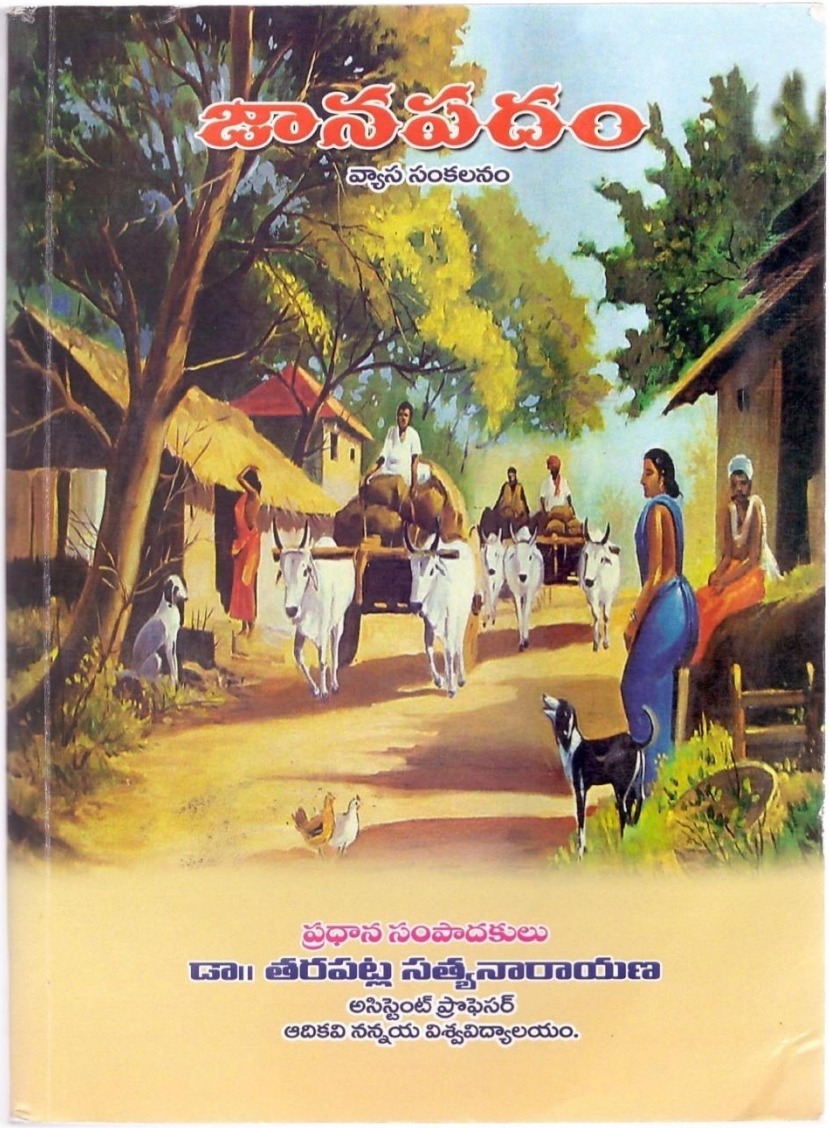
శకుంతల తన్ను చూసి చూడనటువంటి రాజుతో ఓ రాజా నేను నీ భార్యను ఈ పిల్లవాడు మనిద్దరికి పుట్టిన పిల్లవాడు. ఆనాడు నీవు నాకు వరము ఇచ్చిన ప్రకారము ఈ పిల్లవానిని పట్టాభిషిక్తుడ్ని చేయి అంటుంది. అందుకు రాజు నీవెవరివో నాకు తెలియదు. ఎక్కడ నుండి వచ్చావో అక్కడికే వెళ్ళు అంటాడు. ఓ రాజా ! నేనెవరినో నీకు బాగా తెలిసిన తెలియని వానివలె ఏ మాత్రము పరిచయము లేనివాని వలె ఎందుకు మాట్లాడతారు. నేను తప్ప ఇక్కడ ఉన్నవారు ఎవ్వరికి మన బంధం ఎరగదని మీరు అలా మాట్లాడటం భావ్యం కాదు, అందులో మీరు ధర్మాత్ములు అసత్యము పల్కవచ్చునా? అని ప్రశ్నిస్తుంది. ఆనాడు మీరు నాకు చేసిన వాగ్దానము ఈ సభలో ఉన్న ఎవ్వరికి తెలియకపోయినా మనము చేసే ప్రతిపనిని వేదములు పంచభూతములు గమనిస్తాయి, కాబట్టి మీరు ఆత్మవంచన చేసుకోకండి అని రాజును హెచ్చరిస్తుంది. అంతేగాక ప్రకృతికి నోరులేదు గాని కళ్ళు ఉన్నాయని హెచ్చరిస్తుంది. పతివ్రత, గుణవతి, సంతానవతి, భర్తకు అనుకూలమైన భార్యను అవమానిస్తే ఆ వ్యక్తికి ఇహలోకములో, సుఖము కాని, పరలోకము గతులు ఉండవని, భార్య భర్తలో సగభాగము అని శకుంతల భార్య గొప్పతనాన్ని చెప్తుంది.

తన నీడను నీటిలో చూచుకొన్నట్లు తన ప్రతిబింబమైన కొడుకుని చూసి ప్రేమతో మురిసిపోతాడు తండ్రి. పున్నామి నరకము నుండి రక్షించువాడు కొడుకు అని వేదాలు ఉద్ఘోషిస్తున్నాయి అంటుంది. సరస్వతీదేవి నీ కుమారుడు పుణ్యాత్ముడు వంశాభివృద్ధికి కారకుడై నూరు యజ్ఞములు చేసి ఘనత కెక్కును అని మునులు వినుచుండగా నాకు ఆకాశవాణి విన్పించింది అని చెప్తుంది. నీ కుమారుని కౌగలించుకోవటం వల్ల కలిగే ఆనందము మరి దేనివల్ల కలుగదు అంటుంది. ఇలాంటి గొప్పగుణములు కలవాడును, వంశాభివృద్ధికి కారకుడైన నీ కుమారుని విషయంలో పూర్వము కణ్వాశ్రమములో ఇచ్చిన వరముకు విరుద్ధముగా ప్రవర్తించుట నీకు న్యాయమేన అని నిలదీస్తుంది. తండ్రీ కొడుకుల సంబంధాన్ని గొప్పగా చెప్తుంది.

సత్యపాలనమే వ్రతముగా కలవాడా! ఓరాజా మంచి నీటితో నిండిన నూరు చేదుడు బావుల కంటె ఒక దిగుడు బావి శ్రేష్ఠము అట్టి నూరు దిగుడు బావుల కంటె ఒక యజ్ఞము శ్రేష్ఠమైనది. నూరు యజ్ఞముల కంటే ఒక కుమారుడు శ్రేష్ఠము అట్టి నూరుగురు కుమారులకంటే ఒక సత్యవాక్యము ఉత్తమమైనది. వేయి అశ్వమేధ యాగములను త్రాసులో ఒకవైపున రెండవ వైపున సత్యమును ఉంచి తూచినచో సత్యము వైపునే ముల్లు మొగ్గుచూపును అనగా వేయి అశ్వమేధ యాగాలకన్న ఒక సత్యమే ముఖ్యమని చెప్తుంది. అనేక పుణ్య క్షేత్రములను దర్శించి వచ్చుట, సర్వ వేదములను అధ్యయనము చేయుటయు సత్యముతో సమము కావు. అన్ని ధర్మముల కన్న సత్యమే ముఖ్యమైనదని మునులు చెప్పుదురు. ఈ విషయము తెల్సుకోమని దుష్యంతునితో అంటుంది. మహారాజా ! క్షత్రియులలో శ్రేష్ఠుడైన విశ్వామిత్రునకు పవిత్రమైన మేనకకు కుమార్తెనయి నేను అనత్యమును పలుకు అంత అధర్మపరురాలనా? అని తన వంశచరిత్రను తెలియజేస్తుంది. శకుంతల మాటలు అంగీకరించక దుష్యంతుడు ఇట్లా అంటాడు. నేనెక్కడ? నీవెక్కడ? ఈ కుమారుడెక్కడ? నేనెప్పుడు నిన్ను చూడలేదు. ఆడవారు అబద్ధములు ఆడతారు అను మాట నిజమగునట్లు నీవిధముగా మాట్లాడుట నీకు న్యాయమేనా అని దుష్యంతుడు ప్రశ్నిస్తాడు. ఇట్టిలోక విరుద్ధమైన మాటలు మాట్లాడకు. నీవు ఎక్కడ నుంచి వచ్చావో అక్కడికి తిరిగి వెళ్ళు అంటాడు. ఇలాంటి దు:ఖస్థితిలో ఉన్న తనను ఆదుకొనువారు దేవుడే కాని మరి ఎవరు లేరని భావించి తిరిగి వెళ్ళుచుండగా సభలోని వారందరు ఆశ్చర్యపడే విధముగా ఆకాశవాణి దుష్యంతునితో ఈవిధముగా చెప్పినది. ఈ బాలుడు నీకును, శకుంతలకు పుట్టినవాడు. ఇతనిని స్వీకరించుము. శకుంతల సాధ్వి మహాపతివ్రత, సత్యమే పల్కినది అని చెప్పగా సభలోని వారందరు శకుంతల ప్రాతివత్యమును సత్యనిష్టను హర్షించారు. గాంధర్వ పద్ధతిలో ఈమెను వివాహము చేసుకున్న విషయము ఈ శకుంతలకు నాకు తప్ప మరియొవరికి తెలియదు. నిందా

భయముచేత మీకెవ్వరికి చెప్పలేకపోయాను అని దుష్యంతుడు ప్రేమతో కుమారుని ఆలింగనము చేసుకుని శకుంతలని తీసుకొని తన రాజ్యమునకు వెళ్ళి శకుంతలకి ఇచ్చిన మాట ప్రకారము భరతుని యువరాజుగా అభిషక్తుణ్ణి చేశాడు. ఈ సందేశము, కనుమరుగౌతున్న వివాహ వ్యవస్థకి కనువిప్పు కలిగిస్తుంది. మనలో సత్యము ఉన్నప్పుడు ఓటమిని అంగీకరించక శకుంతలలా చివర వరకు పోరాడాలి.

ఈవిధముగా ఇచ్చిన వాగ్దానాన్ని అనుసరించి శిబిచక్రవర్తి లోకానికి ఆదర్శప్రాయుడయ్యాడు. హరిశ్చంద్రుడు అనుపేరు పెట్టుకొని సత్యమనే మాటకు మారు రూపమై సత్యహరిశ్చంద్రుడుగా గణితికెక్కాడు హరిశ్చంద్రుడు. భార్యా, భర్తల బంధాన్ని, కుమారుని గొప్పతనాన్ని, స్త్రీ గొప్పతనాన్ని శకుంతల దుష్యంతునికి వివరించింది. వేదాలు చదువుట వలన తీర్థయాత్రలు చేయటం వల్ల, అశ్వమేధ యాగాలు చేయటం వల్ల వచ్చే ఫలాల కన్నా ఎక్కువ ఫలం సత్యము పలకడం వలన వస్తుందనే నీతిని ఆమె తెలిపింది. ఆధునిక యుగంలో గాంధీగారు కూడా సత్యమేవ జయతే అనే సూక్తిని బహిర్గతం చేశారు. కాబట్టి సత్యంతో సమానమైనది ఏది లేదు. అందుకే సత్యాన్నే ఎల్లవేళలా, పలకాలనే నీతి, నేటి ప్రపంచానికి అమృతాంబుధి.



ప్రధాన సంపాదకులు
డా॥ తరపట్ల సత్యనారాయణ
అసిస్టెంట్ ప్రొఫెసర్
ఆదికవి నన్నయ విశ్వవిద్యాలయం.

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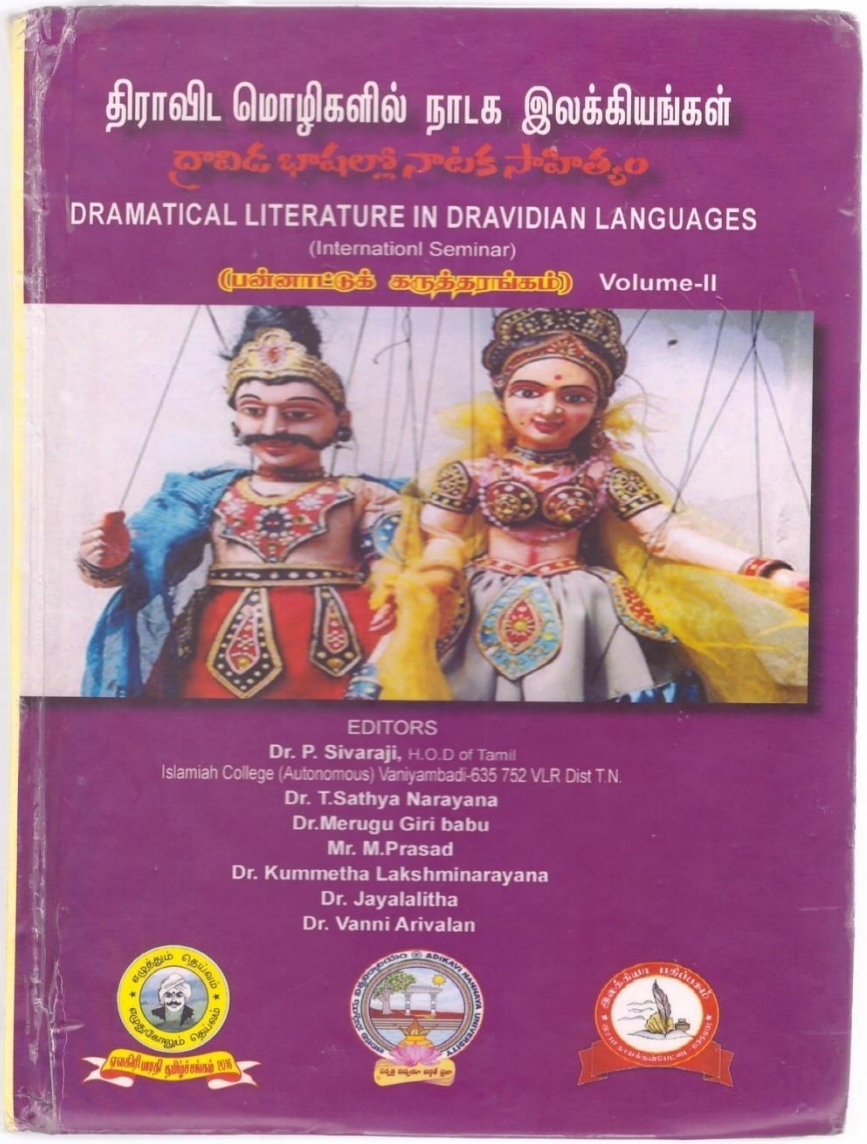
51 - జానదప గేయ గాథలలో వీర రస ప్రాధాన్యత

బి. మేరికుమారి,
జె.యం.జె.కళాశాల, తెనాలి

ఆదిమ మానవ సంఘమున మొట్టమొదటిగా ఊపిరి పోసుకొన్న రసము వీరము అనుటకు సందేహము లేదు. మానవుని ఆహార సంపాదనకై అమాయక జంతువులను, దుష్ట జంతువులను చంపి తినేవాడు. ఇవి ఆదిమ మానవుని వీరరసము పుట్టుక కారణమైనది. ప్రకృతి తనకు నష్టము కలిగిందే, గాలివానచే అతివృష్టి జలప్రళయమును శత్రువుగా ఉపకారము కలిగించే సూర్యకాంతిని చంద్రుని మిత్రములుగా భావించుట ఉన్నది. వేదముల యందు ఇంద్రుని వీరునిగా వర్ణించుట వృత్రఘ్నం తియై అతడు చేసిన గోవిమోచనమును ప్రశంసించుట నీ ఊహపై ఆధారపడినదే. ఇది ప్రాచీన పురాణగాథ ఇది ఆర్యావర్తనమునకే కాక ప్రాచీన జాతులన్నింటికిని సంబంధించినది. ఉదా:- బాబిలోనియాలోని పురాణగాథలో మర్డక్ అను వీరునకు తియామడ్, లబ్బాలను రాక్షసులతో సంఘర్షణ ఏర్పడి ఆ వీరుడు రాక్షసులను చంపి భూమిపై ఆనందము కలిగించెను. ఈజిప్ట్ దేశపు పురాణ గాథలలో సూర్యదేవత యగు 'రా' 'అపెపీ' అను రాక్షసునితో పోరాడి విజయము పొందెను. గ్రీకు పురాణగాథల యందలి ప్రొసెర్పిన్ అపహరణ గాథ హేమంత, వసంతర్తు పరిభ్రమణ గాథలకు పండుగలకు సంబంధించిన మతపరమగు కర్మకాండలను పరిశీలించినచో వర్షా హేమంత శిశిరములతో ప్రకృతి సింగారించుకొని నవీన మాదుట కనబడును. హైందవులు జరుపుకొనే హోలి వసంతోత్సవమునకు సంబంధించిన కథలో హోలికా రాక్షసీ సంహారము మున్నది. Lord Raglan పురాణ గాథలలోని వీరలక్షణములను, చరిత్రకు సంబంధించిన వీరుని లక్షణములను పరిశీలించి పురాణగాథలకును, కర్మకాండకును సంబంధించినంతవరకు వీర చరిత్రము నొక నిర్దిష్టమగు 'నమూనా'లో అమర్చవచ్చును.

పురాణగాథల యందలి వీరులకును కొంత చరిత్ర ప్రాధాన్యము కలిగిన వీరులకును భేదము ఉన్నది. పురాణ గాథలలోని వీరులు భూమిపై నివసించిన పాత్రలు కారు. హిరణ్యాక్షుని నుండి భూమి నుద్ధరించిన విష్ణువు. కాళిందీ నదీ మార్గమును తన హలముచే నవకర్షణము చేసిన బలరాముడు. మధుకై టభలను సురవరం చంపి భూమి ఏర్పడుటకు కారణమైన విష్ణువు ఒక మర్డక్. ఒక తియామ్

20.


திராவிட மொழிகளில் நாடக இலக்கியங்கள்
ద్రావిడ భాషల్లో నాటక సాహిత్యం
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திராவிட மொழிகளில் நாடக இலக்கியங்கள்

(பன்னாட்டுக் கருத்தரங்கம்)

ద్రావిడ భాషల్లో నాటక సాహిత్యం

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కావూరి సత్యనారాయణ నాటికలలో సామాజిక దృక్పథం

బి. మేరికుమారి,
జె.యం.జె.కళాశాల, తెనాలి

సామాజిక నాటక రంగ చరిత్రలో పలు విజయవంతమైన నాటికలను రచించి, ప్రత్యేకమైన స్థానం పొందిన రచయిత కావూరు సత్యనారాయణ.

మొదట వినోదం కోసం, కాలక్షేపం కోసం, పిరికిని బెరుకుతనాన్ని పోగొట్టడం ఈరోజులలో వికృత రూపం ధరించింది. నేటి విద్యా సంస్థలలో జరుగుతున్న ఎందరో అమాయకుల ప్రాణాలను బలిగొంది. పెడదారి పడుతున్న యువత పాఠాలను బోధించి, విజ్ఞానవంతులను తయారు చేయవలసిన అధ్యాపకుల ...ను అద్భుతంగా చూపించిన నాటిక.

...కళాశాలలో చదువుతున్న మదన్, గోపాల్ స్నేహితులు వీరు పద్మజ అనే ..., వేధింపులతో హింసిస్తారు. వీరిబారి నుండి తప్పించుకోవడానికి పద్మజ పై ... చనిపోతుంది. ఆ కళాశాల ప్రసిడెంట్ మదన్ తండ్రి ప్రజాహితరావు ...రిపడినట్లు ఫిర్యాదు చేయవలసిందిగా ప్రిన్సిపాల్‌ను ఒత్తిడి చేస్తాడు. ...అమానుష దాడులను గూర్చి నాలాగా ఎందరో సభ్యజనులు ...స్తున్నారే గాని నేరస్థుడు మన కళ్ళముందే తిరుగుతుంటే ఇదేమిటి ...లేని దుర్భర స్థితి అంటూ ప్రిన్సిపాల్ ఎదురుతిరుగుతాడు. ...గోపాల్ జనం నన్ను పట్టుకొన్నారు శవాన్ని నాకు అప్పగించారు. ...జరుగుతుందో అక్కడ నుండి శవం వెళ్ళాలంటే మన ముగ్గురం ...చట్టానికి లొంగిపోవాలంట అని జనం శాసించారు అంటాడు. ...రావు అని పేరు పెట్టడం రచయిత వ్యంగ్య ధోరణి కన్పిస్తుంది. ...పై కవికి ఉన్న దూరదృష్టి ప్రస్ఫుటంగా కన్పిస్తుంది.

...కొడుకును చదివించుకోవటానికి పట్టణానికి వస్తాడు. కొడుకు ...శంకరం తండ్రి పతి అడ్డదారుల్లో ప్రశ్నాపత్రాలను తెస్తాడు.

తెలివిలేని శంకరం స్టేట్ ఫస్ట్ వస్తే తెలివిగలవాను సీట్ పొందలేక నిరాశతో
మారతాడు. హతాశుడైన శ్రీధరరావు పవిత్రమైన విద్య పచ్చి వ్యాపారంగా మారింది
పోయాను డబ్బు మాత్రమే ఫలితాలను తారుమారు చేస్తుందని గ్రహించలేకపో
మేధావుల మేధను నిర్దేశించే పేపర్లు నీటి బజారులో పట్టపగలు చిత్తు కాగితాల
పోతుంటే ఇంక చదువెందుకు అంటాడు. టెంత్ లీకేజ్, ఇంటర్ లీకేజ్,
హోల్ ఇండియా ఈజ్ ఇన్ లీకేజి. చిల్లులు పడ్డ వ్యవస్థకి మరమ్మత్తులు చేయకుం
అలసత్వం ప్రదర్శిస్తుంటే సామాన్యుడికి చదువెందుకు అంటాడు. చదువుకునే
చదువు కొనే వారైన డాక్టర్లూ, ఇంజనీర్లు, సైంటిస్ట్‌లు, టెక్నీషియన్లతో ఈదేశం
సందేశాన్ని అందించ్చాడు.

ముఖ చిత్రం: వార్తా పత్రికలలో వచ్చే వార్తా కథనాలకు స్పందించి నాటకీకరించే
మన నాటక కర్తలలోఉంది. చలపతి ఏకైక సంతానం రఘు. కష్టపడకుం
కోటేశ్వరుడు కావాలనుకొనే రఘు ఒక వృద్ధురాలిని హత్యచేసి నగలు
విషయం తెల్సుకున్న చలపతి రఘును పోలీసులకు అప్పచెప్తాడు. డబ్బు
నుండి వచ్చిన రఘు తల్లిదండ్రులను తూలనాడి వారిని కత్తితో గాయపరుస్తాడు
విష సంస్కృతి పెరుగుతుంది. సోడాబుడ్డి విసిరేసిన వాణ్ణి ఈ సమాజం బాస్ అం
విసిరిన వాణ్ణి శెహబాస్ అంటూ మహారాజు మర్యాదతో స్వాగతం చెప్తున్నారు.
కోట్లు గడించినవాణ్ణి దైవాంశ సంభూతునిగా భావించి భజనలు చేస్తున్నారు.
నేరస్థులు చట్ట సభలకెళ్లి అధికార పీఠం మీద కూర్చొని రాజ్యాంగ రక్షణ చేస్తున్నారు.
రోడ్లమీద తిరుగుతున్న యువకులు విష సంస్కృతి వైపు ఆకర్షితులవుతున్నారు.
స్నేహం చేసి తాము కూడా నేరాలు చేసి తమకు తామే హీరో వర్షిప్‌ను ఆపాదించు
ఒరేయ్ నీలాంటి నేరస్థులను శిక్షించేది పోలీసులూ, చట్టాలూ, కోర్టులూ, ప్రభుత్వా
సామాజిక బహిష్కరణే నీకు తగిన శిక్ష ఏదో ఒకరోజున కడుపు మండిన జనం
చావు చస్తావ్, అంటూ తండ్రి రఘును వెళ్ళగొడతాడు. పెడదారి పడుతున్న యువకు
దుర్మార్గాలకు ఈ నాటిక ముఖచిత్రంగా నిలిచింది.

వాసు సీట్ పొందలేక నిరాశతో పిచ్చి
విద్య పచ్చి వ్యాపారంగా మారిందని తెలు
మారు చేస్తుందని గ్రహించలేకపోయా
లో పట్టపగలు చిత్తు కాగితాల మాదిరి
ంత్ లీకేజ్, ఇంటర్ లీకేజ్, యంసెట్
వ్యవస్థకి మరమ్మత్తులు చేయకుండా ప్ర
ందుకు అంటాడు. చదువుకునే రోజుల
టిస్టులు, టెక్నీషియన్లుతో ఈదేశం ఉండకా

కథనాలకు స్పందించి నాటకీకరించే సంప్ర
సంతానం రఘు. కష్టపడకుండా అర్ధం
స్త్రీలని హత్యచేసి నగలు దోచుకుంటాడు.
సులకు అప్పచెప్తాడు. డబ్బు ఎరగా వేసి
వారిని కత్తితో గాయపరుస్తాడు. నేటి సమా
సిన వాణ్ణి ఈ సమాజం బాస్ అంటుంది.
మర్యాదతో స్వాగతం చెప్తున్నారు. నేరాల
భావించి భజనలు చేస్తున్నారు. జైళ్ళలో మ
ర్చొని రాజ్యాంగ రక్షణ చేస్తున్నారు. నిరుద్యో
సంస్కృతి వైపు ఆకర్షితులవుతున్నారు. నేర
కు తామే హీరో వర్షిప్‌ను ఆపాదించుకుంటు
సులూ, చట్టాలూ, కోర్టులూ, ప్రభుత్వాలు,
ఒకరోజున కడుపు మండిన జనం చేతిలో
తాడు. పెడదారి పడుతున్న యువతరం వి
చింది.

[illegible] కాని మొగుడు నాకొద్దూ అంటూ, లాభంలేని పెళ్ళాం నాకక్కరలేదు [illegible] తమలపాకులు తీసుకున్నంత తేలికగా తీసుకుంటున్నారు. మీరు ఇలా [illegible] పవిత్రమైన వివాహబంధాన్ని ఇంతదాకా మోసుకొచ్చేవారంకాదు. [illegible] రోజే సమాధి చేసి ఉండేవారు. నైతిక విలువలన్నింటికి విలువలూడ్చి, [illegible] పైకివెక్కేస్తున్నాం అనుకుంటూ పవిత్రమైన వివాహ బంధాన్ని వ్యాపార [illegible] మిమ్మల్ని మా పిల్లలని చెప్పుకోవటానికి సిగ్గుపడుతున్నాం. వివాహ [illegible] ఆర్థిక పరిరక్షణ ఆనకట్ట. ఈ బంధం సక్రమముగా ఉంటే దేశం [illegible] అనాగరిక కృత్రిమ విలువలు తల్లక్రిందులై నైతిక నియమాలు [illegible] వ్యవస్థ లేదు అని ప్రపంచ దేశాలకే ఆదర్శమైన వైవాహిక జీవిత మాధుర్యాన్ని [illegible]

[illegible] కార్గిల్ యుద్ధంలో కొడుకు చనిపోయాడని హృదయ విదారకంగా విలపిస్తున్న [illegible] ఏడిస్తే వాడికి అవమానం వాడు మరణించి వందకోట్ల, భారతీయ [illegible] వాడు అమరుడు మర ఫిరంగికి గుండెను గోడగా అడ్డుపెట్టి కోట్లాది [illegible] చేయివేసుకుని నిద్రపోయేలా చేశాడు మన బిడ్డ. తల్లి, తండ్రి, భార్య, [illegible] అనుబంధాలు కంటే మహోన్నత మైనది సైనికుడి బాధ్యత ఈ యుద్ధంలో [illegible] మతాలు, జాతుల సైనికులు పాల్గొన్నారో తెలుసు వారు చిందించిన రక్తంతో [illegible] తడిసింది ఆత్మ రక్షణకోసం, సుస్థిరశాంతి కోసం జరిగే యుద్ధం ఆగదు. ఇది [illegible] భారత సైనిక శక్తి అజేయమని ప్రపంచానికి చాటాడు రచయిత.

[illegible] రచయిత సమాజానికి అవసరమైన ప్రతి విషయాన్ని సునిశిత దృష్టితో [illegible] కాలానికి ఉపయోగపడే రచనలు చేసి తనకంటూ స్థానాన్ని ఏర్పరచుకున్నాడు.

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SIMPLE GAMMA SEMIGROUPS

(Survey Article)

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...ODUCTION:

KRULL [7] proved that the nil-radical of an ideal A in a commutative ring is equal to ...ersection of all minimal prime ideals containing A. SATYANARAYANA [10] ...d KRULL's theorem [7] for commutative semigroups. ANJANEYULU [1], [2] ...uced the notions of ideals in duo semigroups and exhibit some examples and some ... of duo semigroups.

... PRELIMINARIES:

...NITION 0.1 : Let S and Γ be two non-empty sets. Then S is called a ...group if there exist a mapping from S × Γ × S to S which maps $(a, \alpha, b) \rightarrow a\alpha b$ ...ing the condition : $(a\gamma b)\mu c = a\gamma(b\mu c)$ for all $a, b, c \in S$ and $\gamma, \mu \in \Gamma$.

...E0.2 : Let S be a Γ-semigroup. If A and B are two subsets of S, we shall denote the set ... $a \in A$, $b \in B$ and $\gamma \in \Gamma$ } by AΓB.

...NITION0.3 : A nonempty subset A of a Γ-semigroup S is said to be a ***left Γ-ideal*** of S ... $S, a \in A, \alpha \in \Gamma$ implies $s\alpha a \in A$.

...E 0.4: A nonempty subset A of a Γ-semigroup S is aleft Γ- ideal of Siff SΓA⊆A.

...NITION0.5 : A nonempty subset A of a Γ-semigroup S is said to be a ***right*** ... of S if $s \in S, a \in A, \alpha \in \Gamma$ implies $a\alpha s \in A$.

...E 0.6 : A nonempty subset A of a Γ-semigroup S is aright Γ- ideal of Siff AΓS⊆A.

...NITION0.7 : A nonempty subset A of a Γ-semigroup S is said to be a ***two sided*** ...l orsimply a ***Γ- ideal*** of S if $s \in S$, $a \in A$, $\alpha \in \Gamma$ imply $s\alpha a \in A$, $a\alpha s \in A$.

...E 0.8 : A nonempty subset A of a Γ-semigroup S is atwo sided Γ-ideal iff it is both a ... ideal and a right Γ-ideal of S.

...MPLE Γ-SEMIGROUPS

In this section, the terms; left simple Γ-semigroup, right simple Γ-semigroup, simple ...group are introduced. It is proved that (1) a Γ-semigroup S is a left simple ...group if and only if $S\Gamma a = S$ for all $a \in S$, (2) a Γ-semigroup S is a right simple ...group if and only if $a\Gamma S = S$ for all $a \in S$, (3) a Γ-semigroup S is a simple ...group if and only if $S\Gamma a\Gamma S = S$ for all $a \in S$. It is also proved that if S is a left simple ...group or a right simple Γ-semigroup then S is a simple Γ-semigroup. Further it is ... that if S is a duo Γ-semigroup and $a \in S$ then (1) a is regular, (2) a is left regular, (3) a ... regular, (4) a is intra regular and (5) a is semisimple are equivalent.

We now introduce a left simple Γ-semigroup.

...ITION 1.1 : A Γ-semigroup S is said to be a ***left simple Γ-semigroup***if S is its only ...eal.

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We now characterize left simple Γ-semigroups.

THEOREM 1.2 : A Γ-semigroup S is a left simple Γ-semigroup if and only if $S\Gamma a = S$ for all $a \in S$.

Proof : Suppose that S is a left simple Γ-semigroup and $a \in S$.
Let $t \in S\Gamma a$, $s \in S$, $\gamma \in \Gamma$.
$t \in S\Gamma a \Rightarrow t = s_1 \alpha a$ where $s_1 \in S$ and $\alpha \in \Gamma$.

Now $s\gamma t = s\gamma(s_1 \alpha a) = (s\gamma s_1)\alpha a \in S\Gamma a \Rightarrow S\Gamma a$ is a left Γ-ideal of S.
Since S is a left simple Γ-semigroup, $S\Gamma a = S$.
Therefore $S\Gamma a = S$ for all $a \in S$.

Conversely suppose that $S\Gamma a = S$ for all $a \in S$. Let L be a left Γ-ideal of S.
Let $l \in L$. Then $l \in S$. By assumption $S\Gamma l = S$.
Let $s \in S$. Then $s \in S\Gamma l \Rightarrow s = t\alpha l$ for some $t \in S$, $\alpha \in \Gamma$.
$l \in L$, $t \in S$, $\alpha \in \Gamma$ and L is a left Γ-ideal $\Rightarrow t\alpha l \in L \Rightarrow s \in L$.
Therefore $S \subseteq L$. Clearly $L \subseteq S$ and hence $S = L$.
Therefore S is the only left Γ-ideal of S. Hence S is left simple Γ-semigroup.

We now introduce a right simple Γ-semigroup.

DEFINITION 1.3 : A Γ-semigroup S is said to be a ***right simple Γ-semigroup*** if S is its only right Γ-ideal.

We now characterize right simple Γ-semigroups.

THEOREM 1.4 : A Γ-semigroup S is a right simple Γ-semigroup if and only if $a\Gamma S = S$ for all $a \in S$.

Proof : Suppose that S is a right simple Γ-semigroup and $a \in S$. Let $t \in a\Gamma S$, $s \in S$, $\gamma \in \Gamma$.
$t \in a\Gamma S \Rightarrow t = a\alpha s_1$ where $s_1 \in S$ and $\alpha \in \Gamma$.

Now $t\gamma s = (a\alpha s_1)\gamma s = a\alpha(s_1\gamma s) \in a\Gamma S \Rightarrow a\Gamma S$ is a right Γ-ideal of S.
Since S is a right simple Γ-semigroup, $a\Gamma S = S$.
Therefore $a\Gamma S = S$ for all $a \in S$.

Conversely suppose that $a\Gamma S = S$ for all $a \in S$.
Let R be a right Γ-ideal of a Γ-semigroup S.
Let $r \in R$. Then $r \in S$. By assumption $r\Gamma S = S$.
Let $s \in S$. Then $s \in r\Gamma S \Rightarrow s = rat$ for some $t \in S$, $a \in \Gamma$.
$r \in R$, $t \in S$, $a \in \Gamma$ and R is a right Γ-ideal $\Rightarrow rat \in R \Rightarrow s \in R$.
Therefore $S \subseteq R$. Clearly $R \subseteq S$ and hence $S = R$.
Therefore S is the only right Γ-ideal of S. Hence S is right simple Γ-semigroup.

We now introduce a simple Γ-semigroup.

DEFINITION 1.5 : A Γ-semigroup S is said to be ***simple Γ-semigroup*** if S is its only two-sided Γ-ideal.

We now characterize simple Γ-semigroups

THEOREM 1.6 : If S is a left simple Γ-semigroup or a right simple Γ-semigroup then S is a simple Γ-semigroup.

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Proof : Suppose that S is a left simple Γ-semigroup. Then S is the only left Γ-ideal of S. If A is a Γ-ideal of S, then A is a left Γ-ideal of S and hence A = S.
Therefore S itself is the only Γ-ideal of S and hence S is a simple Γ-semigroup.
Suppose that S is a right simple Γ-semigroup. Then S is the only right Γ-ideal of S.
If A is a Γ-ideal of S, then A is a right Γ-ideal of S and hence A = S.
Therefore S itself is the only Γ-ideal of S and hence S is a simple Γ-semigroup.

THEOREM 1.7 : A Γ-semigroup S is simple Γ-semigroup if and only if $S\Gamma a\Gamma S = S$ for all $a \in S$.

Proof : Suppose that S is a simple Γ-semigroup and $a \in S$.
Let $t \in S\Gamma a\Gamma S$, $s \in S$ and $\gamma \in \Gamma$.
$t \in S\Gamma a\Gamma S \Rightarrow t = s_1\alpha a\beta s_2$, where $s_1, s_2 \in S$ and $\alpha, \beta \in \Gamma$.
Now $t\gamma s = (s_1\alpha a\beta s_2)\gamma s = s_1\alpha a\beta(s_2\gamma s) \in S\Gamma a\Gamma S$
and $s\gamma t = s\gamma(s_1\alpha a\beta s_2) = (s\gamma s_1)\alpha a\beta s_2 \in S\Gamma a\Gamma S$. Therefore $S\Gamma a\Gamma S$ is a Γ-ideal of S.
Since S is a simple Γ-semigroup, S itself is the only Γ-ideal of S and hence $S\Gamma a\Gamma S = S$.

Conversely suppose that $S\Gamma a\Gamma S = S$ for all $a \in S$. Let I be a Γ-ideal of S.
Let $a \in I$. Then $a \in S$. So $S\Gamma a\Gamma S = S$.
Let $s \in S$. Then $s \in S\Gamma a\Gamma S \Rightarrow s = t_1\alpha a\beta t_2$ for some $t_1, t_2 \in S$, $\alpha, \beta \in \Gamma$.
$a \in I$, $t_1, t_2 \in S$, $\alpha, \beta \in \Gamma$, I is a Γ-ideal of S $\Rightarrow t_1\alpha a\beta t_2 \in I \Rightarrow s \in I$.
Therefore $S \subseteq I$. Clearly $I \subseteq S$ and hence S = I.
Therefore S is the only Γ-ideal of S. Hence S is a simple Γ-semigroup.

DEFINITION 1.3.1 : An element a of Γ-semigroup S is said to be a ***α-idempotent*** provided $a\alpha a = a$.

NOTE 1.3.2 : The set of all α-idempotent elements in a Γ- semigroup S is denoted by E_α.

DEFINITION 1.3.3 : An element a of Γ- semigroup S is said to be an ***idempotent*** or ***Γ-idempotent*** if $a\alpha a = a$ for all $\alpha \in \Gamma$.

NOTE 1.3.4 : In a Γ-semigroup S, a is an idempotent iff a is an α-idempotent for all $\alpha \in \Gamma$.

NOTE 1.3.5 : If an element a of Γ- semigroup S is ***an idempotent***, then $a\Gamma a = a$.

DEFINITION 1.3.6 : A Γ-semigroup S is said to be an ***idempotent Γ-semigroup*** provided every element of S is α –idempotent for some $\alpha \in \Gamma$.

DEFINITION 1.3.12 : An element a of a Γ-semigroup S is said to be ***regular*** provided $a = a\alpha x\beta a$, for some $x \in S$ and $\alpha, \beta \in \Gamma$ i.e, $a \in a\Gamma S\Gamma a$.

DEFINITION 1.3.13 : A Γ- semigroup S is said to be ***a regular Γ- semigroup*** provided every element is regular.

EXAMPLE 1.3.14 : Let S be the set of 3×2 matrices and Γ be a set of some 2×3 matrices over of field. Then S is a regular Γ-semigoup.

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Verification : Let $A \in S$, where $A = \begin{pmatrix} a & b \\ c & d \\ e & f \end{pmatrix}$.

Then we chose $B \in \Gamma$ according to the following cases such that $ABABA = ABA = A$.

CASE 1 : When the submatrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is non-singular, then $ad - bc \neq 0$

e, f may both be 0 or one of them is 0 or both of them are non-zero.

Then $B = \begin{pmatrix} \frac{d}{ad-bc} & \frac{-b}{ad-bc} & 0 \\ \frac{-c}{ad-bc} & \frac{a}{ad-bc} & 0 \end{pmatrix}$ and we find $ABA = A$.

CASE 2 : $af - be = 0$. Then $B = \begin{pmatrix} \frac{f}{af-be} & 0 & \frac{-b}{af-be} \\ \frac{-e}{af-be} & 0 & \frac{a}{af-be} \end{pmatrix}$ and $ABA = A$.

CASE 3 : $cf - de \neq 0$. Then $B = \begin{pmatrix} 0 & \frac{f}{cf-de} & \frac{-d}{cf-de} \\ 0 & \frac{-e}{cf-de} & \frac{c}{cf-de} \end{pmatrix}$ and $ABA = A$.

CASE 4 : When the submatrices are singular.

then either $\begin{cases} ad-bc=0 \\ cf-be=0 \end{cases}$ or $\begin{cases} ad-bc=0 \\ af-de=0 \end{cases}$.

If all the elements of A are 0, then the case is trivial. Next we consider at least one of the elements of A is non-zero, say $a_{ij} \neq 0$, $i = 1,2,3$ and $j = 1,2$. Then we take the b_{ji} th element of B as $(a_{ij})^{-1}$ and the other elements of B are zero and we find that $ABA = A$. Thus A is regular. Hence S is a regular Γ-semigroup.

EXAMPLE 1.3.15 : Let $S = \{0, a, b\}$ and Γ be any nonempty set. If we define a binary operation on S as the following Cayley table, then S is a semigroup.

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0	a	b
0	0	0
0	a	a
0	b	b

…efine a mapping from $S \times \Gamma \times S$ to S as $a\alpha b = ab$ for all $a, b \in S$ and $\alpha \in \Gamma$. Then S is …egular Γ-semigroup

THEOREM 1.3.16 : **Every α-idempotent element in a Γ-semigroup is regular**

Proof : Let a be an α-idempotent element in a Γ-semigroup S.

Then $a = a\alpha a$ for some $\alpha \in \Gamma$. Hence $a = a\alpha a\alpha a$. Therefore a is a regular element.

DEFINITION 1.3.17 : A Γ-ideal A of a Γ-semigroup S is said to be ***regular*** if every element of A is regular in A.

THEOREM 1.3.18 : Every Γ-ideal of a regular Γ-semigroup S is a regular Γ-ideal of S.

Proof : Let A be a Γ-ideal of S and $a \in A$. Then $a \in S$ and hence a is regular in S. Therefore $a = a\alpha b\beta a$ where $b \in S$ and $\alpha, \beta \in \Gamma$.

Hence $a = a\alpha b\beta a = (a\alpha b\beta)(a\alpha b\beta a) = a\alpha[(b\beta a)\alpha b]\beta a$.

Let $b_1 = (b\beta a)\alpha b \in S\Gamma A\Gamma S \subseteq A$.

Now $a\alpha b_1\beta a = a\alpha[(b\beta a)\alpha b]\beta a = a$.

Therefore a is regular in A and hence A is a regular Γ-ideal.

THEOREM 1.3.19 :If a Γ-semigroup S is a regular Γ-semigroup then every principal Γ-ideal is generated by a β-idempotent for some $\beta \in \Gamma$.

Proof : Suppose that S is a regular Γ-semigroup. Let $<a>$ be a principal Γ-ideal of S. Since S is a regular Γ-semigroup, there exists $x \in S$, $\alpha, \beta \in \Gamma$ such that $a = a\alpha x\beta a$.

Let $a\alpha x = e$. Then $e\beta e = (a\alpha x)\beta(a\alpha x) = (a\alpha x\beta a)\alpha x = a\alpha x = e$.

Thus e is a β-idempotent element of S.

Now $a = a\alpha x\beta a = e\beta a \in <e> \Rightarrow <a> \subseteq <e>$.

Also $e = a\alpha x \in <a> \Rightarrow <e> \subseteq <a>$.

Therefore $<a> = <e>$ and hence every principal Γ-ideal is generated by an idempotent.

DEFINITION 1.3.20 : An element a of a Γ-semigroup S is said to be ***left regular*** provided $a = a\alpha a\beta x$, for some $x \in S$ and $\alpha, \beta \in \Gamma$, i.e, $a \in a\Gamma a\Gamma S$.

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DEFINITION 1.3.21 : An element a of a Γ-semigroup S is said to be *right regular* provided $a = x\alpha a\beta a$, for some $x \in S$ and $\alpha, \beta \in \Gamma$, i.e, $a \in S\Gamma a\Gamma a$.

DEFINITION 1.3.22 : An element a of a Γ-semigroup S is said to be ***completely regular*** provided, there exists an element $x \in S$ such that $a = a\alpha x\beta a$ for some $\alpha, \beta \in \Gamma$ and $a\alpha x = x\beta a$ i.e., $a \in a\Gamma x\Gamma a$ and $a\Gamma x = x\Gamma a$

DEFINITION1.3.23 : A Γ-semigroup S is said to be***completely regular*** Γ-***semigroup***provided every element of S is completely regular.

DEFINITION 1.3.24 : Let S be a Γ-semigroup, $a \in S$ and $\alpha, \beta \in \Gamma$. An element $b \in S$ is said to be an (α, β)-*inverse* of a if $a = a\alpha b\beta a$ and $b = b\beta a\alpha b$.

THEOREM 1.3.25 : Let S be a Γ-semigroup and $a \in S$. Then a is a regular element if and only if a has an (α, β)-inverse.

Proof : Suppose that a is a regular element. Then $a = a\alpha b\beta a$ for some $b \in S$ and $\alpha, \beta \in \Gamma$.

Let $x = b\beta a\alpha b \in S$

Now $a\alpha x\beta a = a\alpha(b\beta a\alpha b)\beta a = (a\alpha b\beta a)\alpha b\beta a = a\alpha b\beta a = a$ and

$x\beta a\alpha x = (b\beta a\alpha b)\beta a\alpha(b\beta a\alpha b) = b\beta(a\alpha b\beta a)\alpha(b\beta a\alpha b) = b\beta a\alpha(b\beta a\alpha b) = b\beta(a\alpha b\beta a)\alpha b = b\beta a\alpha b = x$. Therefore $x = b\beta a\alpha b$ is the (α, β)-inverse of a.

Conversely suppose that b is an (α, β)-inverse of a.

Then $a = a\alpha b\beta a$ and $b = b\beta a\alpha b$. Therefore $a = a\alpha b\beta a$ and hence a is regular.

DEFINITION1.3.26 : An element a of Γ- semigroup S is said to be***semisimple***provided $a \in \langle a \rangle \Gamma \langle a \rangle$, that is, $\langle a \rangle \Gamma \langle a \rangle = \langle a \rangle$.

DEFINITION1.3.27 : A Γ- semigroup S is said to be***semisimple*** Γ-***semigroup***provided every element of S is a semisimple element.

DEFINITION1.3.28 : An element a of a Γ-semigroup S is said to be***intra regular***provided $a = x\alpha a\beta a\gamma y$ for some $x, y \in S$ and $\alpha, \beta, \gamma \in \Gamma$.

EXAMPLE 1.3.29 : The Γ-semigroup given in example 1.3.15, is an intra regular Γ-semigroup.

THEOREM 1.3.30 : If 'a' is a completely regular element of a Γ- semigroup S, then a is regular and semisimple.

Proof :Since a is a completely regular element in the Γ- smigroup S, $a = a\alpha x\beta a$ for some $\alpha, \beta \in \Gamma$ and $x \in S$. Therefore a is regular.

Now $a = a\alpha x\beta a \in a\Gamma x\Gamma a \subseteq \langle a \rangle \Gamma \langle a \rangle$. Therefore a is semisimple.

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...)

...M 1.3.31 : If 'a' is a completely regular element of a Γ- semigroup S, then a is ...t regular element and a right regular element.

...uppose that a is completely regular. Then $a \in a\Gamma S\Gamma a$ and $a\Gamma S = S\Gamma a$.

...$a\Gamma S\Gamma a = a\Gamma a\Gamma S$. Therefore a is left regular.

...$a\Gamma S\Gamma a = S\Gamma a\Gamma a$. Therefore a is right regular.

...REM 1.3.32 : If 'a' is a left regular element of a Γ-semigroup S, then a is ...mple.

...: Suppose that a is left regular. Then $a \in a\Gamma a\Gamma x$ and hence $a \in \langle a\rangle \Gamma \langle a\rangle$. Therefore a ...isimple.

...OREM 1.3.33 : If 'a' is a right regular element of a Γ-semigroup S, then a is ...simple.

...f : Suppose that a is right regular. Then $a \in a\Gamma a\Gamma x$ and hence $a \in \langle a\rangle \Gamma \langle a\rangle$. Therefore a ...misimple.

...EOREM 1.3.34 : If 'a' is a regular element of a Γ-semigroup S, then a is semisimple.

...f :Suppose that a is regular element of Γ-semigroup S.

...n $a = a\alpha x\beta a$, for some $x \in$ S, $\alpha, \beta \in \Gamma$ and hence $a \in \langle a\rangle \Gamma \langle a\rangle$.

...refore a is semisimple.

...EOREM 1.3.35 : If 'a' is a intra regular element of a Γ- semigroup S, then a is ...isimple.

...f : Suppose that a is intra regular. Then $a \in x\Gamma a\Gamma a\Gamma y$ for $x, y \in$ S and hence ...$a\rangle \Gamma \langle a\rangle$ Therefore a is semisimple.

...EOREM 1.5.8 : If S is a duo Γ-semigroup, then the following are equivalent for any ...nent $a \in$ S.

...a is regular.
...a is left regular.
...a is right regular.
...) a is intra regular.
...) a is semisimple.

...oof : Since S is duo Γ-semigroup, $a\Gamma S^1 = S^1\Gamma a$.
...e have $a\Gamma S^1\Gamma a = a\Gamma a\Gamma S^1 = S^1\Gamma a\Gamma a = \langle a\Gamma a\rangle = \langle a\rangle \Gamma \langle a\rangle$.

...) ⇒ (2) : Suppose that a is regular. Then $a = a\alpha x\beta a$ for some $x \in$ S and $\alpha, \beta \in \Gamma$.
...herefore $a \in a\Gamma S^1\Gamma a = a\Gamma a\Gamma S^1 \Rightarrow a = a\gamma a\delta y$ for some $y \in S^1$, $\gamma, \delta \in \Gamma$.
...herefore a is left regular.

(2) ⇒ (3) : Suppose that a is left regular. Then $a = a\alpha a\beta x$ for some $x \in S$ and $\alpha, \beta \in \Gamma$.
Therefore $a \in a\Gamma a\Gamma S^1 = S^1\Gamma a\Gamma a \Rightarrow a = y\gamma a\delta a$ for some $y \in S^1$, $\gamma, \delta \in \Gamma$.
Therefore a is right regular.

(3) ⇒ (4): Suppose that a is right regular. Then for some $x \in S$, $\alpha, \beta \in \Gamma$, $a = xa\alpha\beta a$
Therefore $a \in S^1\Gamma a\Gamma a = <a\Gamma a> \Rightarrow a = xa\alpha\beta a\gamma y$ for some $x, y \in S^1$ and $\alpha, \beta, \gamma \in \Gamma$.
Therefore a is intra regular.

(4) ⇒ (5): Suppose that a is intra regular.
Then $a = xa\alpha\beta a\gamma y$ for some $x, y \in S^1$ and $\alpha, \beta, \gamma \in \Gamma$. Therefore $a \in <a> \Gamma <a>$. Therefore a is semisimple.

(5) ⇒ (1): Suppose that a is semisimple. Then $a \in <a> \Gamma <a> = a\Gamma S^1\Gamma a$
$\Rightarrow a \in a\alpha x\beta a$ for some $x \in S^1$ and $\alpha, \beta \in \Gamma$.
Therefore a is a regular element.

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DUO NOETHERIAN SEMIGROUPS

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ABSTRACT

In a paper the terms Noetherian semigroup, closed semigroup and center of a semigroup are introduced. It is proved that if S is a noetherian semigroup containing proper ideals, then S has a maximal ideal. It is proved thatif H is the collection of all ideals in a duo semigroupS which are not principal and $H \neq \emptyset$, then there exists a prime ideal of S which is not a principal ideal. It is proved that if every prime ideal including S is principal in a duo semigroup S, then every ideal in S is principal. Also it is proved that if S is a duo semigroup, which is a union of finite number of principal ideals and every proper prime ideal of S is principal and $S = S^2$ then every proper ideal is principal. if S is a duo semigroup such that $S \neq S^2$and every maximal ideal is principal then it is proved that (1) S has atleast two maximal ideals and (2) if P is a proper prime ideal of S then either P is a principal ideal or $P = xP$ for some $x \in S$. If every maximal ideal in a closed duo semigroup S is principal and $S \neq S^2$, then $\cap x^n = \emptyset$ for every $x \in S$, then it is proved that S is a union of two principal ideals and every ideal is an intersection of a prime ideal and an S-primary ideal. If S is a noetherian or archimedian duo semigroup such that $S = \bigcup_{i=1}^{n} < x_i >$ and suppose $a \notin < x, a >$ for all $a \in S$, which is not a product of powers of x_i's,then it is proved that S is finitely generated and in particular if S is noetherian cancellative semigroup without identity then S is finitely generated. If S is a duo semigroup which is a union of finite number of principal ideals andif $S = S^2$, then it is proved that S contains idempotent elements. If S is a cancellable duo semigroup which is a union of finite number of principal ideals, then it is proved that S contains identity if and only if $S = S^2$.

KEY WORDS : Chained semigroup, duo chained semigroup,noetherian semigroup and center of a semigroup.

PRELIMINARIES :

DEFINITION 1.1 : Let S be any non-empty set. Then S is said to be a *semigroup* if there exist a mapping from $S \times S$ to S which maps $(a, b) \to ab$ satisfying the condition : $(ab)c = a(bc)$ for all $a, b, c \in S$.

NOTE 1.2 : Let S be a semigroup. If A and B are two subsets of S, we shall denote the set $\{ ab : a \in A, b \in B \}$ by AB.

DEFINITION 1.3: A nonempty subset A of a semigroup S is said to be a *left ideal* of S if $s \in S, a \in A$ implies $sa \in A$.

NOTE 1.4:A nonempty subset A of a semigroup S is aleft ideal of S iff $SA \subseteq A$.

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In a paper the terms Noetherian semigroup, closed semigroup and center of a semigroup are introduced. It is proved that if S is a noetherian semigroup containing proper ideals, then S has a maximal ideal. It is proved thatif H is the collection of all ideals in a duo semigroupS which are not principal and $H \neq \emptyset$, then there exists a prime ideal of S which is not a principal ideal. It is proved that if every prime ideal including S is principal in a duo semigroup S, then every ideal in S is principal. Also it is proved that if S is a duo semigroup, which is a union of finite number of principal ideals and every proper prime ideal of S is principal and $S = S^2$ then every proper ideal is principal. If S is a duo semigroup such that $S \neq S^2$and every maximal ideal is principal then it is proved that (1) S has almost two maximal ideals and (2) if P is a proper prime ideal of S then either P is a principal ideal or $P = \sqrt{<x>}$ for some $x \in S$. If every maximal ideal in a closed duo semigroup S is principal and $S \neq S^2$, $\bigcap_{n=1}^{\infty} <x>^n = \emptyset$ for every $x \in S$, then it is proved that S is a union of two principal ideals and every ideal is an intersection of a prime ideal and an S-primary ideal. If S is a noetherian or archimedian duo semigroup such that $S = \bigcup_{i=1}^{n} <x_i>$ and suppose $a \notin <x_i, a>$ for all $a \in S$, which is not a product of power of x_i's,then it is proved that S is finitely generated and in particular if S is noetherian cancellative semigroup without identity then S is finitely generated. If S is a duo semigroup which is a union of finite number of principal ideals andif $S = S^2$, then it is proved that S contains idempotent elements. If S is a cancellable duo semigroup which is a union of finite number of principal ideals, then it is proved that S contains identity if and only if $S = S^2$.

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DEFINITION1.5: A nonempty subset A of a semigroup S is said to be a ***right ideal*** of S if $s \in S, a \in A$ implies $as \in A$.

NOTE 1.6 :A nonempty subset A of a semigroup S is aright ideal of Siff AS⊆A.

DEFINITION 1.7: A nonempty subset A of a semigroup S is said to be a ***two sided ideal*** orsimply a***ideal*** of S if $s \in S$, $a \in A$ imply $sa \in A$, $as \in A$.

NOTE 1.8 :A nonempty subset A of a semigroup S is atwo sided ideal iff it is both a left ideal and a rightideal of S.

THEOREM 1.9 : The nonempty intersection of any two (left or right) ideals of a semigroup S is a (left or right) ideal of S.

THEOREM 1.10 : The nonempty intersection of any family of (left or right) ideals of a semigroup S is a (left or right) ideal of S.

THEOREM 1.11 : The union of any two (left or right) ideals of a semigroup S is a (left or right) ideal of S.

THEOREM 1.12 : The union of any family of (left or right) ideals of a semigroup S is a(left or right) ideal of S.

DEFINITION 1.13 :A semigroup S is said to be a ***left duo semigroup*** provided every left ideal of S is a two sided ideal of S.

DEFINITION 1.14 :A semigroup S is said to bea ***right duo semigroup*** provided every right ideal of S is a two sided ideal of S.

DEFINITION 1.15 :A semigroup S is said to be a ***duo semigroup*** provided it is both a left duo Semigroup and a right duosemigroup.

THEOREM 1.16 : A semigroup S is a duo semigroup if and only if $xS^1 = S^1x$ for all $x \in S$.

THEOREM 1.17 : Let A be a ideal in a duo semigroup S and $a, b \in S$. Then $ab \in A$ if and only if $< a >< b > \subseteq A$.

COROLLARY 1.18 : Let A be a ideal in a duo semigroup S. Then for any natural number n, $a^n \in A$implies $< a >^n \subseteq A$.

DEFINITION 1.19 :An ideal A of a semigroup S is said to be a ***maximal ideal*** provided A is a proper ideal of S and A is not properly contained in any proper ideal of S.

DEFINITION 1.20 : An ideal P of a semigroup S is said to be a ***completely prime ideal*** provided $x, y \in S$ and $xy \in P$ implies either $x \in P$ or $y \in P$.

DEFINITION 1.21: An ideal P of a semigroup S is said to be a ***primeideal*** provided A, B are two ideals of S and $AB \subseteq P \Rightarrow$ either $A \subseteq P$ or$B \subseteq P$.

COROLLARY 1.22: An ideal P of a semigroup S is a prime ideal iff$a, b \in S$ such that $ab \in P$, then either $a \in P$ or $b \in P$.

THEOREM 1.23 : Let S be a duo semigroup. An ideal P of S is prime ideal if and only if P is a completely prime ideal.

DEFINITION 1.24 : If A is an ideal of a semigroup S, then the intersection of all prime ideals of S containing A is called ***prime radical*** or simply ***radical*** of A and it is denoted by $\sqrt{A}$ or *rad*

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ITION 1.25 :If A is an ideal of a semigroup S, then the intersection of all completely prime
of S containing A is called ***completeprime radical*** or simply ***completeradical*** of A and it is
ed by ***c. rad A***.

E 1.26 :If A is an ideal of a semigroup S then ***rad*** $A = A_3$ and ***c.rad*** $A = A_4$.

OREM 1.27 : If A is an ideal of a duo semigroup S, then *rad* A = *c.rad* A.

ATION 1.28 : If A is an ideal of a semigroup S, then we associate the following four types of sets.
The intersection of all completely prime ideals of S containing A.
$\in S : x^n \in A$ for some natural number n }
The intersection of all prime ideals of S containing A.
$\in S : \langle x \rangle^n \subseteq A$ for some natural number n }

EOREM 1.29 : If A is an ideal of a semigroup S, then $A \subseteq A_4 \subseteq A_3 \subseteq A_2 \subseteq A_1$.

EOREM 1.30 : If A is an ideal in a duo semigroup S then $A_1 = A_2 = A_3 = A_4$.

INITION 1.31 :A semigroup S is said to be an ***archimedian semigroup***provided for any
$\in S$, there exists a natural number n such that $a^n \in \langle b \rangle$.

INITION 1.32 :A ideal A of a semigroup S is said to be a ***left primary ideal*** provided
Y are two ideals of S such that $XY \subseteq A$ and $Y \not\subseteq A$ then $X \subseteq \sqrt{A}$.
$\sqrt{A}$ is a prime ideal of S.

INITION 1.33 :An ideal A of a semigroup S is said to be a ***right primary***
al provided
, Y are two ideals of S such that $XY \subseteq A$ and $X \not\subseteq A$ then $Y \subseteq \sqrt{A}$.
$\sqrt{A}$ is a prime ideal of S.

INITION 1.34 : An ideal A of a semigroup S is said to be a ***primary ideal*** provided A is both a left
ary ideal and a right primary ideal.

EOREM 1.35 : Let A be an ideal of a semigroup S. Then X, Y are two
eals of S such that $XY \subseteq A$ and $Y \not\subseteq A \Rightarrow X \subseteq \sqrt{A}$ if and only if $x, y \in S$,
$\langle x \rangle \subseteq A$ and $y \notin A \Rightarrow x \in \sqrt{A}$.

EOREM 1.36 : Let A be an ideal of a semigroup S. Then X, Y are two
eals of S such that $XY \subseteq A$ and $X \not\subseteq A \Rightarrow Y \subseteq \sqrt{A}$ if and only if $x, y \in S$,
$\langle y \rangle \subseteq A$ and $x \notin A \Rightarrow y \in \sqrt{A}$.

EFINITION 1.37 :A ideal A of a semigroup S is said to be ***semiprimary*** provided $\sqrt{A}$ is a prime ideal of

EFINITION 1.38 :A semigroup S is said to be a ***semiprimary semigroup*** provided every ideal of S is a
miprimary ideal.

THEOREM 1.39 : Every left primary or right primary ideal of a semigroup is a semiprimary ideal.

DEFINITION 1.40 :Let P be any prime ideal in a semigroup S. A primary ideal A in S is said to be ***P-primary*** or P is a ***prime ideal belongingto A*** provided $\sqrt{A} = P$.

DEFINITION 1.41 :Let S be any prime ideal in a semigroup S. A primary ideal A in S is said to be S-
primary or S is a ***prime ideal belonging to A*** provided $\sqrt{A} = S$.

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REM 2.3 :If S is a noetheriansemigroup containing proper ideals then S has a maximal ideal.

f: Let A_1 be a proper ideal of S. If A_1 is not a maximal ideal of S, then there exists a proper ideal of S such that $A_1 \subset A_2$. If A_2 is not a maximal ideal of S, then there exists a proper ideal A_3 of S such that $A_1 \subset A_2 \subset A_3$. By continuing this process we get an ascending chain of proper ideals of S. Since S is noetherian, the chain $A_1 \subset A_2 \subset A_3 \ldots$ is stationary. It is a contradiction. Therefore there is a maximal ideal of S.

OREM 2.4 : Let H be the collection of all ideals in aduo semigroup S which are not principal. If ≠ ∅ then there exists a prime ideal which is not a principal ideal.

of :Let $H = \{ A_\alpha : \alpha \in \Delta \}$ be the collection of all ideals in a duo semigroup S, which are not ncipal. If $\bigcup_{\alpha\in\Delta} A_\alpha = \langle x \rangle$ for some $x \in S$, then $x \in A_\beta$ for some $\beta \in \Delta$. Therefore $\subseteq A_\beta \subseteq \bigcup_{\alpha\in\Delta} A_\alpha = \langle x \rangle$ and hence $A_\beta = \langle x \rangle$. Then $A_\beta \notin H$. It is a contradiction. Hence $\bigcup_{\alpha\in\Delta} A_\alpha$ is not principal. So $\bigcup_{\alpha\in\Delta} A_\alpha \in H$. Thus H satisfies all the conditions of Zorn's lemma. By n's lemma, H has a maximal element say P. Suppose if possible P is not a prime al. Then there exists $a, b \in S$ such that $ab \subseteq P$ and $a \notin P$ and $b \notin P$. Since P is maximal in H, $P \cup \langle b \rangle \notin H$. Therefore $P \cup \langle b \rangle$ is a principal ideal. Then $P \cup \langle b \rangle = \langle x \rangle$ for some $x \in S$. If P then we get P = <x> and hence $b \in P$. It is not true. Hence $x \notin P$. Therefore $x \in \langle b \rangle$ and nce $\langle b \rangle = \langle x \rangle$. Hence P ⊆<b>. Now $P' = \{s \in S : sb \in P\}$ is an ideal of S. Then clearly $a \in P'$ d $a \notin P$. Therefore $P \subset P'$ and $P \neq P'$. By the maximality of P in H, we get $P' \notin H$. Therefore $= \langle y \rangle$ for some $y \in S$. Now $y \in P' \Rightarrow yb \in P \Rightarrow \langle yb \rangle \subseteq P$ .Let $t \in P$. Since $P \subseteq \langle b \rangle$, we $t = sb$ for some $s \in S$ .Now $sb \in P$. Hence $s \in P' = \langle y \rangle$. Therefore $s = ry$ for some S. Now $t = sb = (ry)b = r(yb) \in \langle yb \rangle \Rightarrow t \in \langle yb \rangle = \langle yb \rangle$. Therefore we have $\subseteq \langle yb \rangle$. Hence $P = \langle yb \rangle$. Thus P ∉ H. It is a contradiction. Therefore P is a prime ideal.

OLLARY 2.5 : If H is the collection of all ideals in a duo semigroup S, which are not finitely erated and H ≠ ∅, then there exists a prime ideal which is not finitely generated.

EOREM 2.6 : If every prime ideal including S is principal in a duo semigroup S, then every ideal in s principal.

oof : Let Hbe the collection of all ideals in S which are not principal. If H ≠ ∅ then by theorem 2.4, contains a proper prime ideal which is not principal. It is a contradiction. Hence H = ∅. Therefore ery ideal in S is principal.

OROLLARY 2.7 : If every prime ideal including S is finitely generated in a duo emigroup S, then every ideal in S is finitely generated.

HEOREM 2.8 : Let S be a duo semigroup, which is a union of finite number of principal ideals. If very proper prime ideal of S is principal and $S = S^2$ then every proper ideal is principal.

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Proof :Since S is a duo semigroup which is a union of finite number of principal ideals, $S = \bigcup_{i=1}^{n} < x_i >$ where $x_i \notin < x_j >$ for all $i \neq j$. Since $S = S^2$, $x_i \in < x_i^2 >$ for $i = 1, 2, \ldots, n$. Thus x_i is semi simple and hence by theorem 1.52, x_i is regular. By theorem 1.54, $< x_i > = < e_i >$ for some idempotent e_i in S. Let A be any proper ideal such that $\sqrt{A} = S$. Therefore $e_i \in e_i^2$ for all $i = 1, 2, \ldots, n$. Therefore $x_1, x_2, \ldots, x_n \in A$ and hence S =A. It is a contradiction. Therefore there exists no ideal of A of S such that $\sqrt{A} = S$. By theorem 2.6, every proper ideal is principal.

THEOREM 2.9 : If S is a duo semigroup such that $S \neq S^2$ and every maximal ideal is principal then S has atmost two maximal ideals.

Proof **:** Let S be a duo semigroup such that $S \neq S^2$. Suppose that every maximal ideal is principal. Let $a \in S \setminus S^2$. Then $S\setminus\{a\}$ is a maximal ideal. Therefore $S\setminus\{a\} = <b>$ for some $b \in S$. Clearly $a \neq b$. Let $b \in S^2$. Then $S\setminus\{a\} = <b> \subseteq S^2$ and hence $S\setminus\{a\} = S^2$. Let M be a maximal ideal of S. Then $M = < c >$ for some $c \in S$. If $c \in S^2$ then $M \subseteq S^2$. Since M is maximal, $M = S^2 = S\setminus\{a\}$. If $c \notin S^2$ then $c \in S\setminus\{a\}$ and hence $c = a$. Thus $M = < a >$. So if $b \in S^2$, S can have at most two maximal ideals, namely $S\setminus\{a\}$ and $< a >$. Let $b \notin S^2$. Then $S = < b > \cup \{a\} = \{a\} \cup \{b\} \cup S^2$. Let $M = < c >$ be a maximal ideal. If $c \notin S^2$ then $c = a$ or $c = b$. Then $M = S\setminus\{a\}$ or $M = S\setminus\{b\}$. If $c \in S^2$ then $M = S^2$ and hence M is properly contained in a proper ideal $S\setminus\{a\}$. It is a contradiction. Hence S has at most two maximal ideals.

THEOREM 2.10 : Let S be a duo semigroup such that $S \neq S^2$ and every maximal ideal is principal. If P is a proper prime ideal of S then either P is a principal ideal or $P = xP$ for some $x \in S$.

Proof : Let P be any proper prime ideal and $a \in S\setminus S^2$. Now $S\setminus\{a\}$ is a maximal ideal. Therefore $S\setminus\{a\} = < b >$ for some $b \in S$. If $a \notin P$ then $P \subseteq S\setminus\{a\} = <b>$. If $b \in P$ then $P = <b>$. If $b \notin P$ then $P = bP$, since P is a prime ideal. Let $a \in P$. If $b \in P$ then $P = S$. If $b \notin P$ then $P \subseteq S\setminus\{b\}$. Since $S\setminus\{b\}$ is maximal ideal, we have $P \subseteq S\setminus\{b\} = <x>$ for some $x \in S$. If $x \in P$ then $P = <x>$. If $x \notin P$, let $y \in P$. Then $y \in < x >$. So $y \in xS \subseteq P$ for some $s \in S$. Since P is prime, $s \in P$. Hence $y \in P \subseteq xP$. Clearly $xP \subseteq P$. Hence $P = < x >$ or $P = xP$ for some $x \in S$.

THEOREM 2.11 : If every maximal ideal in a duo semigroup S is principal and $S \neq S^2$, $< x >^w = \emptyset$ for every $x \in S$, then S is a union of two principal ideals and every ideal is an intersection of a prime ideal and an S-primary ideal.

Proof :Let P be any proper prime ideal of S. By theorem 2.10, either P is a principal ideal or $P = x P$ for some $x \in S$. If $P = x P$ for some $x \in S$, then $x^n P = P$ for all natural numbers n. Thus $P = \bigcap_{n=1}^{\infty} x^n P \subseteq \bigcap_{n=1}^{\infty} < x^n > = < x >^w = \Phi$. It is a contradiction. Therefore $P = < x >$ for some $x \in S$. Thus every proper prime ideal is a principal ideal. If $a \in S\setminus S^2$ then by hypothesis, the maximal ideal $S\setminus\{a\}$ is of the form $<b>$ for some $b \in S$. Therefore $S = \{a\} \cup <b> = <a> \cup <b>$. Then every ideal of S is an intersection of a prime ideal and an S-primary ideal of S.

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M 2.12 : Let S be a duo noetherian semigroup such that $S = \bigcup_{i=1}^{n} < x_i >$. Suppose
$a > for all $a \in S$, which is not a product of power of x_i's. Then S is finitely generated. In
lar if S is noetherian cancellative semigroup without identity then S is finitely generated.
: Suppose that there exists an element a such that a is not a product of x_i's. If $a = x_i s_1$ where
s_1 is not a product of power of x_i's. Hence $s_1 = x_j s_2$ where s_2 is not product of powers of x_i's.
$\in < s_1 >$ then $s_2 = s_1 r$ for some $r \in S^1$ and hence
$= x_i(s_1 r) \in < x_j s_1 >$, which is not true. Hence $< s_1 > \subset < s_2 >$. By continuing this process, we
nonterminating chain of ideals $< s_1 > \subset < s_2 > \subset < s_3 > \subset \cdots$ Since S is noetherian, it is a
radiction. So S is finitely generated. If S is a cancellative semigroup and if $a = a(ba)$, then ba is
dentity in S. It is a contradiction. So $a \notin < x_i a >$ for all $a \in S$. As above, we have S is finitely
rated.

OREM 2.13 : Let S be a duo semigroup which is a union of finite number of principal ideals. If S
then S contains idempotent elements.

f :Suppose that $S = \bigcup_{i=1}^{n} < x_i >$ and $x_i \notin < x_j >$ for $i \neq j$ and $S = S^2$. Since $S = S^2$, we have
$x > ^2$ for each $i = 1, 2, 3, \ldots, n$. Therefore each x_i is semi simple in S. By theorem 1.52,
regular in S and hence by theorem 1.53, S contains idempotents.

OREM 2.14 : Let S be a cancellable duo semigroup which is a union of finite number of
cipal ideals. Then S contains identity if and only if $S = S^2$.

f :Suppose that S is a cancellable duo semigroup and $S = S^2$. By theorem 2.13, S contains
potent element say e. Let $a \in S$. Then $a(ee) = ae$. Since S is cancellative, $ae = a$. Similarly
$= a$. Then e is the identity in S. Therefore S contains the identity. Conversely suppose that S
tains the identity. Then clearly $S = S^2$.

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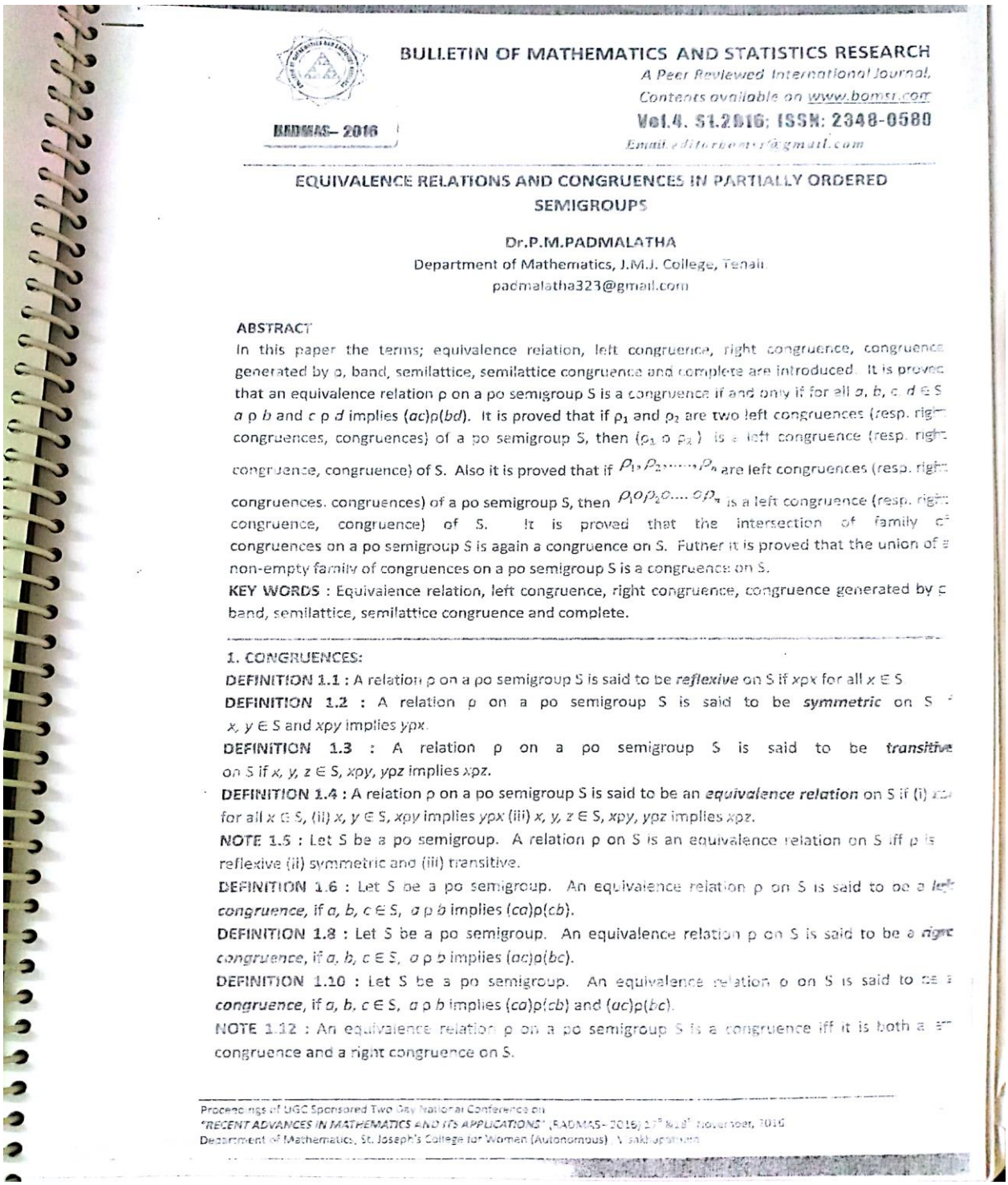

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EQUIVALENCE RELATIONS AND CONGRUENCES IN PARTIALLY ORDERED SEMIGROUPS

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ABSTRACT

In this paper the terms; equivalence relation, left congruence, right congruence, congruence generated by ρ, band, semilattice, semilattice congruence and complete are introduced. It is proved that an equivalence relation ρ on a po semigroup S is a congruence if and only if for all $a, b, c, d \in S$ $a \rho b$ and $c \rho d$ implies $(ac)\rho(bd)$. It is proved that if ρ_1 and ρ_2 are two left congruences (resp. right congruences, congruences) of a po semigroup S, then $(\rho_1 \circ \rho_2)$ is a left congruence (resp. right congruence, congruence) of S. Also it is proved that if $\rho_1, \rho_2, \ldots, \rho_n$ are left congruences (resp. right congruences. congruences) of a po semigroup S, then $\rho_1 o \rho_2 o \ldots . o \rho_n$ is a left congruence (resp. right congruence, congruence) of S. It is proved that the intersection of family of congruences on a po semigroup S is again a congruence on S. Futher it is proved that the union of a non-empty family of congruences on a po semigroup S is a congruence on S.

KEY WORDS : Equivalence relation, left congruence, right congruence, congruence generated by ρ band, semilattice, semilattice congruence and complete.

1. CONGRUENCES:

DEFINITION 1.1 : A relation ρ on a po semigroup S is said to be ***reflexive*** on S if $x \rho x$ for all $x \in S$

DEFINITION 1.2 : A relation ρ on a po semigroup S is said to be ***symmetric*** on S if $x, y \in S$ and $x \rho y$ implies $y \rho x$.

DEFINITION 1.3 : A relation ρ on a po semigroup S is said to be ***transitive*** on S if $x, y, z \in S$, $x \rho y$, $y \rho z$ implies $x \rho z$.

DEFINITION 1.4 : A relation ρ on a po semigroup S is said to be an ***equivalence relation*** on S if (i) $x \rho x$ for all $x \in S$, (ii) $x, y \in S$, $x \rho y$ implies $y \rho x$ (iii) $x, y, z \in S$, $x \rho y$, $y \rho z$ implies $x \rho z$.

NOTE 1.5 : Let S be a po semigroup. A relation ρ on S is an equivalence relation on S iff ρ is reflexive (ii) symmetric and (iii) transitive.

DEFINITION 1.6 : Let S be a po semigroup. An equivalence relation ρ on S is said to be a ***left congruence***, if $a, b, c \in S$, $a \rho b$ implies $(ca)\rho(cb)$.

DEFINITION 1.8 : Let S be a po semigroup. An equivalence relation ρ on S is said to be a ***right congruence***, if $a, b, c \in S$, $a \rho b$ implies $(ac)\rho(bc)$.

DEFINITION 1.10 : Let S be a po semigroup. An equivalence relation ρ on S is said to be a ***congruence***, if $a, b, c \in S$, $a \rho b$ implies $(ca)\rho(cb)$ and $(ac)\rho(bc)$.

NOTE 1.12 : An equivalence relation ρ on a po semigroup S is a congruence iff it is both a left congruence and a right congruence on S.

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OREM 1.13 : An equivalence relation ρ on a po semigroup S is a congruence if and only if $a, b,$ $\in S$, $a \rho b$ and $c \rho d$ implies $ac \rho bd$.

of : Let ρ be an equivalence relation on a po semigroup S.

ppose that ρ is a congruence on S. Let $a, b, c, d \in S$, $a \rho b$ and $c \rho d$

$b, c \in S$, $a \rho b$ and ρ is right congruence $\Rightarrow (ac)\rho(bc)$.

$c, d \in S$, $c \rho d$ and ρ is left congruence $\Rightarrow (bc)\rho(bd)$.

ow $(ac) \rho (bc)$, $(bc) \rho (bd)$, ρ is transitive $\Rightarrow (ac)\rho(bd)$.

onversely suppose that ρ is an equivalence relation on a po semigroup S such that

$b, c, d \in S$, $a \rho b$ and $c \rho d \Rightarrow (ac)\rho(bd)$.

ow $c \rho c$, $a \rho b \Rightarrow (ca)\rho(cb) \Rightarrow \rho$ is a left congruence.

ρb, $c \rho c \Rightarrow (ac)\rho(bc) \Rightarrow \rho$ is a right congruence and hence ρ is a congruence.

OTATION 1.14 : Let ρ be a congruence relation on a po semigroup S. We denote the set $\{b \in S /$ $\rho b\}$ by a_ρ and is called ρ-class containing a. The set of all ρ-classes is denoted by S/ρ.

HEOREM 1.15 : If S is a po semigroup and ρ is a congruence on S then S/ρ is a semigroup with espect to the operation defined by $a_\rho b_\rho = (ab)_\rho$ for all $a_\rho, b_\rho \in S/\rho$.

roof : If $a_\rho, b_\rho \in S/\rho$, then we define the multiplication on S/ρ,

ven by $(a_\rho)(b_\rho) = (ab)_\rho$ for all $a, b \in S$.

his is well defined, since for all $a, b, c, d \in S$, $a_\rho = b_\rho$ and $c_\rho = d_\rho \Rightarrow a\rho b$, $c\rho d$

$(ac)\rho(bc)$, $(bc)\rho(bd)$

$(ac)\rho(bd) \Rightarrow (ac)_\rho = (bd)_\rho$.

t $(a)_\rho$, $(b)_\rho$, $(c)_\rho \in S/\rho$.

hen $[(a)_\rho(b)_\rho](c)_\rho = (ab)_\rho(c)_\rho = [(ab)c]_\rho = [a(bc)]_\rho = (a)_\rho(bc)_\rho = (a)_\rho[(b)_\rho(c)_\rho]$. Therefore S/ρ is a migroup.

EFINITION 1.16 : Let ρ be a congruence relation on a po semigroup S. Then the semigroup S/ρ of all classes with respect to the operation defined as $(a_\rho)(b_\rho) = (ab)_\rho$ for all $a, b \in S$ is called the ***quotient migroup*** of S relative to the congruence ρ.

OTE 1.17 : If S is a po semigroup and ρ is a congruence on S, then the quotient semigroup S/ρ is not po semigroup w. r. t the relation $\preccurlyeq$ on S/ρ defined by means of the order ≤ on S, that is, $(a)_\rho \preccurlyeq (b)_\rho$ there exist $x \in (a)_\rho$ and $y \in (b)_\rho$ such that $x \le y$. But the relation is not a partial order, in general. e show it in the following example.

AMPLE 1.18 : We consider the po semigroup $S = \{a, b, c, d, e\}$ defined by the multiplication and the der ≤ below:

a	a	b	c	d	e
a	a	c	c	d	e
b	a	e	c	d	e
c	a	e	c	d	e
d	a	e	c	d	e
e	a	e	c	d	e

β	a	b	c	d	e
a	a	e	c	d	e
b	a	b	c	d	e
c	a	e	c	d	e
d	a	e	c	d	e
e	a	e	c	d	e

$\le = \{(a, a), (a, d), (b, b), (c, c), (c, e), (d, d), (e, e)\}$.

r $x, y, z \in S$, we have

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$(xy)a = a = x(ya)$, $(xy)c = c = x(yc)$
$(xy)d = d = x(yd)$, $(xy)e = e = x(ye)$
$(xy)b = e = x(yb)$,

$(xy)b = e = x(yb)$ if $y \neq b$
$(xb)b = e = x(bb)$ if $x \neq b$
$(bb)b = e = b(bb)$, $(bb)b = b = b(bb)$.

Then S is a semigroup. Since $xa \leq xd$, $ax = dx$, $xc \leq xe$, $cx = ex$ for all $x \in S$, S is a po semigroup.

Let ρ be the congruence on S defined as follows:

$\rho = \{(a, a), (b, b), (c, c), (d, d), (e, e), (a, e), (e, a), (c, d), (d, c)\}$

Let $\preccurlyeq$ be an order on S/ρ defined by means of the order $\leq$ on S, that is,

$(a)_\rho \preccurlyeq (b)_\rho \Leftrightarrow$ there exist $x \in (a)_\rho$ and $y \in (b)_\rho$ such that $x \leq y$.

We have $a_\rho = \{a, e\}$, $b_\rho = \{b\}$ and $c_\rho = \{c, d\}$. Also we have $a_\rho \preccurlyeq c_\rho$ and $c_\rho \preccurlyeq a_\rho$ but $a_\rho \neq c_\rho$. Thus $\preccurlyeq$ is not an order relation on S/ρ .

THEOREM 1.19 : Let S be a po semigroup. If ρ_1 and ρ_2 are two left congruences of S, then $(\rho_1 \circ \rho_2)$ is a left congruence on S.

Proof : Let $\rho_1$and ρ_2 be two left congruences on S.

Clearly $(\rho_1 \circ \rho_2)$ is an equivalence relation on S.

Let $a, b \in S$ and $s \in S$, $a(\rho_1 \circ \rho_2)b$.

Since $a(\rho_1 \circ \rho_2)b$ there exists $c \in S$ such that $a\ \rho_1 c$ and $c\ \rho_2 b$.

Since ρ_1, ρ_2 are left congruences on S, it follows that $(sa)\rho_1(sc)$ and $(sc)\rho_2(sb)$

This implies that $(sa)(\rho_1 o \rho_2)(sb)$ and hence $(\rho_1 o \rho_2)$ is a left congruence on S.

From theorem 1.19, it can be easily prove the following result by induction:

COROLLARY 1.20 : Let S be a po semigroup. If $\rho_1, \rho_2, \ldots, \rho_n$ are left congruences on S, then $\rho_1 o \rho_2 o \ldots \rho_n$ is a left congruence on S.

THEOREM 1.21 : Let S be a po semigroup. If ρ_1 and ρ_2 are two right congruences on S, then $(\rho_1 o \rho_2)$ is a right congruence on S.

Proof : Let $\rho_1$and ρ_2 be two right congruences on S.

Suppose $a(\rho_1 \circ \rho_2)b$ holds for $a, b \in S$.

Then there exists $c \in S$ such that $a\ \rho_1 c$ and $c\ \rho_2 b$ hold.

Since ρ_1, ρ_2 are right congruences on S, it follows that $(as)\rho_1(cs)$ and $(cs)\rho_2(bs)$ for all $s \in S$. This implies that $(as)(\rho_1 o \rho_2)(bs)$ hold for all $s \in S$ and hence $(\rho_1 o \rho_2)$ is a right congruence on S.

From theorem 1.21, the following corollary can be proved easily by induction:

COROLLARY 1.22 : Let S be a po semigroup. If $\rho_1, \rho_2, \ldots, \rho_n$ are right congruences on S, then $\rho_1 o \rho_2 o \ldots \rho_n$ is a right congruence on S.

THEOREM 1.23 :Let S be a po semigroup. If ρ_1 and ρ_2 are two congruences on S, then $(\rho_1 o \rho_2)$ is a congruence of S.

Proof : By theorem 1.19, $(\rho_1 o \rho_2)$ is a left congruence on S.

By theorem 1.21, $(\rho_1 o \rho_2)$ is a right congruence on S and

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hce $(\rho_1 o \rho_2)$ is a congruence on S.

om theorem 1.23, the following result can be proved easily by induction:

COROLLARY 1.24: Let S be a po semigroup. If $\rho_1, \rho_2, \ldots, \rho_n$ are congruences on S, then $\rho_1 o \rho_2 o \ldots o \rho_n$ is a congruence of S.

THEOREM 1.25 : The intersection of any family of congruences on a po semigroup S is again a congruence on S.

Proof : Let $\{\rho_i / i \in \Delta\}$ be a family of congruences on S.

Let $\psi = \bigcap_{i \in \Delta} \rho_i$ Clearly Ψ is an equivalence relation on S.

Let $a, b, c, d \in S$

Suppose that $a \psi b, c \psi d$.

$a \psi b, c \psi d \Rightarrow a \bigcap_{i \in \Delta} \rho_i b,\ c \bigcap_{i \in \Delta} \rho_i d \Rightarrow a \rho_i b, c \rho_i d$ for all ρ_i

$\Rightarrow ac \rho_i bd$ for all $\rho_i \Rightarrow ac \bigcap_{i \in \Delta} \rho_i bd \Rightarrow ac \psi bd$.

Hence the intersection of any family of congruences on a po semigroup S is again a congruence on S.

THEOREM 1.26 : The union of any family of congruences on a po semigroup S is a congruence on S.

Proof : Let $\{\rho_i / i \in \Delta\}$ be a family of congruences on S.

Let $\psi = \bigcup_{i \in \Delta} \rho_i$ where ρ_i is a congruence on po semigroup S.

Let $a, b, c \in S$. Suppose that $a \psi b$.

$a \psi b \Rightarrow a \bigcup_{i \in \Delta} \rho_i b \Rightarrow a \rho_i b$ for some ρ_i on S

$\Rightarrow a \rho_i b$ for some ρ_i on S and ρ_i is a congruence on S$\Rightarrow ca\ \rho_i\ cb \Rightarrow ca \bigcup_{i \in \Delta} \rho_i cb$

$\Rightarrow ca \psi cb \Rightarrow \psi$ is a left congruence on S

Now $a \rho_i b$ for some ρ_i on S, ρ_i is a congruence on S$\Rightarrow ac\ \rho_i\ bc \Rightarrow ac \bigcup_{i \in \Delta} \rho_i bc$

$\Rightarrow ac \psi bc \Rightarrow \psi$ is right congruence on S.

So, Ψ is a congruence on the po semigroup S. Therefore the union of a non-empty family of congruences on a po semigroup S is a congruence on S.

NOTE 1.27 : The set of all congruences on a po semigroup S is denoted by $C(S)$.

DEFINITION 1.28 : The intersection of all congruences on a po semigroup S containing a binary relation ρ on S is called the ***congruence generated by*** ρ .

DEFINITION 1.29 : A po semigroup S is said to be a ***band*** if every element of S is a idempotent.

DEFINITION 1.30 : A po semigroup S is said to be a ***semilattice*** if S is a commutative band.

DEFINITION 1.31 : A congruence ρ on a po semigroup S is said to be ***semilattice congruence*** if $a, b \in$

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$S \Rightarrow aa\ \rho\ a$ and $ab\ \rho\ ba$.

DEFINITION 1.32 : A semilattice congruence ρ on a po semigroup S is said to be ***complete*** if for any a, $b \in S$, $a \leq b$ implies $a\ \rho\ ab$.

NOTE 1.33 : A semilattice congruence ρ on a po semigroup S is ***complete*** iff $a, b \in S$, $a \leq b$ implies $a\rho(ab)$.

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NATIONAL EDUCATION POLICY 2016: A BENCH MARK OF QUALITY IMPROVEMENT IN INDIAN HIGHER EDUCATION

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[illegible] evolve the new education policy 2016, the MHRD constituted [illegible] committee in October, 2015 to study and address the needs and steps [illegible] be taken for the amelioration of Indian Education system in present [illegible] scenario. The committee was headed by Mr. T.S.R. [illegible], Former Cabinet Secretary with four other members. [illegible] has submitted its report to the MHRD on 30-04-2016. The following [illegible] the issues and recommendations suggested by the committee [illegible] to the Higher Education in India. Based on this report and [illegible] suggestions from the public and other experts, the Government of [illegible] will enact the National Education Policy 2016. Let us hope a best [illegible] will be evolved to cater our needs.

The National Policy on Education, was enacted [illegible] 1986 and [illegible] in 1992, is in force till today. Significant changes have taken [illegible] reviewed [illegible] in India and the world at large. Since the NPE was [illegible] in India [illegible] new NPE [illegible]

[illegible] higher education system is one of the largest systems in [illegible] world. But unfortunately its quality is far away from satisfactory. Our premier institutions are failed to figure in the international rankings of universities in the world. The quality and standards of Indian higher education need to be upgraded systematically to a high level through rigorous screening, innovation and research, recognition of excellence and creativity.

[illegible] UGC controls the matters related to recognition, accreditation, [illegible] approval, permission to [illegible] of scholarship [illegible]

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Research (ICAR), the National Councils for Teacher Education (NCTE) etc..

According to AISHE data for 2014-15, in India there were 32[illegible] state universities, 46 central universities, 128 deemed to be universities, 74 National institutions and 205 state private universities. There were 40,760 colleges. The total estimated enrolment in all higher education institutions in year 2014-15 was 3.33 crores. Technical education has grown rapidly in recent years, which includes around 9.[illegible] lakh engineers, 7 lakh diploma holders, over a lakh computer scientists with post-graduate degrees and 2.4 lakh Management Professionals apart from about 30,000 architects and 50,000 B. Pharma graduates.

Variations in Quality

At present, there are wide variations in the quality of higher education institutions in India. Some institutions, like IITs, NITs, IIITs and IIMs, have been performing well. But the other universities [illegible] far away. Also there are large numbers of privately run 'teaching shops' which are generally ill-equipped, and operating with unqualified staff.

Teacher Availability

Another hindrance is availability of quality teacher, which affects the quality at all levels. Recruiting ad hoc and part-time faculty impacts adversely on the quality. It has been found that wherever the states have [illegible] permanent, qualified faculty, the outcomes are [illegible] [illegible] lesson has to be learned.

[illegible] Quality in Higher Education

The Gross Enrolment Ratio (GER) in higher education is very [illegible] around 23% and sought to be increased, through the *Rashtriya Uchchatar Shiksha Abhiyan* (RUSA) to 30%. According to one industry [illegible] study, less than 20% are getting employment form the [illegible]. If the job opportunities are ensured, the GER can be increased.

Role of State in Management of Higher Education Institutions

[illegible] Universities [illegible] without any affiliating [illegible]

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[illegible]ficient personnel to supervise them which led to malpractices. [illegible]agement quota seats system is another cause for malpractice. The [illegible]mittee noted that the tuition fees thus fixed are reportedly below [illegible] minimum operational requirements of the concerned institution to [illegible] its expenditure.

[illegible]commendations

[illegible]he Committee feels that no university should have more than 100 [illegible]ffiliated colleges.

[illegible]he Committee is convinced that the present institutional and policy [illegible]struments of the Central and State governments are largely [illegible]adequate and ineffective.

[illegible]he committee recommends to create new National Higher [illegible]ducation Promotion and Management Act, supported by state-level [illegible]ws and institutions, establishment of new systems for recognition, [illegible]ssessment and evaluation.

[illegible]d to Revamp the Regulatory Regime

There are nearly 40,000 education institutions in the country, [illegible]nging to multiple categories and with large variation in activities [illegible] performance. While there are a few which can be identified as [illegible]ters of Excellence' but failed to be listed in the top 200 in the [illegible], some of them could well be described as 'degree shops'. Many [illegible], Management and Teacher Training institutions have [illegible] established during the past 2 decades. Most of them are of poor [illegible], with weak faculty and with the objective to extract money only.

The Committee was informed that the overall quality of [illegible] and managements of universities in general in India has [illegible] over the years. The prevailing theory has been that education [illegible] not be commercialized; this indeed is true – education is too sacred [illegible] for it to become totally an uncontrolled business. In these [illegible]cumstances, a regulatory system for higher education is inevitable. [illegible] evaluation methods are input based, rather than [illegible] based on outputs or potential outputs. The [illegible] systems need to be revamped. The regulatory [illegible]

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Recommendations

The Committee notes that the reality on the ground is that 'capitation' fees and extraction of rent from the student are very large. The accreditation/evaluation systems need to be revamped for institutions adjudged as 'quality', much greater freedom has to be given in terms of fixation of student fees or faculty salaries.

Recognition, Accreditation and Quality Assurance

NAAC was established for the evaluation of quality in higher education. NAAC accreditation is mandatory; and un-assessed/unaccredited institutions should be penalized. In practice, there are many lacunae in the implementation process. Internal quality assurance IQA cells were established to improve quality in each institution. In practice, they remain more as a unit to collect data only. The 'A', 'B', 'C' categorization, as it is being done now, serves only a limited purpose and fails to rank the best.

Main Features of the Proposed Accreditation System

Every higher education institution shall be accredited. The overall process of accreditation shall be governed by a National Accreditation Board (NAB). The actual evaluation/assessment of institutions will be undertaken by a number of licensed/approved agencies, preferably non-profit organizations. Each institution shall be evaluated after 3 years but not more than 5 years.

Recommendations

1. *Till such time as a new higher education act is enacted, the NBA/[illegible] would continue to be designated, the national authority for accreditation of institutions of higher learning.*
2. *The Committee recommends an overarching management board, the National Accreditation Board, which will oversee the entire process, set standards and define guideline.*
3. *In the process of evaluation due importance has to be given to establishing benchmarks in respect of research or teaching competences as well as capacity for innovation, applied research with [illegible]...*

Conclusion

Decades of insufficient focus, lack of adequate attention and mismanagement have seriously eroded the quality of our education system. While access has sharply increased, inequalities persist. Deficiencies and shortcomings have now to be treated as opportunities: the country now needs to invest on its strength, i.e. its young people.

The National Policy on Education 2016 has tried to address these deficiencies and challenges, along with the need to sharply increase the quality of Indian education, across the board. It offers a framework for change, make education modern with optimal use of technology, without compromising on India's traditions and heritage.

Let us hope for a good bench mark out come from the New Education Policy 2016.

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INDEPENDENT DOMINATION NUMBER OF EULER TOTIENT CAYLEY GRAPHS AND ARITHMETIC GRAPHS

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ABSTRACT

Nathanson was the pioneer in introducing the concepts of Number Theory, particularly, the "Theory of Congruences" in Graph Theory, thus paved the way for the emergence of a new class of graphs, namely "Arithmetic Graphs". Cayley graphs are another class of graphs associated with the elements of a group. If this group is associated with some arithmetic function then the Cayley graph becomes an Arithmetic graph.

In this paper, we study independent domination number of Euler totient Cayley graphs and Arithmetic V_n graphs.

Key words: Dominating set, Independent dominating set, Euler totient Cayley graph, Arithmetic V_n graph.

AMS subject classification: 05C69

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1. INTRODUCTION

The theory of domination was formalized by Berge [3] and Ore [9] in 1962. Since then it has developed rapidly and various variations of domination are introduced and studied. The independent domination number and the notation $i(G)$ were introduced by Cockayne and Hedetniemi in [4, 5] and later developed by Allan and Laskar [1]. Independent dominating sets have been studied extensively in the literature [2, 6, 7]

A dominating set D of a graph G is a subset of vertex set V of G such that every vertex in $V - D$ is adjacent to at least one vertex in$D$. The minimum cardinality of a dominating set of G is called the domination number of G and is denoted by $\gamma(G)$.

A subset of vertices of V of a graph G is called an independent set if no two vertices in it are adjacent. An independent dominating set of G is a set that is both dominating and independent in G. The independent domination number of$G$, denoted by $\gamma_i(G)$, is the minimum cardinality of an independent dominating set.

2. EULER TOTIENT CAYLEY GRAPH $G(Z_n, \varphi)$ AND ITS PROPERTIES

The concept of Euler totient Cayley graph is introduced by Madhavi [8] and studied some of its properties. For any positive integer n, let $Z_n = \{0,1,2,.n-1\}$ be the residue classes modulo n. Then$(Z_n, \oplus)$, where $\oplus$addition modulo is n, is an abelian group of order n.

The number of positive integers less than n and relatively prime to n is denoted by $\varphi(n)$ and is called an Euler totient function. Let S denote the set of all positive integers less than n and relatively prime to n. that is $S = \{r/\ 1 \leq r < n$ and GCD $(r,n) = 1\}$. Then $|S| = \varphi(n)$.

The Euler totient Cayley graph is defined as follows.

The Euler totient Cayley graph $G(Z_n, \varphi)$ is defined as the graph whose vertex set V is given by $Z_n = \{0,1,2,n-1\}$ and the edge set is $E = \{(x,y)/x - y \in S$ or $y - x \in S\}$.

Clearly as proved by Madhavi [8], the Euler totient Cayley graph $G(Z_n, \varphi)$ is

- a connected, simple and undirected graph,
- $\varphi(n)$ - regular and has $\frac{n.\varphi(n)}{2}$ edges,
- Hamiltonian,
- Eulerian for $n \geq 3$,
- bipartite if n is even and
- Complete graph if n is a prime.

3. ARITHMETIC V_n GRAPH

The concept of Arithmetic V_n graph is introduced by Vasumathi [10] and studied some of its properties.

Let n be a positive integer such that$n = p_1^{\alpha_1} p_2^{\alpha_2} .. p_k^{\alpha_k}$. Then the Arithmetic V_n graph is defined as the graph whose vertex set consists of the divisors of n and two vertices u, v are adjacent in V_n graph if and only if GCD $(u,v) = p_i$, for some prime divisor p_i of n.

In this graph the vertex 1 becomes an isolated vertex. Hence we consider the Arithmetic graph V_n without vertex 1 as the contribution of this isolated vertex is nothing when the properties of these graphs and enumeration of some domination parameters are studied.

Clearly, V_n graph is a connected graph. Because if n is a prime, then V_n graph consists of a single vertex. Hence it is a connected graph. In other cases, by the definition of adjacency in V_n, there exist edges between prime number vertices, their

prime power vertices and also their prime product vertices. Therefore each vertex of V_n is connected to some vertex in V_n. this graph is denoted by $G(V_n)$.

4. INDEPENDENT DOMINATING SETS OF EULER TOTIENT CAYLEY GRAPH $G(Z_n, \varphi)$

We determine minimum independent dominating sets and independent domination number of $G(Z_n, \varphi)$ graph as follows.

4.1. Theorem

If n is a prime, then the independent domination number of $G(Z_n, \varphi)$ is 1.

4.1.1 Proof

Let n be a prime. Then $G(Z_n, \varphi)$ is a complete graph.

Let $D = \{u\}$ where u is any vertex in V. Then every t in V is adjacent to vertex u. Thus every vertex in $V - D$ is adjacent to u, so that D forms a dominating set in $G(Z_n, \varphi)$. since $|D| = 1$, it is evident that D is a minimum dominating set in $G(Z_n, \varphi)$.

In fact every singleton vertex set forms a minimum dominating set and also becomes an independent dominating set of$G(Z_n, \varphi)$.

Thus $\gamma_i\left(G(Z_n, \varphi)\right) = 1$.

4.2. Theorem

If $n = p_1^{\alpha_1} p_2^{\alpha_2} .. p_k^{\alpha_k}$, where $k \geq 2$, then the independent domination number of $G(Z_n, \varphi)$ is $\frac{n}{p_k}$.

4.2.1. Proof

Suppose$n = p_1^{\alpha_1} p_2^{\alpha_2} . p_k^{\alpha_k}$, where$p_1, p_2\ p_3\ \ p_k$ are distinct primes and $\alpha_1, \alpha_2, \alpha_k$ are integers ≥ 1. Consider the following sets in $G(Z_n, \varphi)$.

$$V_1 = \left\{ r\, p_k + 1 \ / r = 0, 1, 2, \frac{n}{p_k} - 1 \right\}$$

$$V_2 = \left\{ r\, p_k + 2 \ / r = 0, 1, 2, \frac{n}{p_k} - 1 \right\}$$

$$V_3 = \left\{ r\, p_k + 3 \ / r = 0, 1, 2, \frac{n}{p_k} - 1 \right\}$$

$$V_{p_k} = \left\{ r\, p_k + p_k \ / r = 0, 1, 2, \frac{n}{p_k} - 1 \right\}$$

For $1 \leq i \leq p_k$, we shall show that each of the above sets, say

$V_i = \left\{ r\, p_k + i \ / r = 0, 1, 2, \frac{n}{p_k} - 1 \right\}$ is an independent set of $G(Z_n, \varphi)$.

Let$x, y \in V_i$, $x \neq y$. Then $x = r\, p_k + i$ and $y = s\, p_k + i$ where$r \neq s$.

Now $x - y = (r\, p_k + i) - (s\, p_k + i) = (r - s) p_k$ and GCD $\left((r - s) p_k , n\right) \neq 1$, since$p_k | n$. So $x - y \notin S$. Hence x and y are not adjacent. This shows that no two vertices in V_i are adjacent. So V_i becomes an independent set of $G(Z_n, \varphi)$.

By the construction of the sets V_i, it is obvious that $V_i \cap V_j = \emptyset$ for $1 \leq i, j \leq p_k$ and $i \neq j$. This shows that the vertex set V is the union of disjoint subsets V_1, V_2, V_{p_k} which are independent and $|V_1| = |V_2| = |V_{p_k}| = \frac{n}{p_k}$.

By the construction of the sets V_1, V_2, V_{p_k}, it is obvious that each is a maximal independent set of $G(Z_n, \varphi)$. but every maximal independent set is a minimal dominating set. So, each of the sets V_1, V_2, V_{p_k} is an independent dominating set with minimum cardinality. Hence $\gamma_i\left(G(Z_n, \varphi)\right) = \frac{n}{p_k}$.

5. INDEPENDENT DOMINATING SETS OF ARITHMETIC V_n GRAPH

We determine minimum independent dominating sets and independent domination number of $G(V_n)$ graph as follows.

5.1. Theorem

If $n = p_1^{\alpha_1} p_2^{\alpha_2} .. p_k^{\alpha_k}$, where p_1, p_2, p_k are primes and $\alpha_1, \alpha_2, \alpha_k$ are integers ≥ 1, then the independent domination number of $G(V_n)$ is given by

$$\gamma_i\left(G(V_n)\right) = \begin{cases} k-1 & \text{if } \alpha_i = 1 \text{ for more than one i} \\ k & \text{Otherwise} \end{cases}$$

Where k is the core of n.

5.1.1. Proof

Suppose $n = p_1^{\alpha_1} p_2^{\alpha_2} . p_k^{\alpha_k}$. Consider the graph $G(V_n)$ with vertex set V. we have the following cases.

5.1.2. Case 1

Suppose $\alpha_i > 1$ for all i. That is $n = p_1^{\alpha_1} p_2^{\alpha_2} .. p_k^{\alpha_k}$ where $\alpha_i > 1, \forall i$. then we show that the set $D = \{ p_1, p_2, ., p_k \}$ becomes an independent dominating set of $G(V_n)$.

By the definition of $G(V_n)$ graph, it is obvious that the vertices in $G(V_n)$ are primes p_1, p_2, p_k, their powers and their products.

All the vertices $u \in \langle V - D \rangle$, for which GCD $(u, p_1) = p_1$ are adjacent to the vertex p_1 in D. All the vertices $v \in \langle V - D \rangle$, for which GCD $(v, p_2) = p_2$ are adjacent to the vertex p_2 in D. Continuing in this way we obtain that all the vertices $w \in \langle V - D \rangle$, for which GCD $(w, p_k) = p_k$ are adjacent to the vertex p_k in D. Since every vertex in $\langle V - D \rangle$ has atleast one prime factor viz., $p_1, p_2, \ldots\ldots, p_k$ (as they are divisors of n) every vertex in $V - D$ is adjacent to at least one vertex in D. Thus D becomes a dominating set of $G(V_n)$.

We now prove that D is minimum. Suppose we remove any p_i from D. then the vertices of the form $p_i^r, r > 1$ will be non-adjacent to any other vertex p_j as

GCD $\left(p_i^r, p_j\right) = 1$ for $i \neq j$. Therefore every p_i, $i = 1, 2, k$ must be included into D. If we form a minimum dominating set in any other manner, the order of such a set is not smaller than that of D. This follows from the properties of prime divisors of a number. Thus D becomes a minimum dominating set of $G(V_n)$.

Now we show that D is an independent set. Consider any two vertices p_i, p_j in D. For $i \neq j$, these vertices are not adjacent to each other because GCD $\left(p_i, p_j\right) = 1$.

Hence D becomes an independent dominating set of $G(V_n)$ with minimum cardinality k.h

Hence $\gamma_i(G(V_n)) == |D| = k$.

5.1.3. Case 2

Suppose $\alpha_i = 1$ for only one i. That is, p_i is the only prime divisor of n with exponent 1. Then $n = p_1^{\alpha_1}.p_2^{\alpha_2}.p_{i-1}^{\alpha_{i-1}}.p_i.p_{i+1}^{\alpha_{i+1}}.p_k^{\alpha_k}$.

Then as in Case 1 we can see that $D = \{p_1, p_2, p_k\}$ is a minimum dominating set of $G(V_n)$ which is also independent.

$$\text{Hence } \gamma_i(G(V_n)) = k.$$

5.1.4. Case 3

Suppose $\alpha_i = 1$ for more than one i. Denote the prime divisors of n with exponent 1 by $p_1, p_2, .., p_i$ and write these i primes in ascending order. Then we have

$$n = p_1.\ p_2.p_i.\ p_{i+1}^{\alpha_{i+1}}.p_k^{\alpha_k}.$$

$$\text{Let } D = \{p_1, p_2, .\ p_{i-2}, p_{i-1}, p_i, p_{i+1}, p_k\}.$$

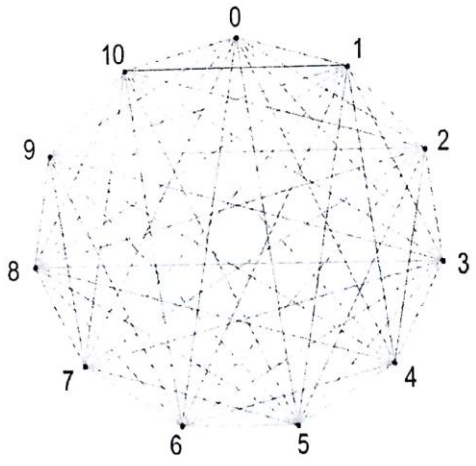
Then we show that D forms a minimum dominating set of $G(V_n)$. Any vertex in $V - D$ will be of the form $p_1^{a_1}.p_2^{a_2}.p_i^{a_i}.p_{i+1}^{a_{i+1}}.p_k^{a_k}$ where $a_1, a_2, a_i \leq 1$, and $a_j \leq \alpha_j$ for $j = i+1, i+2, k$. Then clearly D is a dominating set as every vertex in $V - D$ is adjacent to at least one vertex in D. However this is not a minimum dominating set.

Let $D' = \{p_1, p_2, p_{i-1}.p_i, p_{i+1}, p_k\}$ where the vertices p_{i-1}, p_i are adjacent to the vertex $p_{i-1}.p_i$. This is clearly a dominating set of $G(V_n)$ and deletion of vertices in this set will not make it a dominating set any more.

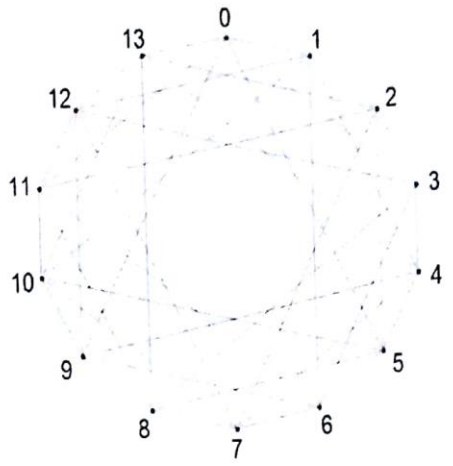
By properties of prime numbers no two vertices in the set D' are adjacent. Hence D' becomes an independent dominating set of $G(V_n)$ with minimum cardinality.

$$\text{Hence } \gamma_i(G(V_n)) = |D'| = k - 1.$$

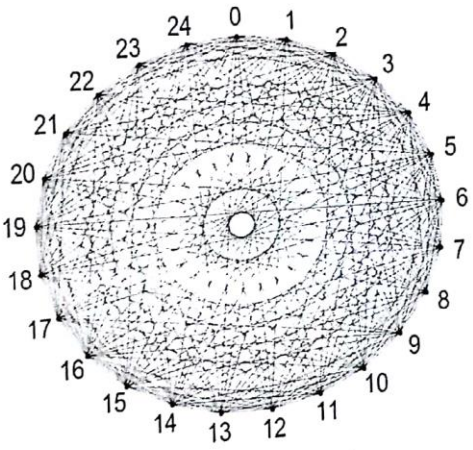
6. ILLUSTRATIONS



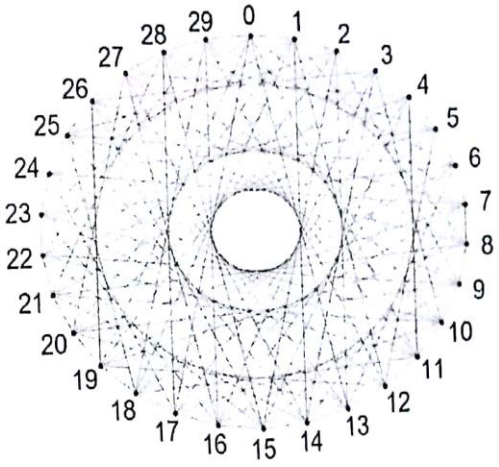
$G(Z_{11}, \varphi)$



$G(Z_{14}, \varphi)$



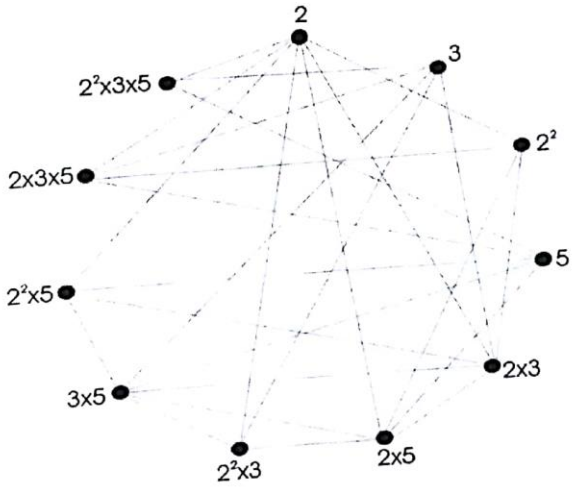
$G(Z_{25}, \varphi)$



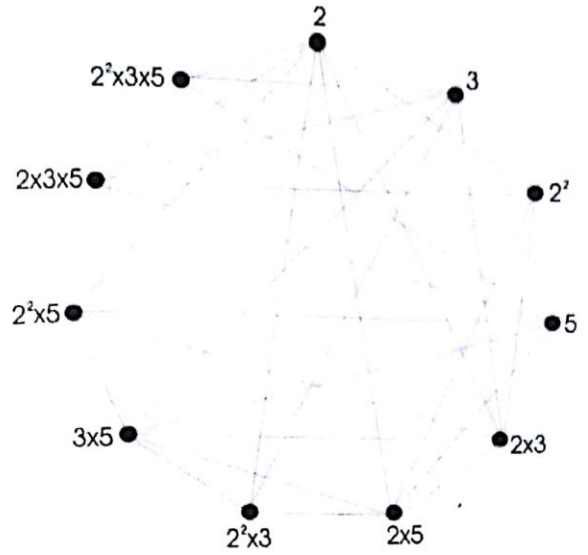
$G(Z_{30}, \varphi)$

Euler Totient Cayley Graph $G(Z_n, \varphi)$

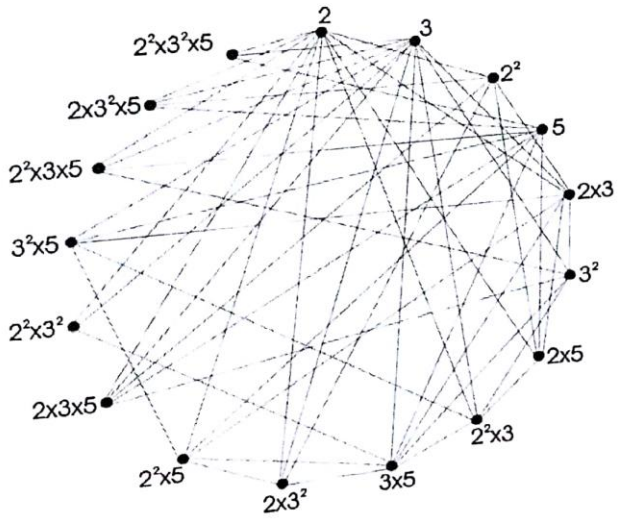
$G(Z_n, \varphi)$	$n = 11$	$n = 14$	$n = 25$	$n = 30$
Minimum Independent Dominating Set	{0}	{0,7}	{0,5,10,15,20}	{0,5,10,15,20,25}
$\gamma_i(G(Z_n, \varphi))$	1	2	5	6



$G(V_{60})$


2
2²x3x5
3
2x3x5
2²
2²x5
5
3x5
2x3
2²x3
2x5

$G(V_{100})$


2
3
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2²
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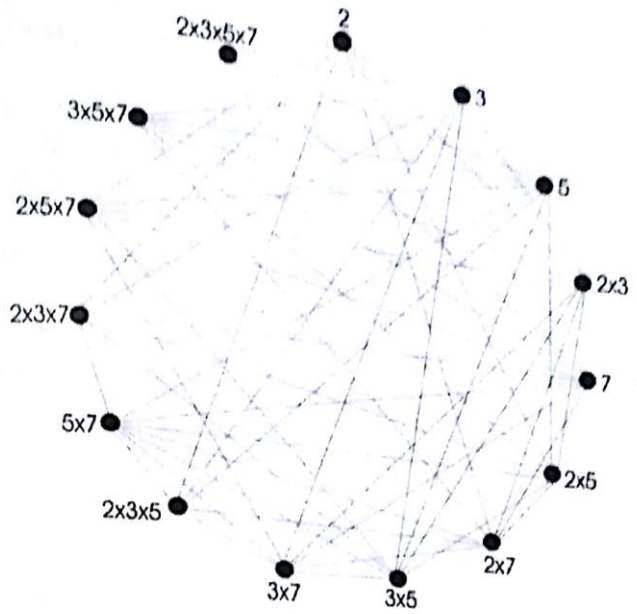
2²x3x5
2x3
3²x5
3²
2²x3²
2x5
2x3x5
2²x3
2²x5
3x5
2x3²

$G(V_{180})$



$G(V_{210})$

Arithmetic V_n Graph $G(V_n)$

$G(V_n)$	$n = 60$ $=2^2 \times 3 \times 5$	$n = 100$ $= 2^2 \times 5^2$	$n = 180$ $= 2^2 \times 3^2 \times 5$	$n = 210$ $= 2 \times 3 \times 5 \times 7$
Minimum Independent Dominating Set	{2,15}	{2,5}	{2,3,5}	{2,3,35}
$\gamma_i(G(V_n))$	2	2	3	3

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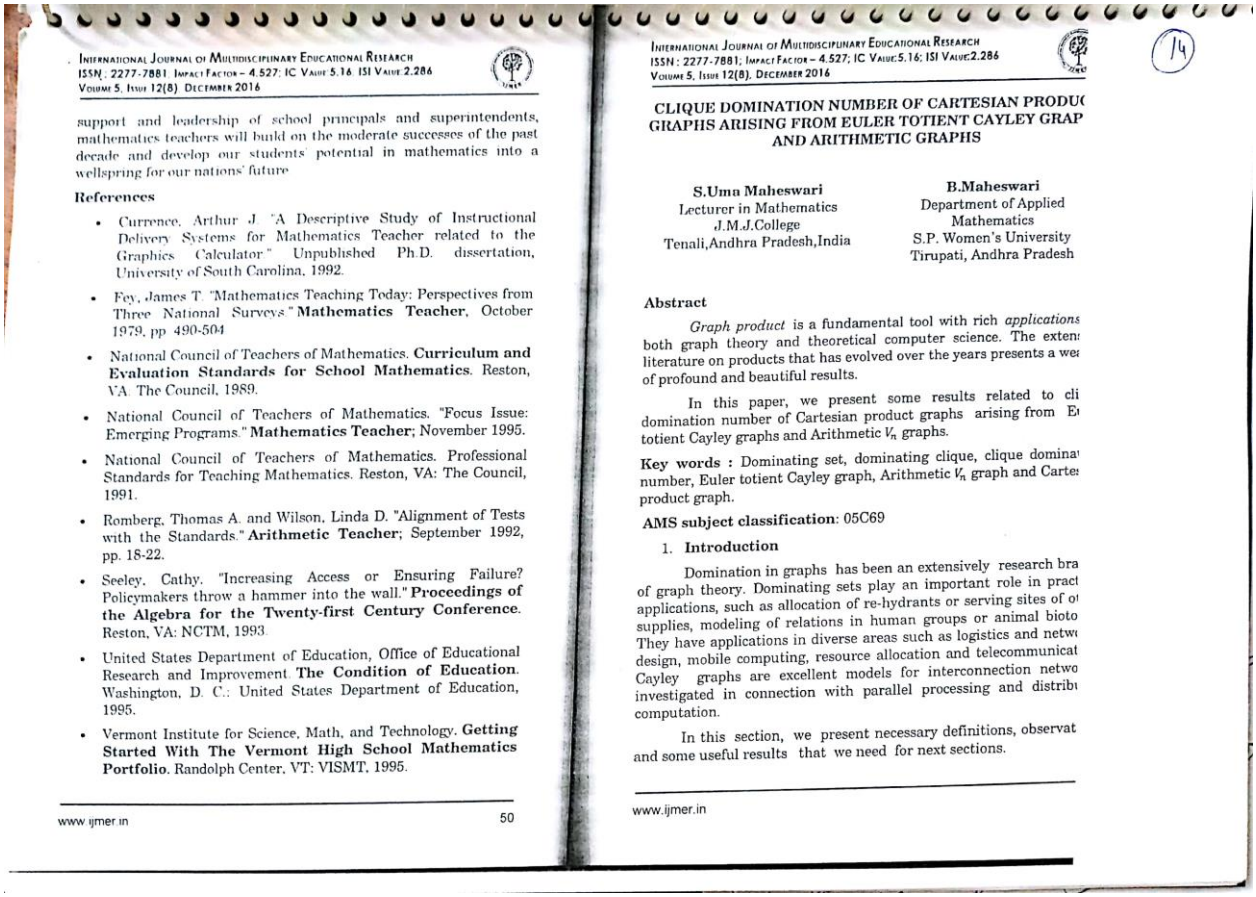

support and leadership of school principals and superintendents, mathematics teachers will build on the moderate successes of the past decade and develop our students' potential in mathematics into a wellspring for our nations' future

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(14)

CLIQUE DOMINATION NUMBER OF CARTESIAN PRODUC GRAPHS ARISING FROM EULER TOTIENT CAYLEY GRAP AND ARITHMETIC GRAPHS

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Abstract

Graph product is a fundamental tool with rich *applications* both graph theory and theoretical computer science. The exten literature on products that has evolved over the years presents a wea of profound and beautiful results.

In this paper, we present some results related to cli domination number of Cartesian product graphs arising from E totient Cayley graphs and Arithmetic V_n graphs.

Key words : Dominating set, dominating clique, clique domina number, Euler totient Cayley graph, Arithmetic V_n graph and Carte product graph.

AMS subject classification: 05C69

1. Introduction

Domination in graphs has been an extensively research bra of graph theory. Dominating sets play an important role in pract applications, such as allocation of re-hydrants or serving sites of o supplies, modeling of relations in human groups or animal bioto They have applications in diverse areas such as logistics and netw design, mobile computing, resource allocation and telecommunicat Cayley graphs are excellent models for interconnection netwo investigated in connection with parallel processing and distrib computation.

In this section, we present necessary definitions, observat and some useful results that we need for next sections.

minating Set

Let G be a graph with vertex set V. A subset D of V is said to be ominating set of G if every vertex in $V - D$ is adjacent to a vertex in The minimum cardinality of a dominating set is called the ination number of G and is denoted by $\gamma(G)$.

que dominating set

A non-empty subset S of V is called a clique if the induced graph $< S >$ is a complete graph.

A dominating set D of vertices in a graph G is called a inating clique if the induced sub graph $< D >$ is a complete graph. cardinality of the smallest dominating clique is called clique ination number and is denoted by γ_{cl}.

er Totient Cayley Graph $G(Z_n, \varphi)$ and its Properties

Madhavi [4] introduced the concept of Euler totient Cayley hs and studied some of its properties.

We define Euler totient Cayley graph as follows.

For each positive integer n , let Z_n be the additive group of gers modulo n and let S be the set of all integers less than n and ively prime to n. The Euler totient Cayley graph $G(Z_n, \varphi)$ is ied as the graph whose vertex set V is given by $Z_n = 2, \ldots . n-1\}$ and the edge set is $E = \{(x, y)/x - y \in S$ or $y - x \in$

Clearly as proved by Madhavi [4], the Euler totient Cayley h $G(Z_n, \varphi)$ is

1. a connected, simple and undirected graph,
2. $\varphi(n)$ - regular and has $\frac{n.\varphi(n)}{2}$ edges,
3. Hamiltonian,
4. Eulerian for $n \geq 3$,
5. bipartite if n is even and
6. complete graph if n is a prime.

The domination parameters of these graphs are studied by Uma Maheswari and we present some of the results which we need without proofs and can be found in [6].

Theorem 1.1: If n is a prime, then the domination number of $G(Z_n, \varphi)$ is 1.

Theorem 1.2: If n is power of a prime, then the domination number of $G(Z_n, \varphi)$ is 2

Theorem 1.3: The domination number of $G(Z_n, \varphi)$ is 2, if $n = 2p$ where p is an odd prime.

Theorem 1.4: Suppose n is neither a prime nor $2p$. Let $n = p_1^{\alpha_1} p_2^{\alpha_2} \ldots \ldots . p_k^{\alpha_k}$, where $p_1, p_2, \ldots p_k$ are primes and $\alpha_1, \alpha_2, \ldots . \alpha_k$ are integers ≥ 1. Then the domination number of $G(Z_n, \varphi)$ is given by $\gamma(G(Z_n, \varphi)) = \lambda + 1$, where λ is the length of the longest stretch of consecutive integers in V, each of which shares a prime factor with n.

Arithmetic V_n graph

Vasumathi and Vangipuram [8] introduced the concept of Arithmetic V_n graphs and studied some of its properties.

Let n be a positive integer such that $n = p_1^{\alpha_1} p_2^{\alpha_2} \ldots \ldots . p_k^{\alpha_k}$. Then the Arithmetic V_n graph is defined as the graph whose vertex set consists of the divisors of n and two vertices u, v are adjacent in V_n graph if and only if GCD $(u, v) = p_i$, for some prime divisor p_i of n.

In this graph vertex 1 becomes an isolated vertex. Hence we consider Arithmetic graph V_n without vertex 1 as the contribution of this isolated vertex is nothing when the properties of these graphs and enumeration of some domination parameters are studied.

Clearly, V_n graph is a connected graph. Because when n is a prime, V_n graph consists of a single vertex. Hence it is a connected graph. In other cases, by the definition of adjacency in V_n, there exist edges between prime number vertices and their prime power vertices and also to their prime product vertices. Therefore each vertex of V_n is connected to some vertex in V_n.

The domination parameters of these graphs are studied by S.Uma Maheswari and we present some of the results which we need without proofs and can be found in [7].

Theorem 1.5: If $n = p_1^{\alpha_1} p_2^{\alpha_2} \ldots \ldots . p_k^{\alpha_k}$, where $p_1, p_2, \ldots p_k$ are primes and $\alpha_1, \alpha_2, \ldots . \alpha_k$ are integers ≥ 1, then the domination number of $G(V_n)$ is given by

$$\gamma(G(V_n)) = \begin{cases} k-1 & \text{if } \alpha_i = 1 \text{ for more than one i} \\ k & \text{Otherwise.} \end{cases}$$

where k is the core of n.

Cartesian Product Graph

The Cartesian product of graphs is a straight forward and natural construction. According to Imrich and Klavzar [1], Cartesian products of graphs were defined in 1912 by Whitehead and Russell [9]. These products were repeatedly rediscover later, notably by Sabidussi [5] in 1960.

Cartesian product graphs can be recognized efficiently, in time $O(m \log n)$ for a graph with m edges and n vertices [2, 3]

This product is commutative and associative as an operation on isomorphism classes of unlabelled graphs. But not on labeled graphs.

We know that if G_1 and G_2 are two simple graphs with their vertex sets as $V_1 = \{u_1, u_2, \ldots \ldots\}$ and $V_2 = \{v_1, v_2, \ldots \ldots\}$ respectively then the Cartesian product of these two graphs denoted by $G_1 \square G_2$ is defined to be a graph with its vertex set as $V_1 \times V_2$, where $V_1 \times V_2$ is the Cartesian product of the sets V_1 and V_2 and any two distinct vertices (u_1, v_1) and (u_2, v_2) of $G_1 \square G_2$ are adjacent if

(i) $u_1 = u_2$ and $v_1 v_2 \in E(G_2)$ or

(ii) $u_1 u_2 \in E(G_1)$ and $v_1 = v_2$.

The square symbol $\square$, is the unambiguous notation for the Cartesian product of graphs. It shows visually the four edges resulting from the Cartesian product of two edges.

2. Clique Domination in Cartesian Product $G_1 \square G_2$

Let G_1 be an Euler Totient Cayley graph and G_2 be an Arithmetic V_n graph. Then G_1 and G_2 are simple graphs as they have no loops and multiple edges. Hence by the definition of adjacency in Cartesian product, $G_1 \square G_2$ is also a simple graph.

Now we investigate results related to dominating clique of $G_1 \square G_2$.

Theorem 2.1: If n is a prime, then the clique domination numbe $G_1 \square G_2$ is 1.

Proof: Let n be a prime. Then the graph $G_1 \square G_2$ is a complete graph any single vertex dominates all other vertices in $G_1 \square G_2$. Let $\{(t, p)\}$, where t is any vertex in G_1 and p is a vertex in G_2. Let V der the vertex set of $G_1 \square G_2$.

Then every vertex in $(V - D)$ is adjacent to the vertex (t, p) in D.

Therefore $\gamma(G_1 \square G_2) = 1$

Obviously the induced sub graph $< D >$ is a complete graph minimum cardinality. Hence D is a minimum dominating clique of G_2.

Therefore $\gamma_{cl}(G_1 \square G_2) = 1$

Theorem 2.2: If $n = p^{\alpha}, \alpha > 1$ then the clique domination numbe $G_1 \square G_2$ does not exists.

Proof: Suppose $n = p^{\alpha}$, where p is a prime and $\alpha > 1$ is an integer.

Consider the graph $G_1 \square G_2$. Let V_1 and V_2 denote the vertex sets of G_1, G_2 respectively. Then $V(G_1) = \{0, 1, 2, \ldots, p^{\alpha} - 1\} = V_1$, $V(G_2) = \{p, p^2, \ldots, p^{\alpha}\} = V_2$. Let $V(G_1 \square G_2) = V_1 \times V_2$.

By Theorem 1.2 of [6], the set $D_1 = \{u_{d_1}, u_{d_2}\}$ is a dominating set c with minimum cardinality 2 and also u_{d_1}, u_{d_2} are adjacent to each ot So, D_1 is a dominating clique of G_1 and $\gamma_{cl}(G_1) = 2$.

By Theorem 1.5 of [7], the set $D_2 = \{p\}$ be a dominating set also a dominating clique of G_2 with minimum cardinality.

Let $D = D_1 \times D_2 = \{u_{d_1}, u_{d_2}\} \times \{p\} = \{(u_{d_1}, p), (u_{d_2}, p)\}$. I we verify whether the set $D = \{(u_{d_1}, p), (u_{d_2}, p)\}$ form a dominating or not.

Consider the set of vertices in $V - D$ which $\{u_{d_3}, u_{d_4}, u_{d_5}, \ldots \ldots, u_{d_n}\} \times \{p, p^j\} \cup \{u_{d_1}, u_{d_2}\} \times \{p^j\}$, $j > 1$. The vert $\{u_{d_3}, u_{d_4}, \ldots, u_{d_n}\} \times \{p\}$ in $V - D$ are adjacent to either $\{u_{d_1}, p\}$ or $\{u_d$ as D_1 is a dominating set of G_1. The vertices $\{u_{d_1}, u_{d_2}\} \times \{p^{\square}\}$ are adjacent to either $\{u_{d_1}, p\}$ or $\{u_{d_2}, p\}$ because $GCD(p, p^j) = p$. But

ces $\{u_{d_3}, u_{d_4}, \ldots, u_{d_n}\} \times \{p^j\}$ are not dominated by the vertices in D, use of the definition of Cartesian product.

Thus D does not form a dominating set with cardinality 2.

he definition of the Cartesian product, vertices $\{u_{d_3}, u_{d_4}, \ldots, u_{d_n}\} \times$ in $\langle V - D \rangle$ are adjacent to vertices $\{u_{d_1}, u_{d_4}, \ldots, u_{d_n}\} \times \{p\}$ or $u_{d_2}\} \times \{p^j\}$, $j > 1$. Hence to get a dominating set of $G_1 \square G_2$, we include the vertices $\{u_{d_3}, u_{d_4}, \ldots, u_{d_n}\} \times \{p\}$ or $\{u_{d_1}, u_{d_2}\} \times \{p^j\}$, into D. Hence the dominating set D becomes

$u_{d_1}, u_{d_2}, u_{d_3}, u_{d_4}, u_{d_5}, \ldots\ldots, u_{d_n}\} \times \{p\}$ or $D = \{u_{d_1}, u_{d_2}\} \times \ldots, p^{\alpha}\}$.

n compare with the set $\{u_{d_1}, u_{d_2}, u_{d_3}, u_{d_4}, u_{d_5}, \ldots\ldots, u_{d_n}\} \times \{p\}$, the set $u_{d_2}\} \times \{p, p^2, \ldots, p^{\alpha}\}$ contains less number of elements. Hence for nal dominating set we prefer to consider set D as $D = \{u_{d_1}, u_{d_2}\} \times \ldots, p^{\alpha}\}$.

Now we check whether D is a dominating clique or not.

By the definition of Cartesian product, the vertices $p^i)$ and (u_{d_1}, p^j) are not adjacent and the vertices $p^i))$ and $(u_{d_2}, p^j))$ are not adjacent for $i, j > 2$ and $i \neq j$ because $(p^i, p^j) = p$. So, the induced subgraph $< D >$ is not a complete on these vertices.

Similarly if we consider D as $= \{u_{d_1}, u_{d_2}, u_{d_3}, u_{d_4}, u_{d_5}, \ldots\ldots, u_{d_n}\} \times$ hen also dominating clique does not exist for the graph G_1 and by the definition of Cartesian product, it follows that a ıating clique does not exist for the graph $G_1 \square G_2$.

If we construct a dominating set of any cardinality in any er then also we cannot get a complete graph on these vertices, se by the definition of Cartesian product and by the definition of in G_1 and G_2 respectively.

Hence clique domination number does not exist for the graph 2.

rem 2.3: Let $n = 2p$ where p is an odd prime, then clique ıation number does not exist for the graph $G_1 \square G_2$.

Proof: Let $n = 2p$, p is an odd prime. Consider the graph $G_1 \square G_2$.

Let $V(G_1) = \{0, 1, 2, \ldots\ldots, 2p - 1\} = V_1$

$V(G_2) = \{2, p, 2p\} = V_2$ and $V(G_1 \square G_2) = V_1 \times V_2 = V$ be the set of vertices of the graphs G_1, G_2 and $G_1 \square G_2$ respectively.

By using Theorem 1.3 of [6], we may take a dominating set D_1 of G_1 as $D_1 = \{u_{d_1}, u_{d_2}\}$ where $|u_{d_1} - u_{d_2}| = p$.

To obtain a dominating set of $G_1 \square G_2$, we proceed as follows.

Consider $D = D_1 \times V_2$

$= \{u_{d_1}, u_{d_2}\} \times \{2, p, 2p\}$

$\{(u_{d_1}, 2), (u_{d_1}, p), (u_{d_1}, 2p), (u_{d_2}, 2), (u_{d_2}, p), (u_{d_2}, 2p)\}$

We will now prove that D is dominating set of $G_1 \square G_2$.

Let (u, v) be any vertex in $\langle V - D \rangle$ in $G_1 \square G_2$. Then the vertex u in G_1 is adjacent to either u_{d_1} or u_{d_2}, say u_{d_1} in D_1 as D_1 is a dominating set of G_1. Then by the definition of Cartesian product, the vertex (u, v) in $\langle V - D \rangle$ is adjacent to vertex (u_{d_1}, v) in D. Since (u, v) is an arbitrary vertex in $\langle V - D \rangle$ it follows that D is a dominating set of $G_1 \square G_2$.

Now we check whether D is a dominating clique or not.

In $D = \{(u_{d_1}, 2), (u_{d_1}, p), (u_{d_1}, 2p), (u_{d_2}, 2), (u_{d_2}, p), (u_{d_2}, 2p)\}$, there is no edge between the vertices $(u_{d_1}, 2)$ and (u_{d_1}, p), because GCD $(2, p) \neq p$. With the similar reason, there exists no edge between the vertices $(u_{d_2}, 2)$ and (u_{d_2}, p).

So, the induced subgraph $< D >$ is not a complete graph on these vertices. Hence dominating clique does not exist for the graph $G_1 \square G_2$. If we form a dominating set with cardinality 6 or greater than 6 in any other manner, then also we cannot get a clique dominating set.

This is because by the definition of adjacency in$G_1 \square G_2$ and the properties of prime numbers.

Theorem 2.4: Let $n = p_1^{\alpha_1} p_2^{\alpha_2} \ldots p_k^{\alpha_k}$, where $p_1, p_2, \ldots, p_k$ are primes, $p_1 < p_2 < \cdots < p_k$ and $\alpha_1, \alpha_2, \ldots, \alpha_k$ are integers ≥ 1, then the clique domination number of $G_1 \square G_2$ does not exist.

Proof: By Theorem 1.4 of [6], it is clear that $D_1 = \{u_{d_1}, \ldots, u_{d_{\lambda+1}}\}$ is a dominating set of G_1 with cardinality $\lambda + 1$.

Let $D = D_1 \times V_2 = \{u_{d_1}, \ldots, u_{d_{\lambda+1}}\} \times V_2$ where V_2 be the vertex set of G_2.

By the definition of Arithmetic graph it is obvious that the vertices in V_2 are primes $p_1, p_2, \ldots\ldots, p_k$ and their powers and their products.

We now claim that D is a dominating set of $G_1 \square G_2$.

Let (u, v) be any vertex in $V - D$. Then $u \neq u_{d_i}$ for $i = 1, 2, 3, \ldots, \lambda + 1$ and $v \in V_2$. Since D_1 is a dominating set of G_1, the vertex u must be adjacent to at least one of the vertices of D, say u_{d_i}. Since u and u_{d_i} are adjacent, by the definition of Cartesian product the vertex (u, v) is adjacent to vertex (u_{d_i}, v) in D.

Thus all the vertices in $V - D$ are adjacent to at least one vertex in D so that D becomes a dominating set in $G_1 \square G_2$.

Now we check whether D is a dominating clique or not.

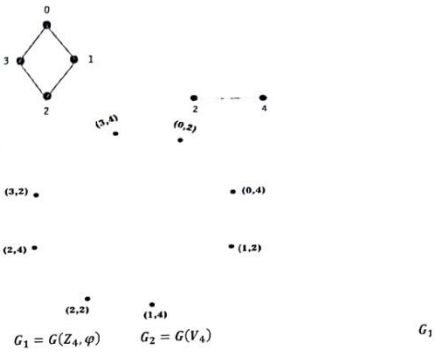
Since $D = D_1 \times V_2 = \{u_{d_1}, \ldots, u_{d_{\lambda+1}}\} \times V_2$ and vertices in V_2 are primes $p_1, p_2, \ldots\ldots, p_k$, their powers and their products, vertex (u_{d_1}, v_x) in D is not adjacent to vertex (u_{d_1}, v_y) in D if GCD $(v_x, v_y) \neq p$.

So, the induced subgraph $< D >$ is not a complete graph on these vertices.

Similarly if we consider dominating set D as $D = \{u_{d_1}, u_{d_2}, \square_{d_3}, u_{d_4}, u_{d_5}, \ldots\ldots, u_{d_n}\} \times \{p_k, p_k p_1, p_k p_2, \ldots p_k p_{k-1}\}$, then by the definition of Cartesian product, it follows that a dominating clique does not exist for the graph $G_1 \square G_2$. If we construct a dominating set of any cardinality in any manner then also we cannot get a complete graph on these vertices, because by the definition of Cartesian product and by the definition of edges in G_1 and G_2 respectively.

Hence clique domination number does not exist for the graph $G_1 \square G_2$.

3. Illustrations



$G_1 = G(Z_4, \varphi)$ $G_2 = G(V_4)$ G_1

$G(V_6)$

$G_1 = G(Z_6, \varphi)$

$G_1 \square\, G_2$

$G(Z_{11}, \varphi)$

$G_2 = G(V_{11})$

$G_1 \square\, G_2$

Cartesian Product Graph $G_1 \square\, G_2$

	Dominating sets	$G_1 = G(Z_n, \varphi)$	$G_2 = G(V_n)$	$G_1 \square\, G_2$	Domination Number in $G_1 \square\, G_2$
$n = 4$	Minimum Dominating set	{0,1}	{2}	{(0,2), (2,4)}	$\gamma = 2$
	Minimum Clique Dominating set	{0,1}	{2}	Does not exists	-
$n = 6$	Minimum Dominating set	{0,3}	{6}	{(0,6), (1,6), (2,6), (4,2), (4,3)}	$\gamma = 5$
	Minimum Clique Dominating set	Does not exists	{6}	Does not exists	-
$n = 11$	Minimum Dominating set	{0}	{11}	{(0,11)}	$\gamma = 1$
	Minimum Clique Dominating set	{0}	{11}	{(0,11)}	$\gamma_{cl} = 1$

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DEPARTMENT OF PHYSICS

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RFID- Backed community healthcare solution from a Central Medical Facility

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Abstract: Group based healthcare is perpetually basic for the prosperity of occupants of best in class economies. Without a various win demonstrate, the framework won't function admirably. The desire of a RFID-supported group healthcare arrangement is to permit simple and unswerving recognizable proof of individual patients, proceed with more precise restorative records, encourage better medicinal services, and build up the personal satisfaction in groups that are blocked off from a focal therapeutic office. There are relentless exposures to menace components.

KEYWORDS: RFID, UART

I. INTRODUCTION:

A numeral of advancements is pertinent for individual identification, and for putting away and recovering records. Be that as it may, a waiting test is framework reconciliation of different innovations into an intelligent arrangement customized for use with positive organizations. Computational insight (CI) ideal models offer some pay in mechanizing and making a human-like fitness in social insurance applications. There are numerous layers of danger exposures connected with the proposed arrangement, including specialized dangers, human variables, and operationally related disabilities. While specialized issues are critical, as often as possible it is the last two danger parts that can prompt less than ideal failures of a framework.

II. RELATED WORK:

CI-based strategies are discretionary for procedure mining in clinic data frameworks. Mining of electronic restorative records to look at doctor choices is recommended, to perceive the effect of doctor choice on patient consummation and healing center expenses. This is of critical outcome in situations where doctors are not held responsible for their expenses in a human services environment, possibly because of tight restrictions. Truth be told, the acknowledgment of record frameworks in created nations demonstrates that change administration, arrangement, and arrangement issues are the essential issues, instead of innovation. Moreover, planning and overseeing social insurance staffs to manage specialized frameworks are noteworthy issues. CI-based biometric advances are record for the representation and acknowledgment of deficient biometric information, discriminative component extraction, biometric coordinating, and online layout redesigning.

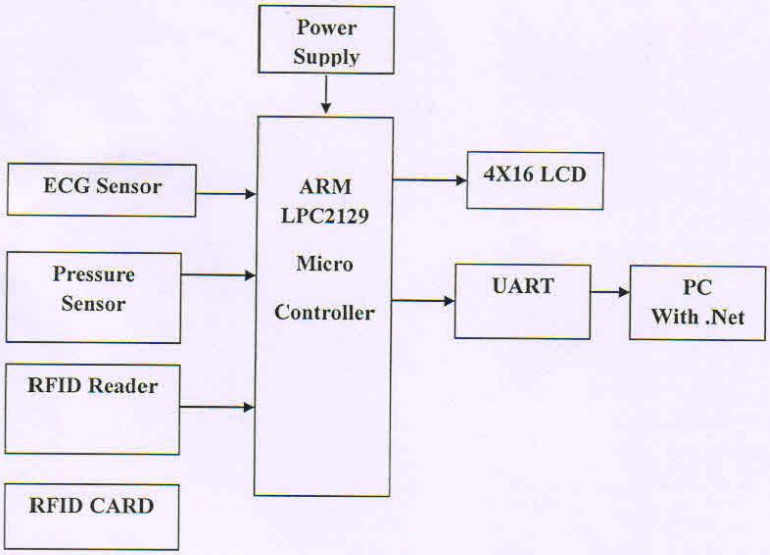
III. PROBLEM DEFINITION:

There is no appropriate system for storing the database of the patient in rural areas, where we need a system particularly for rural villages which is detached from the city. Hence we go for proposed system.

IV. PROPOSED APPROACH:

In this proposed system we have intended a system which has controller which in turn interfaced with PC. When the patient has entered into the health care centre he/she has to show the RFID card in the RFID reader which is interfaced with the microcontroller. The controller will read the RFID tag and sends the data to the PC via UART protocol. In the PC the data is by now stored to that particular RFID number. And also the doctor can keep informed the database for the particular RFID card.

V. SYSTEM ARCHITECTURE:



VI. PROPOSED METHODOLOGY:

TECHNOLOGY ASPECTS ANDCOMPUTATIONAL INTELLIGENCE:

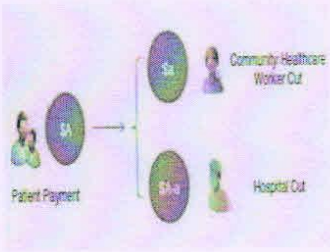
Remote frameworks for patient-to-purpose of-consideration correspondences will require suspicious thought of information handling plans taking into account when, where and how the data is get hold of and put away. A perfectly customized answer for pathway data incorporates RFID, GPS and Wi-Fi, with the need to quantify data security hazard and change of advancements and methodology license access to approved staff. Wise advancement strategies have a noteworthy part in occasion mining of system exercises in RFID logistics applications, including the improvement of RFID tactile capacities.

POTENTIAL BUSINESS MODEL:

The working or plan of action is of urgent significance to ensure a long haul self-maintaining framework. The framework needs to induce adequate incomes keeping in mind the end goal to cover, in any event, the expense, if not a sensible benefit. To make simple this, the social insurance

specialist will need to accumulate a charge from the patient for each administration exchange. The sum could be similar to the expense that the patient needs to pay if s/he visits the focal therapeutic office in individual. We may likewise direct the charge to incorporate a "comfort premium for home visit." The accommodation for the patient incorporates shorter travel separation to look for medicinal help, augmented administration hours of therapeutic administrations, permission to critical out-of-hour administrations inside his/her neighborhood, diminished loss of-income because of removing time to travel, keep from the requirement for join by relatives, and condensed expenses of travel.

VII. RESULTS:



Themedical capability may also providea basic retention wage to the villagehealthcare worker, but thecommon of the income will comefrom the deal fee with thepatient. A revenue sharing modelwill support the communityhealthcare workers to becomemore practical with reaching outto the remote communities in her/his neighbourhood.This will also decrease the loadingof the central medical facilityby ordinary and routine ailments and allow the concentration ofresources on more serious cases –the cases that cannot be overhaul bythe community healthcare workers.

VIII. CONCLUSION:

The proposed execution structure underpins an investigate and improvement office, agree to interdisciplinary worldwide commitments intending to build up the result of the usage.

This will make conceivable operation of CI-based methods inside the framework, while watch and concentrating on the pilot test. Best case scenario, there are expense and fitness suggestions. Best case scenario, it could put individuals' life at danger. Keeping in mind the end goal to overcome some of these troubles, a versatile focal electronic therapeutic record framework that can be all in all correct to use by the group social healthcare workers in the field could demonstrate helpful.

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RFID-Health: Implemented RFID Chip and Improving Healthcare System

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Abstract: Every Day, New Applications Of RFID Emerge comes in market, In Public Transport (Brussels, Beijing, Shanghai, Paris, Etc.), Ski Packages (The Biggest Alpine Ski Resorts Are Already Equipped With The Technology), Chips For Animals, Etc. But The Area In Which RFID Technology Is Really Being Adopted *En Masse* Is In Supermarket Distribution. RFID's Remote Reader and Unique Identifiers Can Bring about Improvements in Logistics. Inventories Of Objects Can Be Obtained In Real Time, Without Any Need To Handle The Objects. Emerging Information Technologies Offer A Means For Healthcare To Measure And Control Their Resources And Workflow Processes, And Ultimately Improve Patient Care. The Usefulness Of One Emerging Information Technology, Radio Frequency Identification (RFID). RFID Technology Can Assist In The Measurement And Ultimate Control Of Workflow Processes, But Also That Traditional And Non-Traditional IS Practices Are Necessary For Successful RFID Implementation.

Keywords: RFID, Healthcare.

I. Introduction

Depending on the RFID technology, these readers may emit waves in three frequency bands: 125 kHz for very low frequency (LF) readers, 13.56 MHz for high-frequency (HF) readers and 900 MHz for ultra-high-frequency (UHF) readers. The impacts of these waves on the human body therefore depend on the frequency band used. The electromagnetic fields generated by the readers have been measured in laboratory conditions, as recounted in a report by AFSSET, the French agency for safety in the environment and at work, renamed Anses in 2010. The field emitted in the LF and HF bands quickly fades and is only significant in the immediate vicinity of a reader. In any case, this radiation remains lower than the threshold limit value for humans recommended by the ICNIRP, the International Commission on Non-Ionizing Radiation Protection (maximum permitted magnetic field = 400 nT for HF technology and 105 nT for UHF). Although, in UHF frequency bands, the magnetic fields span greater distances, measurements have shown that the radiation does not exceed the threshold limit values. Technologies of all kinds are continuously considered as potential tools to help address these and other crises faced in healthcare today. While new medical technologies are often showcased as a means for improving healthcare services (e.g., diagnostic procedures with new imaging technologies), information and communication technologies that hold promise for significant benefits often work in their shadows. Healthcare organizations are beginning to recognize that information and communication technologies can also improve the quality of patient care and/or reduce patient wait times [e.g., American College of Emergency Physicians, 2003]. One emerging technology that could aid hospitals in their resource and workflow process management activities is Radio Frequency Identification (RFID). RFID consists of small integrated-circuit “tags” that can store information and announce their existence passively through wireless radio communication to a network of RFID readers. RFID potentially can track physical items – medical equipment, patient charts, even patients – in real time. Data from RFID tags are not only useful in identifying the locations of patients and inventory in real time, but can be

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accumulated over time to support patient care and resource management decisions.

II. Radio Frequency Identification (RFID)

The RFID tag is also accused of jeopardising people's privacy. It is true that each RFID tag has a unique identifier. If this identifier is paired with the identity of a person, that person can be traced each time the tag tranPsmits its identifier. This can happen, for instance, when several tags come within the field of a reader. If they all emit at the same time, the signal will be scrambled and none of them will be identified. Anti-collision protocols are implemented to mitigate this problem. Some of these protocols require the tag to send its identifier, while others do not, but do not guarantee that the identifier will not be sent. When the tag is placed on a product sold in a shop, the CNIL and the European Commission recommend deactivating the RFID chip when the product leaves the store, unless the consumer explicitly requests otherwise. Most of the time, people don't even know that the products they buy have RFID tags, which are generally theft prevention devices, and these tags are automatically destroyed at the cash desk, which deactivates the theft prevention device. Furthermore, the information collected or stored on RFID tags is subject to the rules set out in the 1995 EU Directive on data protection. The basic principles are clear: the data collection must have a specific purpose and must only concern relevant information. The period for which the data is retained must then be justified in relation to this purpose. It is prohibited to couple an RFID identifier with a person's identity, unless the person concerned explicitly so requests. When RFID tags are used in badges for paying motorway tolls or in public transport passes, the owner of the card is associated with the card itself, as with a bank card. This person can therefore be traced. Such cases are accepted by the CNIL, as the card is created at the express request of the consumer. The limits of consent are always a subject of debate. The Commission recommends adapting the level of detail of the data to suit different uses. For example, for public transport, the CNIL has decided to issue a recommendation to ensure that the collection and processing of personal data by public transport companies as part of ticket applications comply with the principles of the law on 'Information technology and freedoms' of 6 January 1978. The CNIL recommends, among other things, that data concerning people's journeys should not be used in a form that would enable the users to be identified, except for the purposes of fraud prevention, and then only for the time necessary to detect the fraud, which must not exceed two consecutive days.

III. Problem Definition-(Implanted RFID Chips).

Implanted RFID chips under the skin of its regular customers. The idea was as follows: when entering the club or buying a drink, customers would, instead of getting out their wallet, simply present their skin to an RFID reader. The tag would be read, the customer identified and their bank accounted debited. They could travel light and wouldn't have to worry about anyone stealing their wallet or purse. This practice was legal, as only people who requested a chip had one implanted. The danger lay in the fact that the chip was not implanted by doctors. In some cases, customers suffered muscle damage.

IV. Proposed Approach

In this proposed system we have intended a system which has controller which in turn interfaced with PC. When the patient has entered into the health care centre he/she has to show the RFID card in the RFID reader which is interfaced with the microcontroller. The controller will read the RFID tag and sends the data to the PC via UART protocol. In the PC the data is by now stored to that

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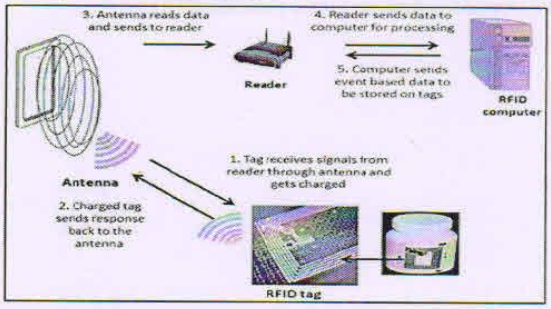
particular RFID number. And also the doctor can keep informed the database for the particular RFID card.

V. System Architecture

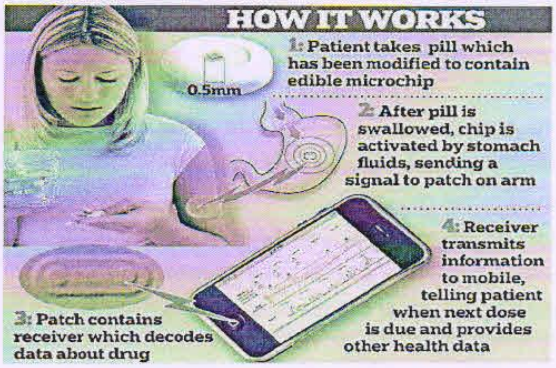


VI. Proposed Methodology

Technology Aspects and computational Intelligence:

Remote frameworks for patient-to-purpose of-consideration correspondences will require suspicious thought of information handling plans taking into account when, where and how the data is get hold of and put away. A perfectly customized answer for pathway data incorporates RFID, GPS and Wi-Fi, with the need to quantify data security hazard and change of advancements and methodology license access to approved staff. Wise advancement strategies have a noteworthy part in occasion mining of system exercises in RFID logistics applications, including the improvement of RFID tactile capacities.

VII. Results



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Conclusion:

Further research would increase the understanding of how to architect an RFID reader network to provide fewer read anomalies. An automated data filtering facility would improve the reliability and integrity of the RFID data, and would minimize the time needed to produce actionable reports. In addition, a real-time graphical user interface that displayed the status and location of all patients in a unit would provide decision makers with critical information that should improve their real-time decision making capacity.

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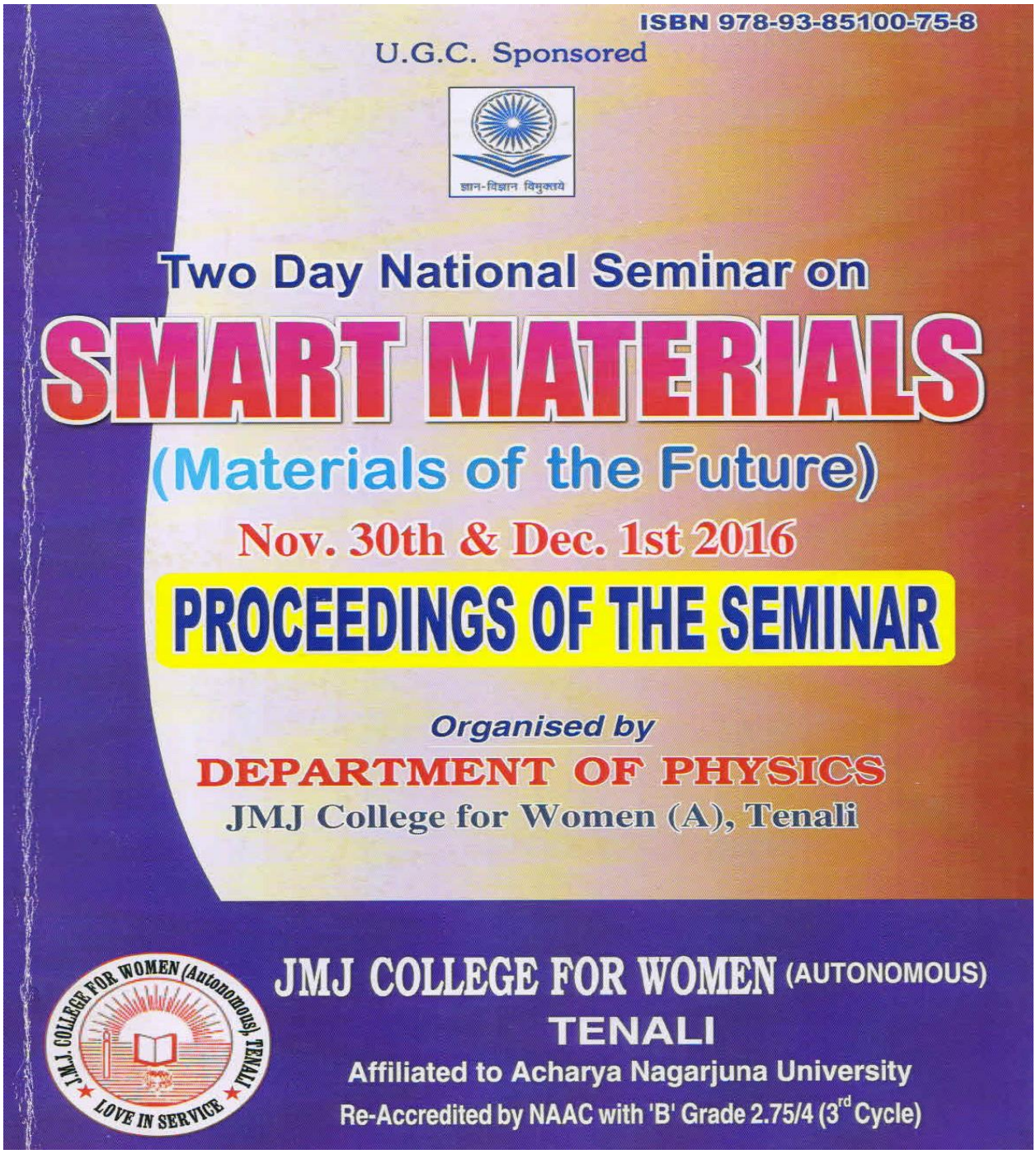
29.Presented a paper on magnetostrictive materials in the national seminar proceedings of smart materials on Nov 30th & Dec 1st 2016 with ISBN 978-93-85100-75-8



CONTENTS

MAGNETOSTRICTIVE MATERIALS

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ABSTRACT

Magical power of magnets awed people of early civilizations as a strange force from the rocks that attracts shoes and swords without revealing itself! Wealthy Egyptians believed magnets could prevent aging. Cleopatra used to put magnetic beads on her forehead which were supposed to retrain her beauty for ever! Since then a galaxy of applications of magnetism have been record in the history ranging from navigation tools, war-arms, motors, generators, levitators, spectroscopic instruments, computer-memory chips and even items for magnetic therapy.

In 1842, James Joule noted that a ferromagnetic sample changed its length with the application of magnetism. This effect of change in size by magnetic force ('striction' = compressed, pressured or tensed') was noted as 'magnetostriction' and named after him as 'Joule effect'. Later, in 1865, the reciprocal phenomenon, that is the change in magnetisation due to the change in stress in a material is found by Villari and has been subsequently acknowledged as 'Villari effect'.

This led to research for new active materials with competing characteristics to that of the existingpiezo transducers. The discovery of a giant magnetostrictive material, commercially known asTerfenol-D, led to a breakthrough in the development of a new generation of sonar transducers.Now, the materials (including composites) as well as sensors are commercially available. A new generation of transducers have emerged in ocean-related areas like acoustic tomography, long-rangeunderwater communication, geophysical exploration, oil well exploration, etc.,

Similar effect is also found in the dielectrics under high electric field, which is known as **electrostriction**. These electro-mechanical phenomena are quite different from the piezo-electricity asthese are essentially non-linear in nature and under unbiased field, the response is always unidirectional. In other words, the materials can only expand irrespective of the direction of the magneticfield applied to it.

Magnetostrictive transducers are found to be very much cost-effective in the low-frequency band and could be effectively used for deep-sea measurements. Since then, magnetostrictive materials are being used for special purpose under-water transducers, for example, in the latest TALON system shown in Figure 1.

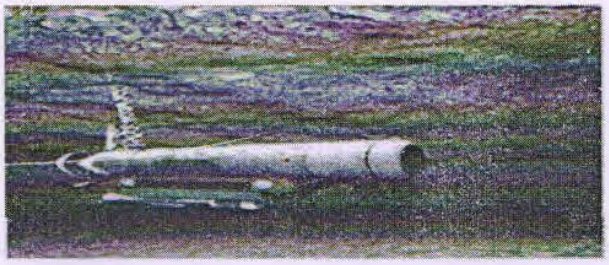


Fig., 1TALON (Tactical Acoustic Littoral Ocean Network) sonar system uses Magneto strictive Terfenol -D for under -water submarine detection, source: Etrema Products

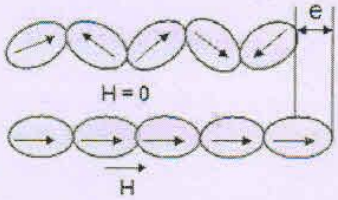
INTRODUCTION

Magnetostrictive Materials

Magnetostriction is mostly found in the magnetic transition materials like iron, cobalt and nickel and in the rare-earth materials like lanthanum and terbium. The grains of these materials consist of numerous small randomly oriented magnetic domains, which can rotate and align under the influence of an external magnetic field. The magnetic orientation or alignment brings forth internal strain in the material, which is known as **magnetostriction**.

The phenomenon of magnetostriction was discovered in nickel by James Joule in 1840. It was alsoobserved later in other Ferro magnets and their alloys, although the maximum achievable strain waslimited to 150 ì -strain only. Soon after, the discovery of low-temperature magneto-elasticity in rare earth elements, likes Tb (terbium), Dy (dysprosium) and Sm (samarium), has given a fresh impetus for continuing the search of magnetostrictive materials suitable for developing transducers.

Clark has obtained room-temperature magnetostriction in the alloy of Tb and Fe, which also has higher Curie temperature (around 7000K). Subsequently, it is found that by adding another rare-earth material called dysprosium with Tb-Fe alloy, the magnetic anisotropy in the alloy can be reduced, thus generating even larger strains. The commercially available and well-known magnetostrictive material Terfenol-D is an example of the alloy of terbium, iron and dysprosium. However, the proportion of Tb, Fe and Dy varies depending on specific requirement of magneto-elasticity and temperature characteristics.



It is shown experimentally that the 'Terfenol' compound made using the composition Dy0.73Tb0.27Fe1.95 produces less free strain than the same compound made of Dy0.7Tb0.3 Fe1.95 composition.However, in the former, the strain varies more linearly with the magnetic field as compared to the latter.This makes the first alloy more suitable for actuation purpose. Also, substituting dysprosium from Tb-Fealloy by other rare earth materials like holmium or samarium, elastic characteristics can be significantly changed.

Fig 2., Magnetostriction (e) in materials due to the domain migration and reorientation under applied magnetic field H

In the linear region of actuation and sensing (assuming the vector quantities along the direction of maximum response) the constitutive equations of magnetostriction are given by

$$S = sH\, s + d\, H$$

$$B = d\, s + ìs\, H$$

where S is the strain, s the mechanical stress, H the magnetic field intensity and B the flux density. The compliance value at a constant magnetic intensity is denoted by sH, d is the magneto–mechanical constant and $ì\, s$ is the permeability of the medium under constant stress condition.

The equations are of the same form as that of piezo electricity. However, the study of any typical *S–H* and *B–H* curve [10-20] brings out the following observations.

The relationship between magnetostriction and applied magnetic field is highly dependent on the intensity of the magnetic field. The relationship is approximately linear when the intensity of the applied magnetic field *H* is much lower than the intensity of the polarizing field *Hpol*(field at which the magnetic domains are initially aligned). The non-linearity begins as *H* approaches H poland the curve gradually flattens out signifying saturation or completion of all the domain alignments. Typically, for Terfenol-D rods under stress-free condition, such a relationship is approximately linear in the range of magnetic field from 0 to 100 Oersted.

The maximum free strain generated by magnetostriction is quite large, almost twice as much as that of PZT. Yet, unlike piezoelectric material, the reversal of magnetic field does not result in the reversal of strain here. Particularly, for dynamic applications like vibration suppressions, reversal of actuation strain is very much necessary. Hence, for such applications these actuators are operated with a biased magnetic field such that with respect to the biasing centre, reversal of strain occurs. Thetechnique, however, reduces the availability of actuation strain by approximately 50%; thus, lowering its edge over the piezoelectric materials.

Although Magnetostriction is broadly defined by a change of size in certain ferromagnetic materials in presence of a magnetic field, a more rigorous description is necessary to discuss the evolution of such materials.Magnetostriction involves two processes in a macroscopic scale (as shown in Figure 1). First, the domain walls of ferromagnetic material start to migrate in presence of a magnetic field and then the domains rotate or re-orient themselves with respect to the magnetic field. Magnetostriction is a combined effect of these two processes. If a crystal of ferromagnetic material is initially at a compressed state, the effect of Magnetostriction becomes more pronounced. All ferromagnetic elements show certain degree of Magnetostriction. It is observed that Cobalt which saturates around 50 μstrain can achieve maximum saturation. The Magnetostriction noted in different materials is provided. The last three materials in the bottom of the table can produce very high magnetostriction due to high magnetic anisotropy of rare earth metals like Terbium (Te) and Dysprosium (Dy). In fact, it was known for quite some time that the rare-earth metals of the Lanthanide group (Gd, Te, Dyand Ho) had high magnetic anisotropy due to their open 4f shell; however, in pure form, this useful property is retained up to very low temperature. Clark [1] and his co-workers at Naval Ordinance Laboratory, USA, had successfully prepared stoichiometric alloys containing Fe, Dy, and Tb of the form $Tb_xDy_{1-x}Fe_y$ (x = 0.3, y = 1.9-1.95) and named it as Terfenol-D ('Ter' - Terbium, Fe - Iron, NOL - Naval Ordinance Lab, D - Dysprosium).Terfenol-D, operated under a mechanical bias can strain up to 2000 microstrain in a field of 2 kOe at room temperature. This high temperature large magnetostriction is also referred as Giant Magnetostriction in the literature. For typical transducer and actuator applications, Terfenol-D is one of the most commonly used magnetostrictive materials today.

Magnetostrictive Actuators based on Giant Magnetostriction

The discovery of giant magnetostriction in 1975 by Clark at naval ordinance laboratory, USA inspired the investigation of such materials as actuators. The important behaviour of these materials in a coupled electro-mechanical environment is presented below:

Direct Effects	Indirect Effects
Joule Effect: Magnetostriction: Change in sample Dimension in the magnetic field	Villari Effect: Change in magnetisation due to applied stress
Wiedemann Effect: Torque induced by helical magnetic field	Matteuci Effect: Helical anisotropy and EMF induced by a torque
Magneto volume Effect: Volume change due to magnetostriction	Nagoka-Honda Effect: Change in the magnetic state due to change in the volume.

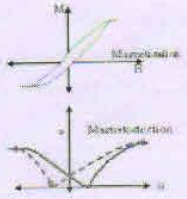
The high strain output of magnetostrictive materials, especially in Terfenol-D has inspired the development of linear actuators. Reed, Hiller and Wise developed independent models of large sized magnetostrictive actuators using Terfenol-D driven plungers. These models are proposed for the control of high frequency vibration and acoustic noise control. A typical MMA is shown in Figure 3. Pre-load springs and permanent magnets are used to put the piston in zero-position and to reduce hysteresis. The energizing coil around the rod is used to activate the Terfenol-D rod for dynamic application.This type of actuators can be easily embedded inside a laminated composite structure and used for vibration control.

Fig 3: Detailed View of a Magnetostrictive Actuator; Source: Cameron McWilliams, University of Western Sydney

The first term in the right-hand side expression corresponds to the elastic strain, the seconddue to the magneto-elastic coupling (note that magnetisation is expressed in terms of applied current in the energizing coil) and the last term corresponds to thermal effect in the coil.

$$\bullet_c(t) = S(\acute{o} + \acute{o}_0) + d\,G\,i(t) + \acute{a}\,K + \text{"}e^{-t/C}{}_i^2\,(t)\,dt$$

• - strain, S- compliance modulus, ó - stress, $\acute{o}_0$ – pre-stress, d – magneto-mechanical constant, G – control parameter, i(t) – control current, á - equivalent thermal coefficient of the housing, and C –a parametric constant



It has been observed that the maximum hindrance to the performance of such actuators occur due to thermal disturbances. If the control current is not stopped a little *a priori* to the almost attenuated vibration, the thermal strain causes rebuilding of vibration and it may even lead to instability. Two other related issues to the magnetostrictive actuator are: (a) presence of inherent non-linearity and (b) hysteresis in the system. Depict a pair of typical magnetisation and magnetic strain generation curves which implies the non-linearity of the MMAs

Magnetostrictive Sensors based on Villarieffect

The use of magnetostrictive materials in vibration sensing is relatively less explored. Developing thin film sensors out of Terfenol-D blocks is difficult and quite expensive. Two approaches are made to encounter thisproblem: (a) Development of particulatecomposite in which Terfenol-D particles of micron to sub-micron size is dispersed in a suitable resin and cured to form sensors and (b)Development of thin-film metallic glasses as magnetostrictive (MS) sensors. Considering the second group of sensors, Hristoforou is one of the pioneers in the use of thin-film based Magnetostrictive sensors. It is found in 1978 that the rapid cooling of iron, nickel and cobalt alloys together with one of the elements like boron, silicon or phosphorous can produce metallic glasses of magnetostrictive nature. Hristoforou has used such amorphous materials in the form of wires to develop sensors based on magnetic delay-line (MDL) technique (see Figure 4). The basic idea of MDL is to sense the change of signals passed from an excited source to the receiving end whenever the amorphous wire is excited by a pulsed current. The transmitting MS coil generates an elastic wave using the magneto-elastic coupling which travels through the attached test member and is received by the receiving MS coil as a current signal due to the same coupling. Since elastic waves travel slower than electromagnetic waves, a millisecond phase difference between the transmission and receiving coil signals can be used to differentiate between healthy and cracked specimens.

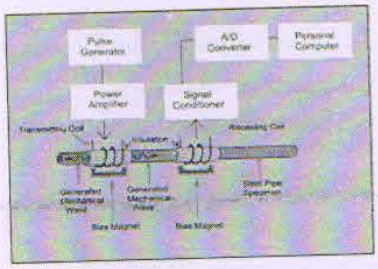
The magnetostriction in the MDL is defined by the following simple phenomenological relation:

$$H(x,t) = f(x)\, I(t) = 1/(\text{“}(a^2 + x^2)\, I(t)$$

$$ë(H) = ë_s\,(1-e^{-áH}),\ \ á>0$$

H – applied pulsed magnetic field, I(t) - applied current, a - distance between the pulsed conductor and MDL, $ë_s$ - saturation magnetostriction, á - a material parameter

Recent advances in this field are taking place in developing miniaturised MDLs. Using a few mm long Iron-based MDL, and a three-layered receiving coil, the sensors could be developed for deformation and vibration sensing in a very small region. Hristoforou has developed a $Ni_{81}Fe_{19}$/ SiO_2/$Ni_{81}Fe_{19}$three-layered MR structure below a magnetostrictive $Fe_{70}Si_{15}B_{15}$ thin film, separated by a silicon dioxide layer. The insulating layers and $Fe_{70}Si_{15}B_{15}$ amorphous thin films have been deposited by r.f. sputtering method. The $Ni_{81}Fe_{19}$ thin films (about 0.05 μm in thickness) are deposited by electron beam vacuum evaporation.



Such devices would enormously help crack detection in large steel pipes and cables. Thin 'Metglas' ribbons are also in high demand for the bio-medical instruments

Fig 4: Magnetostrictive Delay Line Sensor – Source: SwRI, Sweden

Magnetostrictive Particulate Composites for Vibration Sensing and Actuation

One of the key attributes of a smart structure is distributed sensing and actuation. MMAs and MDLs discussed in earlier sections refer mostly to pointed actuation and sensing of static and dynamic deformation. With the advent of advanced composites, researchers became interested to find the feasibility of embedding magneto-strictive sensors and actuators inside laminated composites. In 1994, Sandlund *et al* proposed a method of mixing and degassing Terfenol-D particles in epoxy resin. The resulting mixture after curing was found to possess substantial magnetostriction (up to 1000 strain). By using extended Hamilton's principle, it was shown that the governing equations of motion for an asymmetric laminated composite beam could be expressed as below:

$$A_{11}u_{,xx} - B_{11}\,w_{,xxx} - F_1 C w'_{,xx} - m\,u'' = 0\text{-}B_{11}u_{,xxx} + D_{11}\,w_{,xxxx} + F_2 C\,w'_{,xx} + m\,w'' = G(x,t)$$

Stiffnesses for n-layered laminate aredefined as:

$$A_{11}, B_{11}, D_{11} = ?_{i=1,n}? \; Q^{(i)}_{11}\,(1,z,z^2)\,dz$$

Active Control as:

$$F_1, F_2 = ?C\,(1,z)\,\hat{}m\,dz,\ C = \text{Control}$$

Gain Mass as:

$$M = \hat{}_{i=1,n}? \; ?Đ^{(i)}dz$$; Operators '/' denotes temporal and ',' spatial differentiation

Conclusion

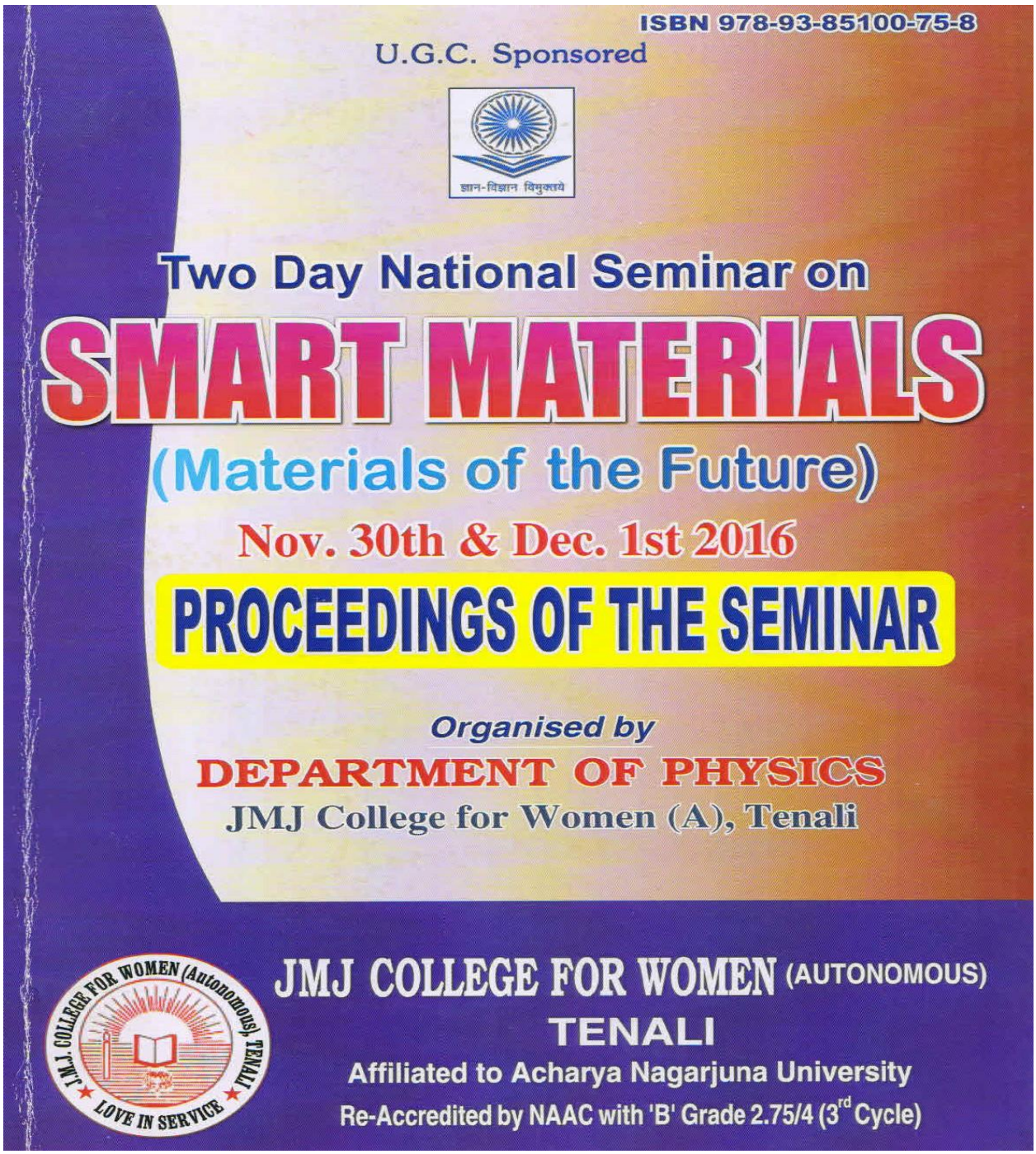
Current drives in magnetostrictive sensing and actuation are both in terms of developing new materials as well as Nano-composites of existing materials to enhance the efficiency in sensing and actuation.

Magnetic materials group at Naval Surface War Centre, USA has recently developed a new magnetostrictive actuator called Galfenol. Galfenol, though possess a lower active free-strain (about 1500 strain) it can be used under robust mechanical and chemical environment. Another new class of such material is Ferromagnetic Shape Memory Alloy (FSMA). FSMA consists of a composite of ferromagnetic material and a Shape Memory Alloy (SMA). The function of ferromagnetic material is to induce magnetic force which is then used to induce the stress in the SMA, resulting in the stress-induced martensitic transformation. This procedure guarantees a fast response system as well as large active strain combining the advantages of magnetostrictive material and shape memory actuators.

Work is also going on to develop Nano-structured magnetostrictive composites. It has been shown by McKnight and Carman that if the magnetostrictive particles are oriented towards the 111 axis during composite development, the availability of free-strain isenhanced up to 2400 strain. Nano-structuring of such particles using spark-eroded nickel and Terfenol-D particles further reduces the hysteresis and the eddy-current loss drastically.

The greatest advantage of magnetostrictive transducers is the capability of non-contact sensing and actuation. New patents are being taken towards non-contact energy dissipation from a mechanically active medium such as a rotating hard-disk or a high-speed compressor blade. The mystic force that has been awed for thousands of years has become one of the best friends of mechatronic engineers today.

30. **Dr.G.Saraswathy**, presented a paper on 'Photo voltaic materials and Cells' in National Seminar proceedings of 'Smart Materials' at JMJ college, Tenali ISBN 978-93-85100-75-8 on 30th Nov. &1st Dec. 2016.

- 

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PHOTOVOLTAIC MATERIALS AND CELLS

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ABSTRACT

Photo voltaic cells,also called solar cells ,convert sunlight directly into electricity. This process of conversion of light into electricity is called the Photo voltaic effect. Traditional PV cells are made from silicon, which are usually flat plate and are the most efficient. Second generation PV cells called thin film PV cells because they are made from amorphous silicon or non-silicon materials. Third generation PV cells are made from a variety of new materials beside silicon. Amorphous silicon, copper indium diselenide and cadmium telluride are hopeful approaches for very cost effective PV cells . In this paper , some other more speculative materials and concepts are described.

Keywords:-
Photovoltaic materials , silicon , thin film PV cells , amorphous silicon.

INTRODUCTION

A photovoltaic cell, also called solar cell, is a semiconductor device that generates electricity when light falls on it. Photovoltaics comprises the technology to convert sunlight directly into electricity. Photovoltaic effect was observed 1839 by Edmund Becquerel, French scientist. Who found that certain materials would produce small amounts of electric current when exposed to light. In 1905, Albert Einstein described the nature of light and the photovoltaic effect on which photovoltaic technology is based, for which he won a Nobel prize in Physics . But it was fully comprehensible with the development of quantum theory of light and solid state physics in middle 20th century. Photovoltaic has made significant progress in 1996.
In 1960's the space industry began to make the first use of technology to provide power aboard spacecraft and smaller items like calculators and watches. During the energy crisis in the in 1970's , photovoltaic technology gained recognition as a source of power for non – space applications. Traditional solar cells are made from silicon. They are usually flat – plate and are the most efficient. Second generation cells are thin film solar cells as they are made from amorphous silicon or non-silicon materials like cadmium telluride.

Photovoltaic cell (PV) :
For PV cells, a semiconductor wafer is specially treated to form an electric field, positive on one side and negative on the other side.
When sunlight strikes a PV cell, the photons of the absorbed sun light dislodge the electrons from the atoms of the semiconductor material. The free electrons that move through cell, creates holes in the cell .The movement of electrons and holes generates electricity. The current produced is directly dependent on how much light strikes .

A single PV cell produces up to 2 watts of power. To increase power output, many PV cells are connected together to form **modules**. These modules are further can be wired together or assembled into large units called **arrays.** In general, the larger the area of a module or array, the more electricity that will be produced .PV modules or arrays produce direct current and can be connected both in series and parallel to produce any required voltage and current combination. The modular nature of PV enables designers to make PV systems with different outputs suitable for various types of applications.

In addition to PV module, a complete PV system consists of other support structures like storage and conversion devices. Too major types of PV systems are flat plate and concentrators. Most prevalent type of PV systems is flat plate systems in which PV modules build on a rigid flat surface to capture sunlight. Concentrator systems use lenses to concentrate sunlight on the PV cells and increase the cell power output. Comparatively flat plate systems are less complicated but employ a large number of cells while the concentrator systems use cells of small area and require a sophisticated,expensive tracking systems. Concentrator systems do not work under cloudy conditions.

Today's most common PV devices use a single junction or interface to create electric field within the cell. The photo voltaic response of single junction cells is limited to the portion of sun's spectrum whose energy is above the band gap of the absorbing material. This limitation can be overcome by using different cells, with more than one band gap and more than one junction to generate voltage. Multi junction devices can achieve higher total conversion efficiency as they can convert more of the energy spectrum of light to electricity.

Types of PV cell Materials

PV Cells are made up of semiconductor materials, majority of which are crystalline and thin films. They vary from each other in terms of light absorption efficiency , energy conversion efficiency and manufacturing technology.

Crystalline materials:

1. Single-crystal silicon –

These cells are most common in PV industry. The technique for producing single-crystal silicon is the Czochralski (CZ) method. In this method poly crystalline is melted in a quartz crucible. A single crystal silicon seed is dipped into this molten mass of polycrystalline. When the seed is slowly pulled out from the melt, a single-crystal ingot is formed. The ingots are then sawed into thin wafers of about 200 to 400 μm thick. The thin wafers then polished, doped, coated, interconnected and assembled into modules and arrays.

High uniformity of single-crystal silicon results in higher energy conversion efficiency. The higher the conversion efficiency, the more electricity it generates for a given area of exposure to sunlight. The conversion efficiency for single-silicon commercial module is highly reliable for outdoor power applications. About half of the manufacturing cost comes from wafering, a time consuming and costly batch process in which ingots are cut into thin wafers with a thickness not less than 200 μ m . If the wafers are too thin, the entire wafer will break-in wafering and subsequent processing.

Poly crystalline silicon :

Poly crystalline silicon PV cells are less energy efficient than single crystalline PV cells. The grain boundaries in Poly crystalline silicon hinder the flow of electron and reduce the power output of the cell. The energy conversion efficiency of a Poly crystalline silicon ranges between 10 to 14% Production of Poly crystalline silicon PV cells involve slicing of thin wafers from

blocks of cast Poly crystalline silicon. In the ribbon growth method, silicon is grown directly as thin ribbons are sheets for making PV cells. The most commercially developed ribbon growth approach is EFG (edge defined Film fed Growth).

Poly crystalline silicon material is stronger and can be cut into one-third the thickness of single crystal material. It has lower wafer cost and less strict growth requirements. However their lower manufacturing cost is offset by the lower cell efficiency.

Gallium-Arsenide (Ga As)

A compound semiconductor , GaAs has a crystal structure similar to that of silicon. An advantage of GaAs is that it has high level of light absorptivity. To absorb the same amount of Sun light , GaAs requires only a layer of few μ m thick while crystalline silicon requires a wafer of about 200 to 300 μ m thick. Also GaAs has a much higher energy conversion efficiency than crystal silicon. It' s high resistance to heat makes it an ideal choice for concentrator systems in which cell temperatures are high. Ga As is popular in space application where strong resistance to radiation damage and high cell efficiency are required. A major drawback of GaAs PV cells is high cost of the single crystal substrate that GaAs is grown on. It is most often used in concentrator systems where only a small area of Ga As cells is needed.

Thin Film materials

In a thin film PV cell, a thin semiconductor layer of PV material is deposited on low cost supporting layer like glass , metal or plastic foil. Since thin film materials have higher light absorptivity than crystalline materials, the deposited layer of PV materials is extremely thin. Thinner layers of material results in significant cost saving. The deposition techniques in which PV Materials are sprayed directly on to glass or metal substrate are cheaper. The manufacturing process is faster and mass production is made easier than the ingot – growth approach of crystalline silicon. However, thin film PV cells suffer from poor cell conversion efficiency due to non –single crystal structure, requiring larger array areas and increasing area related costs.

Materials used for thin film PV modules are :

Amorphous silicon :

Amorphous silicon is the dominant thin film PV material since it was discovered in 1974. It is used mostly in consumer electronic products which require lower power output and cost of production. Amorphous silicon is a non - crystalline form of silicon. Its advantage is its high light absorptivity which is about 40times higher than that of single crystal silicon. Only a thin layer of silicon is sufficient for making PV cells. Also it can be deposited on various low cost substrates like steel , glass and plastic. The manufacturing process requires lower temperatures and thus less energy. So the manufacturing costs are lower per unit area.

Amorphous silicon has two major drawbacks to overcome. One is low cell energy conversion efficiency and the other is the outdoor reliability problem in which the efficiency degrades within a few months of exposure to Sunlight.

Cadmium Telluride[CdTe]

Cadmium telluride polycrystalline semiconductor compound has a high light absorptivity level. About a micrometer thick can .absorb 90% of the solar spectrum. Also it is relatively easy and cheap to manufacture by a process such as high rate evaporation, spraying or screen printing. The conversion efficiency of it is about 7%.The instability of cell and module performance is one of the major drawbacks of using CdTe for PV cells. Also demerit is that cadmium is a toxic substance.

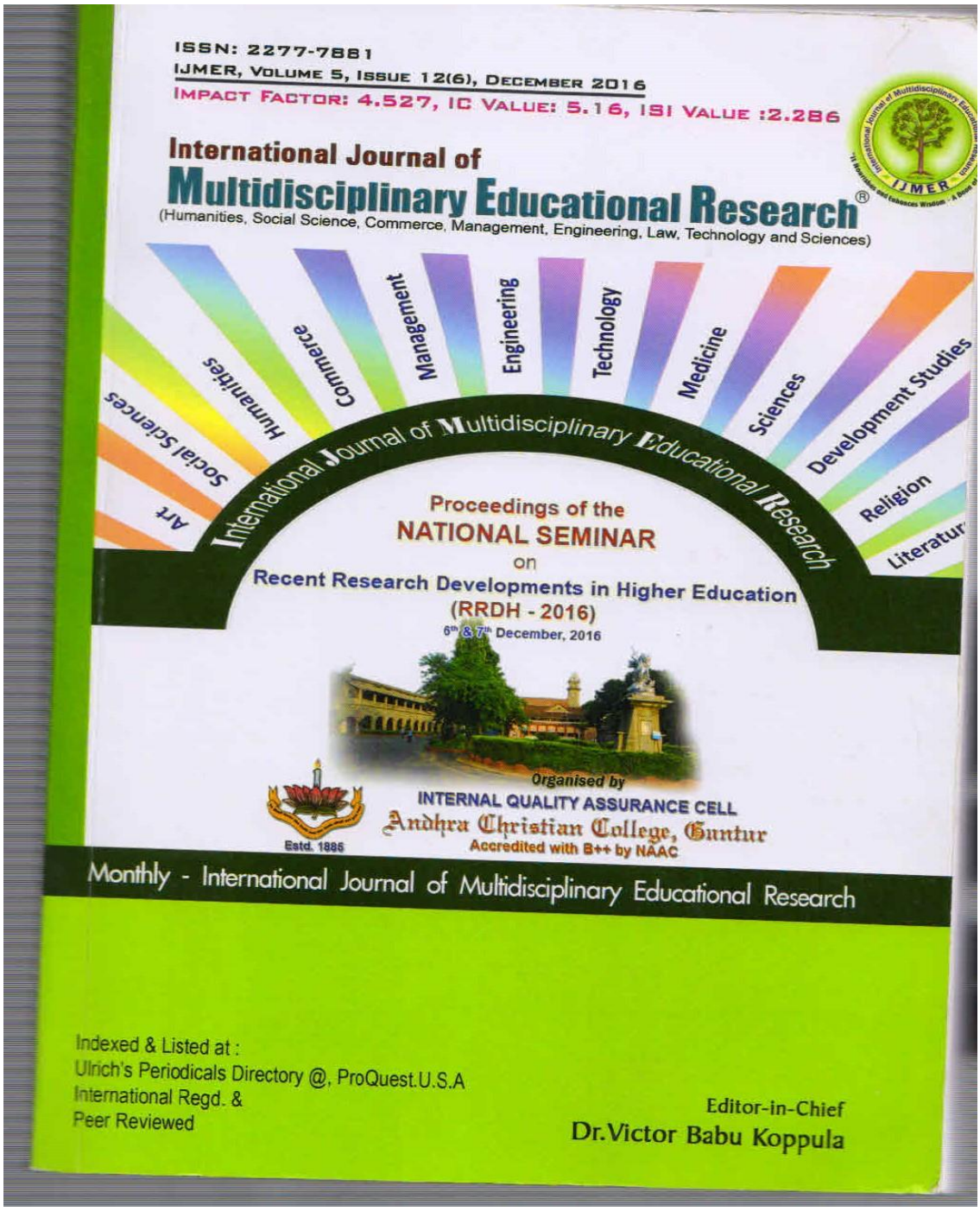
Copper Indium Diselenide[$CuInSe_2$]

A poly crystalline semi conductor compound of copper,indium and selenium has been one of the major research areas in thin film industry. It has the highest energy conversion of 17.7% in 1996 and also best among all the existing thin film materials. It is also one of the most light absorbent semi conductor. A 0.5 micrometer thick compound can absorb 90% of the solar spectrum. It is an efficient but complex material. Its manufacturing process involves hydrogen selenide, an extremely toxic gas. So it is not commercially available.

Conclusion

Though crystalline silicon has been the workhorse of the PV cells, thin film technology makes thin film PV cells dominate the market place and realize the goals of PV cells i.e., a low price and a reliable source of energy supply.

31. **Dr.G.Saraswathy**, presented a paper on 'Bench Marking Procedures and Practices for Quality Improvement in Higher Education Institutions' in National Seminar on Recent Research developments in Higher Education, AC.College, Guntur in International Journal of Multidisciplinary Educational Research vol 5,Dec 2016 with ISSN : 2277-7881 & Impact factor : 4.527, IC value:5.16,ISI valu:2.286 on 6th &7th Dec 2016.



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BENCHMARKING PRACTICES FOR IMPROVING INSTITUTIONAL PROCESSES AND PERFORMANCE

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Increasing competition, demands for accountability and knowledge explosion are changing the methods of how higher educational institutions should perform. For substantial and sustainable efficiency and productivity, a new method of functioning that makes "Quality" an integral part of institutional structure is required. Many quality parameters, which measure or benchmark the progress and success, are being developed. Among the improvement strategies and techniques like Total Quality Measurement [TQM] , setting up of IQAC & QAC cells in the educational institutions, accreditation by UGC bodies like NAAC , NBA , AICTE etc.., academic audits, "Benchmarking" has emerged as an effective, useful and easily understood tool for staying successful. Bench marking is an ongoing, systematic process for measuring and comparing the work processes of one institution to those of another higher performing institution. In this paper, the author would like to discuss about the realities in application, identification and adaptation of best practices benchmarking, the seven Criteria benchmarks laid by NAAC and selection of good benchmarking partners.

Best Practices Bench Marking In Higher Education

Increasing competition, demands for the accountability and knowledge explosion are changing the methods of how institutions of higher education perform. For higher education to enact substantial and sustainable changes in efficiency and productivity, number of new paradigm to measure or benchmark the progress and success are developed. Among many improvement strategies and techniques like total quality management [TQM], continuous quality improvement [CQI] etc.., academic audits "Benchmarking" has emerged as a useful, easily understood and effective tool.

The strategy of benchmarking is important both conceptually and practically and is used for improving administrative processes and instructional models at college and universities. Benchmarking is an ongoing, systematic process for measuring and comparing the work processes of one institution to those of another. The goal of benchmarking is to provide key personnel, in-charge of processes with an external standard for measuring the quality of internal activities and to help identify where opportunities for improvement may reside.

For most of institutions of higher education, the desire to learn from each other and to share aspects of best practices is not new. Such desire manifested themselves in many ways like academic and non-academic professional associations , visits by delegations from one higher education system to another, Collaborative working of professional bodies to support academic provision and to mediate standard. Thus, improving performance by collaboration or comparison with institutions is nothing new in higher education but the increasing interest in the formalization of such comparisons is new. Here, the intension is not merely copy the best practice but to adopt it and reapply some of the operational principle, that stem from it.

Benchmarking process is to establish benchmarks through the process which can be used in future to guide management in the quest for continuous improvement. It is generally recognized that benchmarking is a means of making comparisons of performance usually with a view to establish best practice methods and as such it is used to diagnose problems in performance and to identify areas of strength. The central purpose of benchmarking is to provide managers with an external point of reference or standard for evaluating the quality and cost of their organizations internal activities, practices and processes.

Benchmarking needs to be an ongoing systematic process for measuring and comparing the work processes of one organization with those of another by bringing and external focus on internal activities.

Types of Benchmarking:-

"Internal benchmarking" is a process in which comparisons are made of the performance of different departments, campuses with in an institution in order to identify best practices in the institution , without

necessarily having an external standard against which to compare the results.

In the external benchmarking, a comparison of performance in the key areas is based upon information from institutions which are seen as competitors.

External collaboration of benchmarking involves comparison with a large group of institutions who are not immediate competitors.

External trans-Industry (best in class) bench marking seeks to look at multiple industries in search of new and innovative practices, no matter what their source. It can lead to major improvements in the performance and has been described as "The ultimate goal of bench marking process", in practice, it may be difficult to opera – to analyze the results of such cross – industry comparisons and may also require a very high level of institutional commitment.

Implicit benchmarking is likely to increase in future as government and central funding agencies seek to apply benchmarking even to universities.

"Ideal type standards" where by a model is created based on idealized best practice, and then used as the basis to assess institutions on the extent to which they fit that model.

Activity based on benchmarking is a methodology in which a selected no. of activities , which are either typical or representative of the range of institutional provision , are analyzed and compared with similar activities in the other selected institutions..

Vertical benchmarking seeks to quantify the productivity and performance of a defined functional area. As this approach is generally based upon existing organizational structures , data collection is often more straight forward. Horizontal benchmarking seeks to analyze the productivity and performance of a single process that cuts across one or more functional areas.

Both horizontal and vertical benchmarks are the useful diagnostic tools in identifying and recognizing opportunities to improve an administrative process or function.

The most popular type of benchmarking currently being undertaken involves inextricable collaboration with institutions both

within the country and internationally. Higher education remains an essentially a combination of collaborative activity with institutions having a strong tradition of mutual support.

A common misconception is that benchmarking is relatively quick and inexpensive process but some critical mistakes, may be made by an organization attempting benchmarking They are 1. Ineffective leadership 2. Poor team selection and preparation 3. Inadequate support mechanisms for teams 4. imprecise objectives 5.Unrealistic time and cost expectations 6. Inadequate understanding of both data and practices 7. Inappropriate follow - up.

Practices of Benchmarking:-

So far as the methodologies for benchmarking are concerned, a wide variety of approaches are practiced. Spendolini's (1992) five steps process involves

1. Determining what to benchmark
2. Forming a benchmarking team
3. Identifying benchmarking partners
4. Collecting and analyzing information and taking action

Zairi (1996) presented a 16 step two-phase approach which distinguishes between actions to ensure the effectiveness of current process and those to gain the benefits of competitive bench marking.

Because the lack of data about implementation, the potentiality of bench marking has not been exploited with in higher education although numerous performance indicators and individual bench marks have been collected, A coherent management change strategy based on bench marking is rare. In practice, most institutional initiatives are probably best characterized as being of the "Implicit bench marking kind".

The difficulties of implementing process oriented bench marking are similar to those encountered in introducing the other comprehensive approaches to quality management like TQM. In majority of cases those bench marking activities that are attempted will be either relatively small in scale and under taken by enthusiasts for the process or driven by senior managers, and directed either priority functions or areas of perceived poor performance. For Adams 1997) the

idea of modest, honest, starting small and priority, the benefit of limited quality management initiatives, is the key to subsequent success. He suggests that this the only way that the resistance of many academic staff can be overcome.

Best in practice bench marking approach to quality management in Higher Education institutions, with a focus on practice and continuous improvement of standards involves five stages. It helps the institutions to play their role effectively in quality sustenance and enhancement. The five steps are 1.Identification 2.Implementation 3.Institutionalization 4.Internalization and 5.Disseminalization of best practices.

The identification of best practices depends on variables such as institutional goals, pedagogic requirements, and local contexts, and global concerns, competencies of staff, nature of learners, infrastructure facilities and governance requirements.

Best practices are limited in a number of ways. For example "Best Practices" depends on our own limited knowledge perception, contexts, interests and values.

The input, process and output factors should be taken into account in identifying the criteria of best practices. The criteria of Economy, efficiency and effectiveness may also be used in identification. The international network of Quality Assurance Agencies in Higher Education suggested some guidelines for the identification and application of best practices. The practices should be 1. Dynamic and revisited periodically 2. Recognize diversity, cultured and historical contexts 3. Not lead to dominance of one specific view or approach 4. Promote quality of performance.

Implementation of Best practices include planning, resource mobilization, capacity building, monitoring and evaluation. The implementation approach focuses more on performance with the participation of everyone in the organization. M.K.Gandhi said, we must be the change that we wish to see in the world.

Institutionalization of Best practices is the process of making the best practices as an integral and inextricable part of the institutional working. Institutionalization is an effort to make it more institution centric than leader or individual centric, and also to make the best practices as a normal practice.

Many practices are institutionally specific and individual managed.

These individuals have been the change agents, mobilizing and ensuring the wide-spread support of the campus community for the best practices. This approach may result in commendable improvement in the quality of institutions, but continuance and sustainability of those practices depends mainly on individual initiative and runs the risk of disruption or half hearted pursuit if and when the individual is displaced for any reason. If such practices are formalized, individual identity will be superseded by the anonymity of the function. Many practices require extra effort. To sustain that effort it has to become an integrated part of the functioning of the institution.

Internalization of best practices refers to individuals in the institution. Internalization of best practices means making excellence an integral part of one's habit and nature. i.e. making the principle and essence of the best practices as part of the characteristic performance of an institution. Such internalized best practices becomes "Tradition" of the institution. Markup the practice as strategy or value, Quality education is not entirely resourcefully specific. Attitudes play a critical role in quality assurance, Internationalization of best practice is an attitude formation conductive to sustaining quality in Higher Education.

Dissemination of Best Practices:

Educational institutions have the social responsibility of application of Best practices and also an equal responsibility of dissemination of these practices for wider application in the society as education is a public activity.

Due to lack of information about the feasibility and adoptability of the best practices, many Higher Education institutions do not attempt certain practices. We must learn and benefit from each other's experience. Institutions have to evolve suitable strategies like data base of good practices, review forums, recording evidence for success etc, to discuss within and among institutions. NAAC advocated every institution to establish Internal Quality Assurance Cell, with one of the functions of recording and dissemination of best practices followed by that institution.

The "best" as an "ideal" should be the Vision of every Higher Education institution. Stakeholders, policy makers, management, faculty, students should play effective role in quality sustenance and enhancement.

NAAC Criterion Benchmarks:

NAAC (National Assessment and Accreditation Council) initiated the concept of best practices bench marking.

NAAC in its assessments of quality education looks into how the various policies and processes of the institution determine the education provisions and consequently the quality of its performance. NAAC has identified the elements of the best practices that contribute to the efficient and effective functioning of the institution and they are called **criterion Statements.** They serve as bench marks. The criterion statements focus on the norms that generate the practices. The seven criterion statements are as follows:

Criterion – 1 : Curricular Aspects

Designing of the programmes of the institution that are consistent with the goals and objectives of the institution, with academic flexibility and effective feedback mechanism.

Criterion – 2 : Teaching – Learning and Evaluation

It include well conceived plan for monitoring student progress continuously, valid and reliable assessment procedures, open and participative mechanism for evaluation of teaching and opportunities for continued academic progress and professional development of the teachers.

Criterion – 3 : Research Consultancy and Extension

It includes the culture of promoting research among faculty and students, encouraging faculty to publish in academic forums and programmes relevant to community needs and related extension programmes.

Criterion – 4 : Infrastructure and Learning Resources

Adequate Infrastructure to run the educational programmes effectively, to keep the institution in pace with the academic growth and effective

maintenance mechanism, library and computer facilities with easy access as learning resources.

Criterion – 5 : Student support and progression

Clear information about admission and administration policies, effective mechanism to use student feedback for quality enhancement.

Criterion – 6 : Organisation and Management

Participatory and transparent governance, academic and administrative planning, relevant welfare schemes, effective resource mobilization, planning, development strategies, standardized budgeting and auditing procedures.

Criterion – 7 : Healthy Practices

Institution is geared to promote an ambience of creativity and innovation, adopting quality management strategies in all academic and administrative aspects, promotion of value based education, social responsibilities, and good citizenry.

On the basis of the data collected from the self study report, the peer team analyzes any gap between the performance expected with reference to the bench mark statement and the actual performance witnessed. Higher Education institution would like to know the practices that have contributed to enhancement of quality in the accredited institutions.

Emphasizing the need to reflect on best practices, the NAAC intends to make the identification and validation of best practices as a part of the re-accreditation strategy.

Stages involved in Best practices Benchmarking

A practice or method or process may be considered as best practice if it produces good results, better than the normal output. It should be a new or innovative use of technology or the man power and is recognized by different references as the best practice. It has received an external award or if that practice recognized by an industry expert or organizations utilizing it have a patent for that practice.

The organization's leaders must develop a specific and organized approach to implementing benchmarking. It must be established into

the organization as a working process. Different steps involved in benchmarking endeavors are as follows:

The first step is defining the process to be benchmarked. Then it is to be flow charted. This will help identify the problem areas and locate potential trouble areas. Then Measurements by which to compare future progress are to be established. Organisation's resources & circumstances to confine whether reforming process is affordable are to be prepared.

Thus we must have a sharply focused, clearly defined process that tells management what to be changed (bench marked), how much change can be achieved within given limitations and how to measure accurately the process against those of others and also institution's future projections.

Second step involves selection of organizations to be bench marked or whose practices can be adopted, organizations which can produce which can give useful, accurate and up to date information's, whether their practices are compatible with us, thus we must prepare a list of organization's from which we select an institution, a potential partner based on the superior quality of their process.

Third step involves creating a plan for collecting data from selected largest by conducting site visits and writing site visit report. Then institution will have complete, accurate and relevant data with which its own processes with "the best of the best".

Fourth step involves analyzing the data collected estimating to what degree present performance laps behind the best in each area and combining the best features from the best practices into an ideal process that can be implemented within budgetary and other constraints of organization.

In the fifth step, we'll examine organizations past performance both with and without the proposed bench, marking changes, implementation of this step will give management a clear idea of its options and allot it a relative conception of the potential benefits of adopting the benchmarking practices. Thus this step helps us in identifying the quantitative benefits of implementing the proposed benchmarking changes.

Six step is communicating the benchmarking result's and their implications to significant partness of the organization and motivating them to carry out the changes. The correct implementation of this step results in a complete understanding by the stakeholders of the necessity in the process involves and a desire to carry them out. Thus this step will ensure that the advantages of the changes have been cleared to the parties that involved in order to motivate them to carry it out.

Step seven involves revising goals to close the performance gap determined and achieving consensus on those goals. This will create relative and clear new standards for the processes involved. Thus this step establishes clear cut goals that management has approved and that all employees understand their achieved goals.

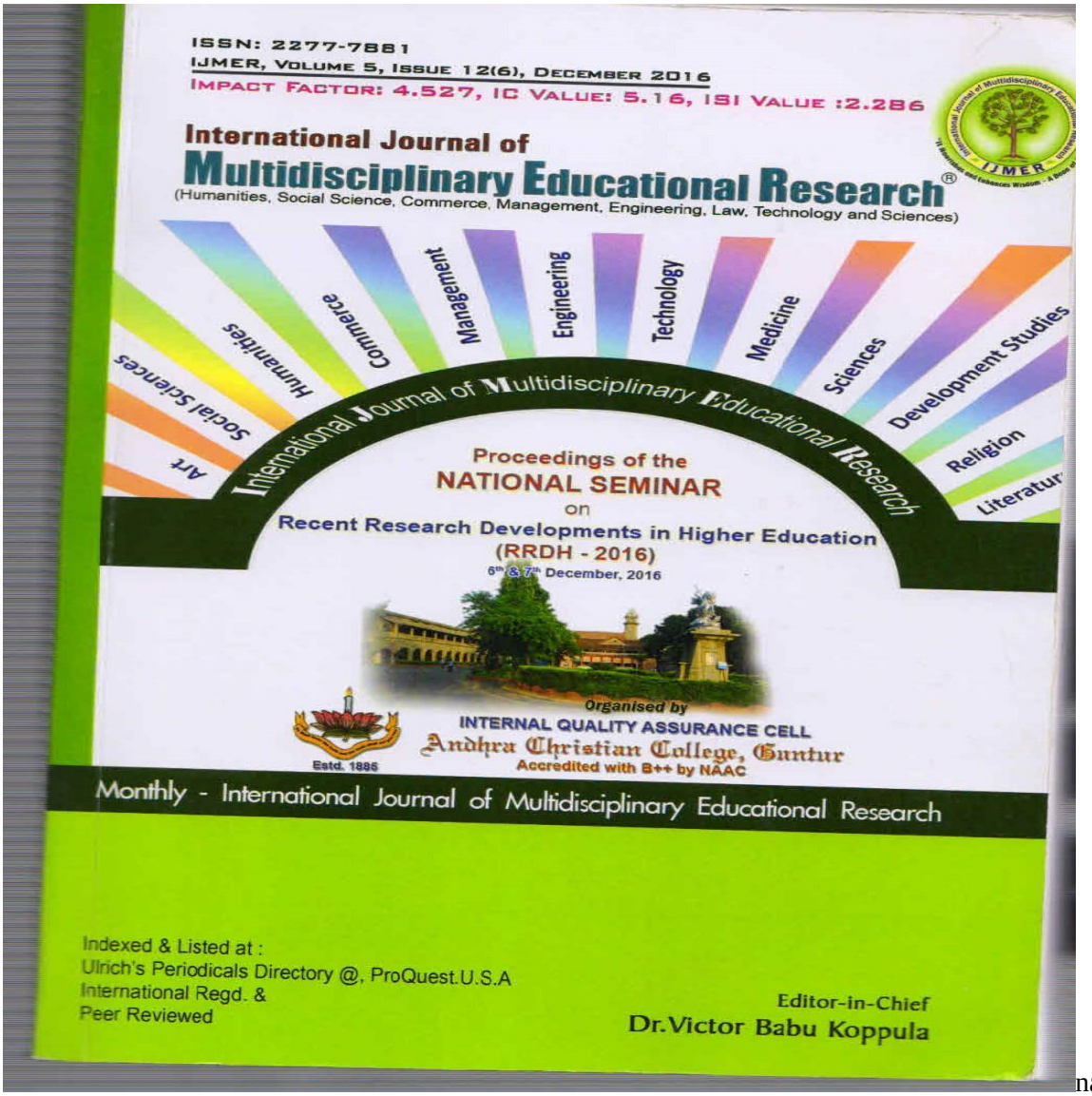
Eight step involves the plan of action to bring about the goals created and approved i.e., the order in which work practices should be implemented, prioritizing the factors that are most crucial, pros & cons of each factor, a schedule of action plan breaking all tasks into comprehensible sequential steps with specified results and resources needed. Identification of appropriate level of management giving them training and authority to manage the process is also important. Responsibilities and deadlines should be clearly displayed or circulated. Thus this step involves establishment plan of action approved by the management with specifies of the plan and allotted for empowered individuals to carry it out keeping in mind their specified goals and work procedure as a hall mark of the goal.

Step nine involves executing the approved best practice procedure and the day to day monitoring of the changes. i.e., creation of timeline charts reflecting the factor to the measured over the selected period of time, keeping lines of communication open to all that are involved, feedback on the process to note the any variance from the actual plan, recording the results and preparing the final report including which is to be accepted as a permanent practice and which is to be repeated. This step involves close monitoring of the changes and tracking of results.

Tenth step ensures the organization when and how it needs to recalibrate bench marks avoiding risk by becoming complacent.

The success of bench marking process depends on the commitment to the process by the organization. The habit of benchmarking must be a permanent part of the organization's culture. And it cannot be separated from the harmonious whole of the organization as it is an inextricable combination of the organization.

32.Presented a paper on benchmarking application in higher education in the national seminar on recent research developments in higher education on 6th and 7th December 2016 in the international journal of multidisciplinary educational research with ISSN 2277-7881 volume 5



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BENCHMARKING APPLICATION IN HIGHER EDUCATION

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Abstract

Benchmarking has proved to be an effective method for identifying the best practices and improving the quality and processes in an organization. The technique has been used widely in business and industry for couple of decades, and within a decade the concept has been broadly embraced and applied in higher education. This paper describes and presents a critical view of research works that have been done in the area of benchmarking and the effectiveness of the benchmarking application practices in higher education from the different perspectives. The purpose of this review is to identify the trend, critical issues, research methodologies, and implications of the research done, finally, some pragmatic suggestions are offered to improve the quality of local universities.

Key words: Benchmarking ,Organization , Higher Education , Institutions , Assessment and innovation , Collaboration , Best practices , Quality enhancement.

Need for Benching marking

Increasing competition, demands for accountability, and higher volumes of available information are changing the methods of how institutions of higher education operate in the mid-1990s. For higher education to enact substantial and sustainable changes in efficiency and productivity, a new way of thinking or paradigm that builds efficiency and a desire for continual learning must be integrated into institutional structures.

Origin and initial development

The term "benchmarking" originated in business and manufacturing firms. Sylvia Coding says that benchmarking was first used in Egypt in the olden times to scale the things by labelling the horizontal flat strip iron of stone at an accurate determined point as a bench. However, in recent decades, almost all authors who wrote about benchmarking linked the early application of it with American Xerox Corp which

found itself in deep trouble in 1979. At that time, Xerox was losing a significant share of the lucrative photocopier market to its Japanese counterparts which could sell cheaper product than Americans. Then Xerox conducted an analysis in its operation and compared it with Japanese firms' best practices. They examined why they failed, how things are done, and how Japanese did things in their various processes. As a result, by 1980, Xerox achieved to survive in market by producing competitive and quality productions and consequently won the prestigious Malcolm Baldrige national quality award in 1991. From the Xerox's experience, it is thus defined that benchmarking as a continuous, systematic process of evaluating companies recognized as industry leaders, to determine business and work processes that represent 'best practices' and establish rational performance goals (Zairi, 1996).

In the decades of 1980-90s benchmarking became one of the popular management tools in organizations to achieve quality and to learn best practices. Later it has been used by several companies like General Motors, Hewlett Packard, Dupont, Motorola, Royal Mail and others. Zairi (1996) described all benchmarking practices that have used by companies and business sectors including service, post office, financial sectors, electronic and IT sectors, telecommunication sectors, chemical industry, aerospace industry, automobile industry, health care and etc. As we know, knowledge develops by occurrence of changes. Teaching and learning is change itself. As Alstete says (1995), benchmarking is a great impetus for changes, it can help overcome resistance to change that can be very strong in conservative organizations, such as colleges and universities, that have had little operational change in many years. As Bender (2001) suggests, institutions must routinely evaluate all their aspects and make changes necessary to address its shortcomings, from the curriculum to the physical plant. Failure it, that means jeopardizing its future. A definite benefit of the benchmarking in higher education is self-analyzing, i.e. institutions are forced to study their own processes, collect information, and raise questions about the efficacy of current processes and systems in place.

Spendolini (1992) says benchmarking offers the opportunity for practitioners to think "out of the box" to discover new ideas, because in many instances leaders tend to work in their own "boxes" most of the time where they have been successful and are comfortable.

Benching marking Need in Higher Education

Benchmarking becomes relevant to higher education because of the external point of reference or standards it can provide to educational managers for evaluating the quality of the processes they manage. This approach is valuable for providing information to be used in the prioritization and decision-making processes of the institution. Generally, it has been used to justify budgets, or for obtaining more funding. Obviously, little of it has been used to improve the quality of higher education. The traditional data such as annual endowment growth, educational and general operational expenditures per student, research income generated, class size, student/faculty ratio, library holdings, student success rate and rate of employment of students do not address the issue of quality enhancement directly and explicitly, although they are tangentially relevant. It is here that the application of the Best Practices Benchmarking can make a meaningful contribution to quality enhancement.

Traditionally, educational organizations are natured for spreading and sharing of knowledge, collaboration in research and, assistance to each other. Several authors advocated that benchmarking is more suitable in higher education than business sector, due to its collegial environment, which encourages easily to collaborate and cooperate. As Schofield says despite increasing market pressures, higher education remains an essentially collaborative activity with institutions having a strong tradition of mutual support. Alstete says, due to its reliance on hard data and research methodology benchmarking is especially suited for institutions of higher education in which these types of studies are very familiar to faculty and administrators.

Application in various parts of the world

Currently in the USA, Benchmarking practices are widely used by professional associations like NACUBO (National Association of College and University Business Officers), ACHE (The Association for Continuing Higher Education) and other universities such as Chicago, Oregon, Pennsylvania, Utah and etc., and private consulting companies like "The Benchmarking Exchange" (www.benchnet.com), or "Educational Benchmarking" (www.webebi.com).

The benchmarking methodologies followed to transfer in European and Australian higher education recently after 1990. In Europe some

centres are currently famous in using and successfully doing the benchmarking programs such as: European Center for Strategic Management of Universities (www.esmu.be) in Belgium, Centre for Higher Education Development (CHE www.che.de) in Germany, UNESCO-CEPES – European Centre for Higher Education (www.cepes.ro), Universidade de Aveiro (www.ua.pt) in Portugal.

Dearing Report on the future of higher education in UK specifically recommends that a new quality assurance agency should "work with institutions to establish small, expert teams to benchmark information on academic standards". The EFQM Excellence Model is a framework for organizational management systems, promoted by the European Foundation for Quality Management (EFQM) and designed for helping organizations in their drive towards being more competitive.

Russian author Knyazev also confirms that, the adoption of benchmarking in higher education strengthened recently after declining state budget on higher educational institutions. They sought to find alternative ways of finance, and at same time they bothered to persevere the efficiency and quality, and to satisfy the stakeholders.

The early benchmarking exercise in Australian universities undertaken by the Teaching and Learning Development Unit at Queensland University of Technology in 1995 to compare the ways in which university teachers undertaking the Graduate Certificate in Education are prepared for teaching. Since 1995, Australian universities also joined to American NACUBO project but consequently participants have not continued this participation due to being reluctant commitment. In the USA benchmarking was first introduced in higher education by nAcuBo (national Association of colleges and university Business officers, www. nacubo.org). overall, early approaches developed in the US were not true benchmarking in our use of the term but "the generation of management information which produces performance indicators and may lead to identification of benchmarks, but does not often extend to benchmarking by identifying best practice and adapting them to achieve continuous improvement in institutional contexts".

In Australia, as elsewhere, the development of benchmarking was linked to the quality enhancement movement and the need to demonstrate comparative quality and efficiency of university

operations. Benchmarking approaches have been developed at the national level, internationally, by universities themselves or with the support of consulting firms. in its report on Benchmarking in Higher education, AuQA, the Australian Universities Quality Agency, concluded that much more needed to be done since there was little systematic use of benchmarking to monitor institutional performance, that there was no clear view of the reasons to initiate benchmarking strategies and a lack of clear understanding of the approach.

In Europe, benchmarking approaches in the higher education sector have developed from the mid-1990s at the national level, either as an initiative launched by a national body, by one or a group of higher education institutions or by an independent body. these usually only involved a small number of institutions and were on a voluntary basis. transnational level exercises have so far been fairly limited. these benchmarking exercises have adopted a mixture of quantitative, qualitative and processes-oriented approaches. the degree to which these were structured depends on experience and purposes.

The eSmu European Benchmarking programme (www.esmu.be) is an example of a transnational benchmarking exercise which goes beyond the mere comparison of data by focusing on the effectiveness of university-wide management processes. in a collaborative way, the programme works with small groups of higher education institutions towards the identification of good practices. The method was originally developed from the one used for the Malcom Baldridge national Quality Award and for the eFQm European excellence model.

Conclusion

In order to be applied effectively to education, benchmarking may be seen as an ongoing systematic means for determining the best practices of the best-in-class institutions, and using the information as basis for goals, strategies and implementation. Establishing benchmarks through best practices is not a new concept in higher education.

In the light of the discussion of the best practices presented above, it is hoped that the deliberations of the conference at both the plenary and the workshops would help identify benchmarks and also concrete instances of proven quality-facilitative outcomes. The practices themselves may be of little use if they are not validated according to parameters which emerge from the discussion.The substantial

improvements in both quality and performance achieved through the use of benchmarking by many private and public sector institutions is a convincing rise for the effectiveness of the approach, but whether this can be achieved in a comprehensive way within universities is less certain.

It is evident that a large amount of interesting work is currently being undertaken, and much of this will need to be evaluated carefully before the benefits can be compared to the significant amount of resources (especially time) that are involved. In addition, numerous small scale initiatives, driven by supportive leadership, are likely to multiply and more activity will become evident, but beyond this the use of benchmarking at the level of whole institutions is more problematic.

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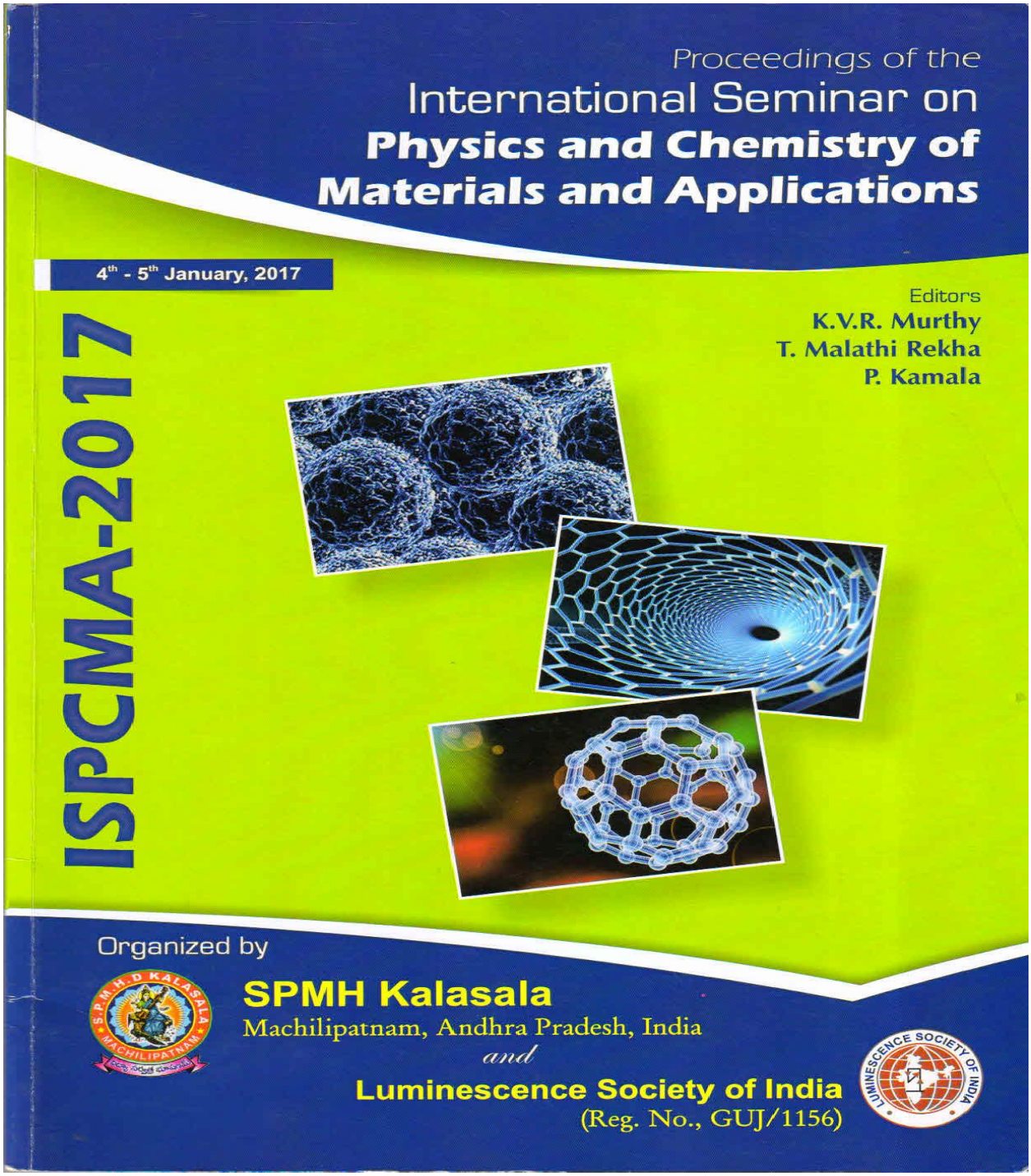
33. **Dr.G.Saraswathy**, presented a paper on' Light Emitting Diodes – Light Sources in Electronics' in International seminar on 'Physics and Chemistry of Materials and Applications' at SPSHMK College ,Machilipatnam with ISBN 978-93-82570-84-4 on 4th& 5th Jan2017



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Light Emitting Diodes[LEDs] - Light Sources in Electronics

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ABSTRACT

"Incandescent bulbs lit the 20th century; The 21st century will be list by LED lamps" It was a statement given by the Royal Swedish Academy Of Sciences, which awards the Noble prizes to those who have conferred the greatest benefit to mankind. LEDs are environment friendly and energy efficient. The blue LED can also be made to excite a phosphor into emitting red and green light with the mixture yielding white light. LEDs do not use mercury which makes them environment friendly. In contrast to the incandescent bulbs and fluorescent lamps, the LEDs directly convert electricity into light particles. If the amount of light flux produced per unit of power supplied is 16 for a tungsten bulb and 70 for a fluorescent bulb, it is 300 for a LED supplied source. This would drastically lower our power consumption if LED lights are used more.

Luminescence is emission of light by a substance not resulting from heat or a form of cold body radiation. It can also be caused by chemical reactions, electrical energy, sub atomic motions or stress on a crystal. The term "luminescence" was introduced in 1888 by Eilhard Wiedemann. Electroluminescence [EL] is an optical phenomenon and electrical phenomenon in which a materials emits light in response to the passage of an electric current or to a strong electric field. In light emitting diodes, light is produced by a solid state process called electroluminescence. The particular semi conductors used for LED manufacture are Gallium Arsenide[GaAs], Gallium Phosphide[GaP] or Gallium Arsenide Phosphide[GaAsP]. The different semi conductor materials and different impurities result in different colours of light from the LED.

Electroluminescence is the result of radioactive recombination of electrons and holes in a material, usually a semiconductor. The excited electorns release their energy as photons – light. Prior to recombination electrons and holes may be separated by doping the material to form a p – n junction (as in semiconductor electroluminescent devices such as LEDs) or through excitation by impact of high energy electrons accelerated by a strong electric field, (as with the phosphors in electroluminescent displays.

Electroluminescent devices are fabricated using either organic or inorganic electroluminescent materials. The most typical inorganic thing film EL is ZnS:Mn. The range of electroluminescent material include:-

- *Powdered Zinc Sulfide with copper or silver.*
- *Thin Film Zinc Sulfide with doped with manganese.*
- *Natural blue diamond with traces of boron.*
- *Semiconductors containing group III and group V elements such as InP, GaAs and GaN.*
- *Certain organic semiconductors.*

LED lighting can be more efficient, durable, versatile and longer lasting. LEDs are emerging out as a reliable, budget friendly and eco-friendly lighting solution. Low Power requirement, high efficiency, long life are benefits of LEDs compared with incandescent and fluorescent illuminating devices. Their typical applications include indicator lights, LCD panel, black lighting, flat panel computer displays, fiber optic data transmission, remote control, opto-isolator. Basically LEDs are just tiny light bulbs that fit easily into an electrical circuit but unlike ordinary incandescent bulbs, they do not have a filament that will burn out. The life span of an LED surpasses the short life of an incandescent bulb by thousands of hours. Tiny LEDs are replacing the tubes that light up LCD HDTVs to make thinner televisions. LED tubes are slimmer and shorter than regular tube lights and do not produce too much heat and UV radiation.

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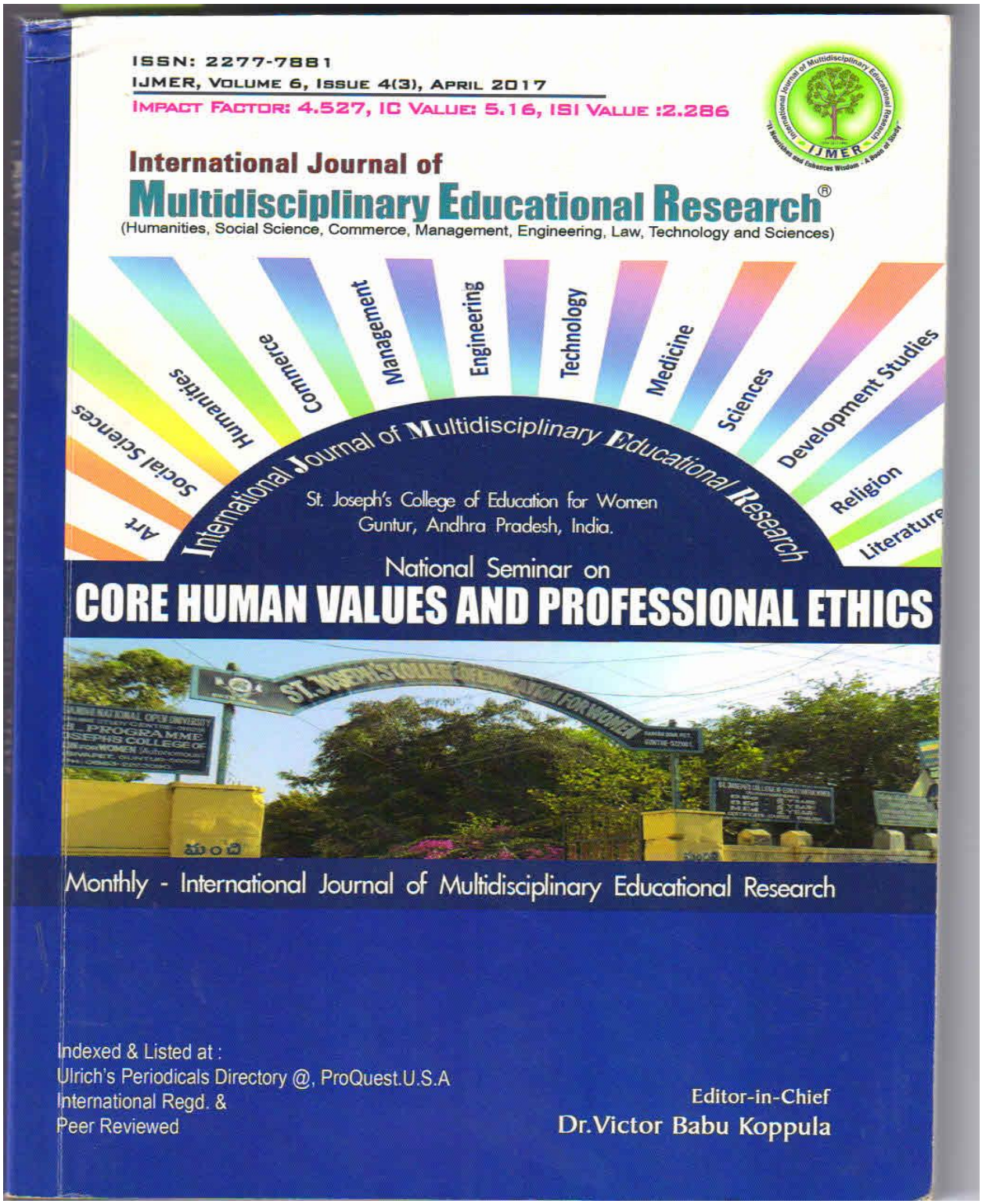
LED efficiency and life span drop at higher temperature which limits the power that can be used in lamps. Thermal management of high power LEDs is a significant factor in design of solid state lighting equipment. LED lamps are sensitive to excessive heat which could cause lamp failure and fire.

LED technology has now developed to the point where there are several different types of LEDs which are finding applications in a variety of areas. As a result many new areas of LED development have been opened up in recent years, allowing for a considerable degree of growth, making LEDs one of the fastest growing sectors in the electronic component industry.

Solar – powered LED lights are also taking the world by storm. From providing illumination to possible future applications such as generating UV light for treating bacteria – infested water, the blue LED has come to stay.

Keywords— *Incandescence, Electroluminescence, LEDs, Semiconductor diodes, thin films.*

34.Dr.G.Saraswathy, presented a paper on "Human values and education" in National Seminar on Core Human Values And Professional Ethics at St.Joseph's college of Education , Guntur on April 2017 in International Journal of Multidisciplinary Educational Research vol 5with ISSN : 2277-7881 & Impact factor : 4.527, IC value:5.16, ISI value :2.286



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HUMAN VALUES AND EDUCATION

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Human values are integral part of every person. They represent the qualities of a person. Individual value priorities arise out of adaptation to life experience. Socio demographic characteristics contribute to explaining individual differences in value priorities as they represent difference sects of life experience. Thus whatever effects the life circumstances to which we must adapt can influence value priorities. How much virtues and vices are filled in depends solely on the parents, teachers, circumstances and environment.

However, every one can be inculcated with human values by friends, well-wishers and even strangers. Self education of human values is also possible by meeting, learning and reading about great individuals, living a holistic life. Educational experiences presumably promote the intellectual openness flexibility, and breadth of perspective essential for self direction values. In addition education correlates positively with achievement values. The constant grading and comparing of performance could account for this. Moral values such as thoughtfulness generosity, honesty, impartiality, courage, love of truth, self control are ideal qualities. Patriotism, freedom, justice, respect are held high in every nation.

Role of Culture and Religion:

Cultural orientation should be the necessary part of the educational programme for moral and spiritual development. We get glimpses of India's value system in scriptures and epics. They tell us about the right conduct. Lives and the achievements of great men inspire the young to lead a higher life.

It is necessary to induct moral and ethical values, if we want to arrest the growing indiscipline, intolerance and violence which ultimately lead to national disintegration. The truths that are common to all the religions should be taught to all children.

India's culture is closely interwoven with spiritual values. Dharma (Right conduct) and Truth are basic tenets of Indian culture. Un-

selfishness, sacrifice and renunciation are important components of Indian culture. Mercy and Forgiveness are the salient features of Indian culture. Respect for women and universality are the Noble characteristics of Indian culture. Indians called their culture" Manava Dharma" (Human culture).

Inculcating Values in Integrated Education:

Education is a powerful and pervasive agent for all round development of individual and social transformation. Without education civilization can not progress. According to Sri Radha Krishnan "Moral and spiritual training is an essential part of education. Values like co-operation, tolerance, neighbourliness austerity ,should be exercised in right earnest in the continual course of education. According to Rabindranath Tagore" education must aim at the development of moral, spiritual and ethical values. Education must teach us to respect each other, universal brotherhood, universal love and to practice compassion and to uphold the dignity of all lives.

Modern education has ignored the heart. In the name of modernization professionals are looking for materialistic progress. The meaning of education in the 21st century is teaching to live by machines and gadgets and not by the universal human vales like truth, non-violence, love and co-operation. Leisure and social get-together are generally neglected. The fast pace of life and madness for money are badly mistaken for 'progress' Impatience is becoming the ruling principle. Integrity in character, public manners and social controls are breaking down .Man is looked at as multi-functionary machine and not as an organic being. Materialistic development and crimes have begun to grow together. Technology goes handy to the criminals and often we hear about high-tech cheating, forgery, killing etc..

Now the higher education scenario in India is that it has lost moorings with human values and culture. The primary function of education no longer the building of character or the promotion of moral order, but the emphasis has shifted to the promotion of skill, technical know how and technology for material progress. Also it is encouraging the promotion of careerism without human values

Altruism, selfless service to fellow human beings and idealism are things of the past. Social tensions unrest prejudices and complexes transmitted through the social environment vitiate the quality of life.

The system of education that blends secular knowledge with spiritual knowledge which helps students to learn self sacrifice. Education must broaden the heart and must expand one's love. It requires integration of human values in teaching pedagogies and help students inculcate values naturally on their own will,

Value based education with objectives like (1) to instill in the youth a deep awareness and respect for the principles enshrined in the constitution, (2) to promote awareness of the cultural heritage with the commitment to their presentation as well as enrichment of their environment and ecology (3) to develop qualities of discipline, self reliance, concern for public welfare and scientific temper (4) to provide maximum access to education for personality development (5)to make the youth to involve in promoting peace is the need of the hour.

Value based education teaches the youth that knowledge and skill are not the only requisites to succeed in life but a positive attitude and human way of action. Teachers should not produce learned monsters, skilled psychopaths, educated Eichmanns.

CONCLUSION:

The basic of all training or education must be shaping of the character or the integrity of a personality. The character comprises of righteousness, truthfulness, politeness, nobility, honesty, humility and many such ideal qualities.

Original Research Article **ISSN; 2411-1376**

Title: Development and Validation of RP-LC Method for Simultaneous Estimation of Amlodipine Besylate and Valsartan in Bulk and Its Pharmaceutical Formulations

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Abstract:

The developed new method for the simultaneous estimation of Amoldipine besylate and Valsartan in tablet formulations is simple, rapid, selective, precise and accurate .The present work has been developed by non isocratic reverse phase high performance liquid Chromatography assay method. The separation was carried out by using column Symmetry C18, (150 x 4.6 mm, 3.5 µ) (Make: Waters), in mobile phase consisted of Acetonitrile and pH 3.0 triethylamine buffer. The flow rate was 1.0 mL/min, column oven temperature 35 oC, the injection volume was 10 µL, and detection was performed at 237 nm using a photodiode array detector (PDA), Run time 20 min. The retention time of amlodipine besylate and valsartan, was noted to be 5.2 min and 8.5min respectively, indicative of rather shorter analysis time. The method was validated as per ICH guidelines. The proposed method was found to be accurate, reproducible, and consistent.

Keywords: Aves, Insulin, Molecular evolution, Amino acid Substitution

Site this Article:

K Geetha Bhavani, N Srinivasu, Nanduri Gayatri Devi and D. Ramachandran, Development and Validation of RP-LC Method for Simultaneous Estimation of Amlodipine Besylate and Valsartan in Bulk and Its Pharmaceutical Formulations, *journal de afrikana*, 2016, 3(4); 261-273.

1.1 INTRODUCTION

Amlodipine is long acting calcium channel blocker. It is dihydropyridine derivative used in the treatment of hypertension and coronary artery disease [1]. Because the parent compound had very poor oral bioavailability, amlodipine is available as the amlodipine besylate pro drug, which has improved oral absorption. The molecular structure of the amlodipine was shown in the Fig: 1.1.

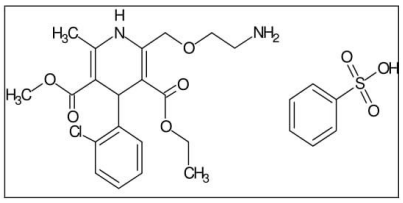


Fig.1.1 Chemical structure of amlodipine besylate

Chemical name is 2-[(2-Aminoethoxy)-4-(2-chlorophenyl)-1, 4-dihydro-6-methyl-3,5-pyridine di-carboxylic acid-3-ethyl 5-methyl esters [7].Molecular formula $C_{20}H_{25}CIN_2O_5$ $C_6H_6O_3S$, molecular weight 567.1 gm/mol, white to off-white crystalline powder . Slightly soluble in water and sparingly soluble in ethanol. Amlodipine is a dihydro pyridine [6] calcium antagonist (calcium ion antagonist or slow-channel blocker) that inhibits the transmembrane influx of calcium ions into vascular smooth muscle and cardiac muscle. Amlodipine binds to both dihydropyridine and non dihydropyridine binding sites. The contractile processes of cardiac muscle and vascular smooth muscle are dependent upon the movement of extracellular calcium ions into these cells through specific ion channels [4]. Amlodipine does also act as FIASMA (functional inhibitor of acid sphingomyelinase) [3]. Valsartan (trade name Diovans) is an angiotensin-II receptor antagonist, acting on the AT-1 subtype. In the U.S, valsartan is indicated for treatment of high blood pressure, of congestive heart failure, and post-myocardial infarction [2]. In 2005, Diovan was prescribed more than 12 million times in the United States. It is tetrazole derivative, used in treatment of hypertension. The molecular structure of the valsartan was shown in the **Fig: 1.2.**

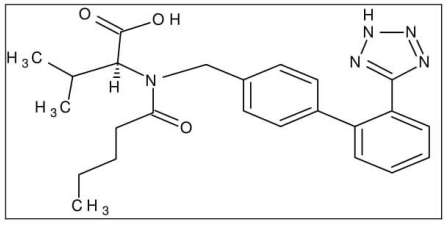


Fig: 1.2 Chemical structure of valsartan

Valsartan competes with angiotensin-II for binding at the AT_1 receptor subtype [5]. As angiotensin-II is a vasoconstrictor which

also stimulates the synthesis of aldosterone, blockage of its effects results in a decrease in systemic vascular resistance. Chemical name is N- (1-Oxophenyl) -N- [[2'-(1H-tet-razol-5yl) [1,1'-biphenyl]-4-yl]methyl] -l-valine [8].Molecular formula $C_{24}H_{29}O_3N_5$, molecular weight 432.51 gm/mol, white to practically white fine powder. It is soluble in ethanol and methanol and slightly soluble in water.

Literature survey reveals the availability of some methods for estimation of amlodipine besylate (AMBL) and valsartan (VAL) includes, RP-HPLC [9-14], TLC [15-16], LC-MS [17], UV spectrometry [18-21], Spectro flourometric [22], capillary electrophoresis [23] and HPTLC [24] alone are in combination with other drugs. Only very few HPLC estimations have been reported in the literature for the determinations of amlodipine and valsartan present in bulk, formulations and biological fluids.

1.2 Materials and Methods:

1.2.1. Chemicals and Reagents

Analytical-grade Triethylamine, Orthophosphoric acid, Methanol, Acetonitrile and Water HPLC-grade, were from Merck Chemicals, Mumbai, India. Millex syringe filters (0.45 µm) were from Millex-HN, Millipore Mumbai, India. All dilutions were performed in standard class-A, volumetric glassware.

1.1 Instrumentation and Chromatographic Conditions

1.3.1 Instrumentation

Waters 2489 U.V-Visible detector/2695 Separation Module, equipped with Empower 2 software, Bandelin ultrasonic bath, pH Meter (Thermo Orion Model), Analytical Balance (Metller Toledo Model) were use in the present assay.

1.3.2 Buffer preparation

2.0 ml of triethylamine was transferred in to a beaker containing 1000 ml of water and mixed. The solution pH was adjusted to 3.0 ± 0.05 with ortho phosphoric acid, Filtered the solution through 0.45µm membrane filter.

1.3.2 Mobile phase-A:

pH 3.0 buffer.

1.3.3 Mobile phase-B:

Acetonitrile

1.3.4 Diluent preparation

A degassed mixture of buffer and methanol in the ratio of 50: 50 v/v prepared.

1.3.5 Standard preparation:

Amlodipine besylate 70 mg and 64 mg of valsartan are weighed and transferred into

100 ml volumetric flask, sonicating for 10 min and diluted to volume with diluents and mixed.From the above standard solution 5 ml was pipetted and transferred into a 25 ml volumetric flask, diluted to volume with diluents and mixed.

1.3.6 Sample preparation:

The combination of AMBL and VAL are available in the ratio of 1:16, 1:32. The tablet taken for the assay contains 10 mg of AMBL and 320 mg of VAL. The final concentration of AMBL and VAL were 100 ppm and 128 ppm respectively.

1.3.7 Chromatographic conditions

Symmetry C-18, (150 x 4.6 mm, 3.5µ) Column was used for analysis at 35°C column temperature. The mobile phase was pumped through the column at a flow rate of 1.0mL/min. The sample injection volume was 10 µL. The photodiode array detector was set to a wavelength of 237nm for the detection and Chromatographic runtime was 20 minutes.

1.4 Results and Discussion

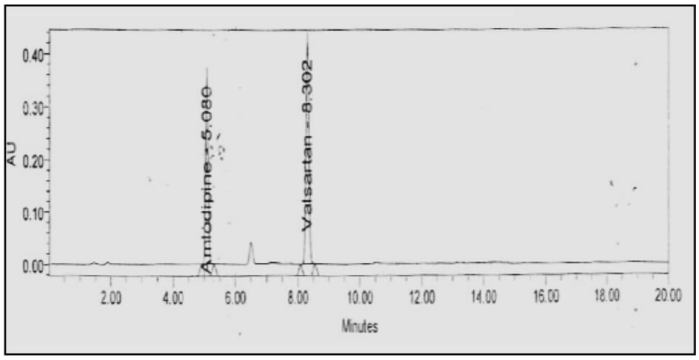
1.4.1 Method development

To develop a suitable and robust LC method for the determination of Amlodipine besylate and Valsartan, different mobile phases were employed to achieve the best separation and resolution. The method development was started with Agilent Zorbax C-18, (150 × 4.6 mm, 5 µ) with the following mobile phase. Accurately transfer 1.0 ml of orthophosphoric acid into 1000ml water and mixed well. Then filtered through 0.22 µ nylon membrane filter and degassed it is used as mobile phase-A. Mobile Phase-B as used aetonitrile: methanol in the ratio of (1:1). Detector wavelength 237 nm, column temperature 40 ^{o}C, Injection volume 10 µL and Flow rate 1.2 ml/min used. Peak shapes were not satisfactory for both amlodipine and valsartan and the retention time of amlodipine and valsartan were found to be 10.05 and 15.216 min respectively.

For next trial the Column was changed Symmetry C18, (150 x 4.6 mm, 3.5 µ); particle size 5µm) Column was used. The mobile phase composition was 2.0 ml of triethylamine was transferred in to a beaker containing 1000 ml of water and mixed. The solution pH was adjusted to 3.0 ± 0.05 with ortho phosphoric acid, filtered through 0.22 µ membrane filter.It is used as Mobile phase-A. Mobile Phase-B used as aetonitrile. Detector wavelength 237 nm, column temperature 35 ^{o}C, Injection volume 10 µL and Flow rate 1.0 ml/min used. Run time 20 min.

Peak shape was satisfactory in both standard and sample preparations. Retention time of amlodipine and valsartan were found to be 5.080 and 8.302 min acceptable. The chromatogram of Amlodipine besylate and Valsartan standard using the proposed method is shown in **(Fig-3.)** System suitability results of the method are presented in **Table-1.**

Figure 3: A typical HPLC Chromatogram showing the peak of AMBL and VAL



1.5 Method validation

The developed RP-LC method extensively validated for assay of Amlodipine besylate and Valsartan using the following Parameters.

1.6 Specificity:

1.6.1 Blank and Placebo interference

A study to establish the interference of blank and placebo were conducted. Diluent and placebo was injected into the chromatograph in the defined above chromatographic conditions and the blank and placebo chromatograms were recorded. Chromatogram of Blank solution **(Fig. no.-3)** showed no peaks at the retention time of Amlodipine besylate and Valsartan peak. This indicates that the diluent solution used in sample preparation do not interfere in estimation of Amlodipine besylate and Valsartan in tablets. Similarly Chromatogram of Placebo solution **(Fig. no.-4)** showed no peaks at the retention time of Amlodipine besylate and Valsartan peak. This indicates that the Placebo used in sample preparation do not interfere in estimation of Amlodipine besylate and Valsartan in Amlodipine besylate and Valsartan tablets.

The chromatogram of Amlodipine besylate and Valsartan Blank using the proposed method is shown in **Fig- 4**.

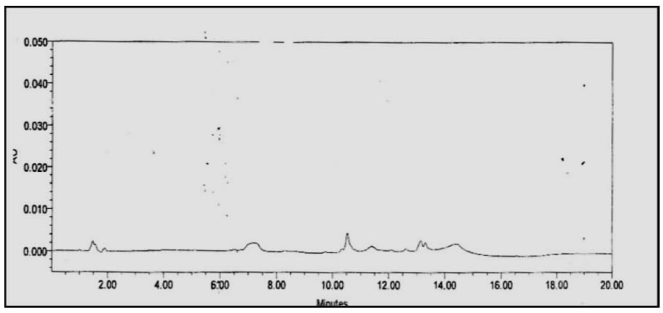


Figure 4: HPLC Chromatogram showing the no interference of Blank for AMBL and VAL

The chromatogram of Amlodipine besylate and Valsartan Placebo using the proposed method is shown in **Fig-5**.

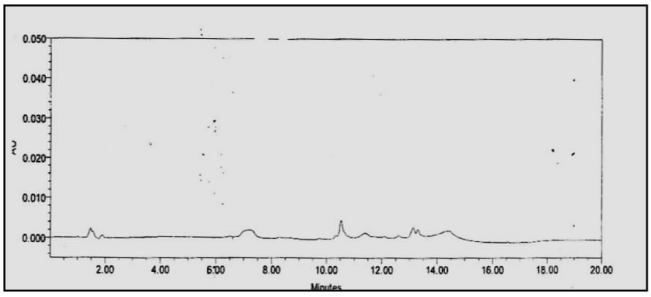


Figure 5: HPLC Chromatogram showing the no interference of placebo for AMBL and VAL

Table 1: System suitability parameters for AMBL and VAL by proposed method

Parameters	AMBL			VAL		
	Mean	SD	%RSD	Mean	SD	%RSD
RT	5.0735	0.006737	0.13279	8.3024	0.00911	0.10969
Peak area	2585903	495.6531	0.01917	2767763	887.432	0.03206
USP plate count	7172.23	11.4703	0.15992	11750.61	20.0869	0.17094
Tailing factor	1.0891	0.011005	1.01	1.11	0.01959	1.76487

1.7 Precision

In the study of the instrumental system precision where, a RSD of 0.05% was obtained for the standard area of Amlodipine besylate and 0.06 for Valsartan obtained corresponding to the first day, Similarly being 0.06% for Amlodipine besylate hydrochloride and 0.07% for Valsartan for the second day, respectively.

The method precision study for six sample preparations in marketed samples showed a RSD of 0.3% for Amlodipine besylate. Similarly the method precision study for six sample preparations in marketed samples showed a RSD of 0.2% for Valsartan.

For the intermediate precision, a study carried out by the same analyst working on different day. The results calculated as inter-day RSD corresponded to 0.1 % (For Standard of Amlodipine besylate) and 0.1% (For Standard of Valsartan). Both results together with the individual results are showing that the proposed analytical technique has a good intermediate precision.

Table 2: Method Precision studies for AMBL and VAL by proposed method

S.NO	AMBL		VAL	
	RT	**Peak area**	**RT**	**Peak area**
1	5.089	2587057	8.311	2768666
2	5.077	2583803	8.294	2774111
3	5.078	2586938	8.298	2780808
4	5.080	2581580	8.302	2777299
5	5.082	2585085	8.304	2782394
Mean	**5.081**	**2584893**	**8.302**	**2776655**
%RSD	**0.3**	**0.1**	**0.1**	**0.2**

1.8 Accuracy

The accuracy of the method was determined on three concentration levels by recovery experiments. The recovery studies were carried out in triplicate preparations on composite blend collected from 20 tablets of Amlodipine besylate and Valsartan, analyzed as per the proposed method. The percentage recoveries with found in the range of 98.4 to 100.2 with an overall %RSD of 0.48 for Amlodipine besylate and The percentage recoveries with found in the range of 98.8 to 100.2 with an overall %RSD of 0.50 for Valsartan. From the data obtained which given in **Table-:3** and **Table-:4** the method was found to be accurate.

Table 3: Recovery studies for Amlodipine besylate by proposed method

Concentration of spiked level	Amount added (ppm)	Amount found (ppm)	% Recovery	Statistical analysis of % recovery	
50% sample	50.08	49.63	99.1	Mean	99.78
	50.56	50.4	99.68	SD	0.534
	50.03	49.53	100.1	%RSD	0.535
100% sample	100.01	98.46	98.36	Mean	99.28
	100.13	99.391	99.26	SD	0.462
	100.23	100.07	100.15	%RSD	0.468
150% sample	150.12	150.05	99.95	Mean	99.28
	150.23	150.15	99.96	SD	0.447
	150.3	149.94	99.76	%RSD	0.4471

Table 4: Recovery studies for Valsartan by proposed method

Concentration of spiked level	Amount added(ppm)	Amount found (ppm)	% Recovery	Statistical analysis of % Recovery	
50% sample	64.58	64.32	99.59	Mean	99.13
	64.98	64.17	98.75	SD	0.505
	64.63	64.01	99.04	%RSD	0.595
100% sample	128.86	127.23	99.07	Mean	99.39
	129.03	128.76	99.79	SD	0.701
	129.45	128.69	99.41	%RSD	0.698
150% sample	192.56	192.36	99.89	Mean	100.22
	193.98	191.64	98.79	SD	0.35
	192.66	192.24	100.23	%RSD	0.249

1.9 Linearity of detector response

The standard curve was obtained in the concentration range of 50-150µg/ml for Amlodipine besylate and 50-150µg/mL for Valsartan. The linearity of this method was evaluated by linear regression analysis. Slope, intercept and correlation coefficient [r2] of standard curve were calculated and

given in **Figure-5** For Amlodipine besylate and **Figure-6** For Valsartan to demonstrate the linearity of the proposed method. From the data obtained which given in **Table-5** For Amlodipine besylate and **Table-6** For Valsartan the method was found to be linear within the proposed range.

Table 5: Linearity studies for Amlodipine besylate by proposed method

Linearity Level	Concentration (ppm)	Average area	%RSD	Statistical Analysis	
L1-50%	50.56	1292693.3	0.58	Slope	-3168
L2-60%	60.08	1551226.8	0.47	Y-intercept	25798
L3-80%	80.45	2068302.4	0.36	% of Y-intercept	0.132
L4-100%	100.23	2585378.2	0.57	Correlation Coefficient R^2	1
L5-120%	120.26	3102453.6	0.49		
L6-150%	150.5	3878068.2	0.52		

Figure 5: Calibration curve for Amlodipine besylate

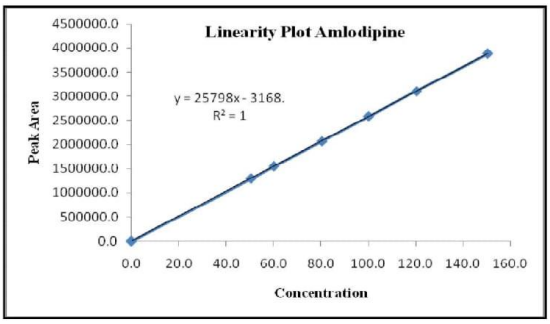
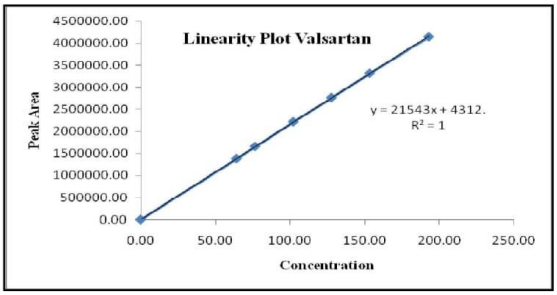


Table 6: Linearity studies for Valsartan by proposed method

Linearity Level	Concentration (ppm)	Average area	%RSD	Statistical Analysis	
L1-50%	64.3	1384334.6	0.45	Slope	4312
L2-60%	76.8	1661201.52	0.35	Y-intercept	21543
L3-80%	102.4	2214935.36	0.56	% of Y-intercept	0.149
L4-100%	128	2768669.2	0.58	Correlation Coefficient R2	1
L5-120%	153.6	3322403.04	0.39		
L6-150%	193.2	4153003.8	0.48		

Figure 6: Calibration curve for Valsartan



1.10 CONCLUSION

The simultaneous estimation of Amlodipine besylate and Valsartan was developed and validated by using RP-HPLC method as per ICH guidelines. The results obtained indicate that the present method is rapid, accurate, selective, and reproducible. Linearity was observed over a concentration range of 50-150µg/ml for Amlodipine besylate and 50-150µg/mL for Valsartan. The method has been successfully applied for the analysis of marketed tablets. It can be used for the routine analysis of formulations containing any one of the above drugs or their combinations without any alteration in the assay. The main advantage of the method is the common chromatographic conditions adopted for all formulations. Therefore, the proposed method reduces the time required for switch over of chromatographic conditions, equilibration of column and post column flushing that are typically associated when different formulations and their individual drug substances are analyzed. We have developed a fast, simple and reliable analytical method for determination of Amlodipine besylate and Valsartan in pharmaceutical preparation using RP-LC. As there is no interference of blank and placebo at the retention time of Amlodipine besylate and Valsartan. It is very fast, with good reproducibility and good response. Validation of this method was accomplished, getting results meeting all requirements. The method is simple, reproducible, with a good accuracy and precision. It allows reliably the analysis of Amlodipine besylate and Valsartan in bulk, its different pharmaceutical dosage forms.

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Development and Validation of RP-LC Method for Ritonavir in Pharmaceutical Formulations

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ABSTRACT

A new, simple, rapid, selective, precise and accurate isocratic reverse phase high-performance liquid Chromatography assay method has been developed for estimation of Ritonavir in tablet formulations. The separation was achieved by using column X-Terra RP18 (4.6x100 mm), 3.5µ (Make: Waters), in mobile phase consisted of Acetonitrile and pH 6.8 Phosphate buffer (0.01M) in the ratio of (50:50, v/v). The flow rate was 1.0 mL.min-1 and column oven temperature ambient temperature, the injection volume was 10 µL. The separated Ritonavir was detected using UV detector at the wavelength of 239 nm. The retention time of Ritonavir was noted to be 4.35 min respectively, indicative of rather shorter analysis time. The method was validated as per ICH guidelines. The proposed method was found to be accurate, reproducible, and consistent.

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INTRODUCTION

Ritonavir is an antiretroviral drug from the protease inhibitor class used to treat HIV infection and AIDS. Viruses are smallest microorganisms which not only take nutrition from host cell but also direct its metabolic machinery to synthesize new virus particles. Anti-viral drugs are active against these viruses and can target virus-specific steps like cell penetration, uncoating, reverse transcription, virus assembly or maturation.

Antiretroviral Drugs [1] are active against the human immunodeficiency virus (HIV). The first Antiretroviral drug Zidovudine was developed in 1987. Over past 20 years, more than 20 drugs belonging to 3 classes have been developed. Mechanisms of drugs act like Nucleoside Reverse Transcriptase inhibitors (NRTI), Non-Nucleoside reverse transcriptase inhibitors (NNRTIS) and Protease inhibitors.

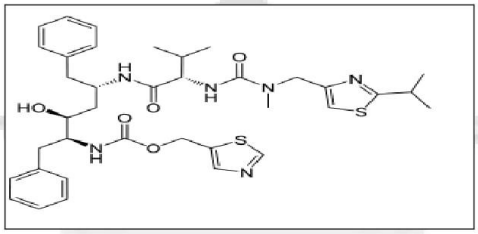

Fig.1 The structure of Ritonavir

IUPAC names**:** 1,3-thiazol-5-ylmethylN-[(2S,3S,5S)-3-hydroxy-5-[(2S)-3-methyl-2-[methyl({[2-(propan-2-yl)-1,3-thiazol-4-l]methyl})carbamoyl]amino}butanamido]-1,6-diphenylhexan-2-yl] carbamate. Ritonavir is a white or almost white powder, Ritonavir has a bitter metallic taste. Freely Soluble in Methanol and Methylene chloride. Very slightly soluble in Acetonitrile; practically insoluble in water. Ritonavir was originally developed as an inhibitor of HIV protease. It is one of the most complex inhibitors. It is now rarely used for its own antiviral activity but remains widely used as a booster of other protease inhibitors. More specifically, Ritonavir is used to inhibit a particular liver enzyme that normally metabolizes protease inhibitors, cytochrome P450-3A4 (CYP3A4). The drug's molecular structure inhibits CYP3A4, so a low dose can be used to enhance other protease inhibitors. This discovery, which has drastically reduced the adverse effects and improved the efficacy of PI's and HAART, was first communicated in an article published in the AIDS Journal in 1997 by the University of Liverpool. This effect does come with a price: it also affects the

efficacy of numerous other medications, making it difficult to know how to administer them concurrently. In addition, it can cause a large number of side-effects on its own.

Literature review revealed that several methods were developed for quantitative estimation of Antiretroviral drugs such as voltammetric [2], capillary electrophoresis [3], spectrofluorometer [4], spectrophotometer [5], and liquid chromatography-(LC) [6-18]. Moreover, voltammetric, capillary electrophoresis, spectrophotometry, spectrofluorometry involves tedious procedure and too many steps which do not satisfy the determination of the samples. Hence, in the present study new sensitive, economical, stability indicating RP-HPLC method was developed and validated in accordance with ICH guidelines.

MATERIALS AND METHODS

Experimental

Chemicals and Reagents

Analytical-grade Potassium dihydrogen phosphate, Sodium Hydroxide pellets, Acetonitrile and Water HPLC-grade, were from Merck Chemicals. Mumbai, India. Millex syringe filters (0.45 µm) were from Millex-HN, Millipore Mumbai, India.

Instrumentation

Waters 2489 U.V-Visible detector/2695 Separation Module, equipped with Empower 2 software, Bandelin ultrasonic bath, pH Meter (Thermo Orion Model), Analytical Balance (Mettler Toledo Model) were used in the present assay.

Buffer preparation

1.3g of Potassium dihydrogen phosphate was dissolved in 1000ml of milli Q water and pH adjusted to 6.8 ± 0.05 With NaOH solution. The solution was filtered through 0.45µ filter paper and degassed.

Mobile phase preparation

Buffer and Acetonitrile were mixed in the ratio of 50:50v/v respectively, filtered and degassed.

Diluent preparation

Water and Acetonitrile were mixed in the ratio of 1:1v/v respectively.

Standard preparation:

Weighed accurately and transferred about 100 mg of Ritonavir working standard into 200 ml volumetric flask. About 170 ml of diluent was added and sonicated to dissolve. Volume was made up to with diluent and mixed well. 10 ml of above solution was taken in 50 ml volumetric flask, diluted up to mark with diluent (100 ppm). Solution was mixed well and filtered through 0.45µm filter.

Sample preparation:

Weighed 10 tablets of the Ritonavir and crushed. Average weight of the Ritonavir tablets was transferred into 200 ml volumetric flask. Added 170 ml of diluent and sonicated for 20 minutes with intermittent shaking in cold water, made up to the volume with diluent and mixed well. 10 ml of above solution was taken in 50 ml volumetric flask, diluted up to mark with diluent (100 ppm). The solution was filtered through 0.45 µm PVDF membrane filter.

Chromatographic conditions

Chromatographic analysis was performed on X-Terra RP18 (4.6x100mm), 3.5µ (Make: Waters) column. The mobile phase consisted of Acetonitrile and pH 6.8 Phosphate buffer (0.01M) in the ratio of (50:50, v/v). The flow rate was 1.0 ml/min, column oven temperature ambient temperature, the injection volume was 10 µl, and detection was performed at 239 nm using a photodiode array detector (PDA).

RESULTS AND DISCUSSION

Method development

Spectroscopic analysis of compound Ritonavir showed maximum UV absorbance (λmax) at 239 nm. To develop a suitable and robust LC method for the determination of Ritonavir, different mobile phases were employed to achieve the best separation and resolution. The method development was started with Inertsil-ODS-3V, 150x4.6mm, 5µ with the following different mobile phase compositions like that 50:50 water, Acetonitrile mixture , 50:50 0.01M Phosphate buffer (pH 3.0), Acetonitrile mixture, 50:50 0.01M Phosphate buffer (pH

3.0), Acetonitrile mixture. It was observed that when Ritonavir was injected, Peak Tailing, not satisfactory.

For next trial, the mobile phase composition was changed slightly. The mobile phase composition was 50:50 0.01M Phosphate buffer (pH 6.8), Acetonitrile mixture. Respectively as eluent at flow rate 1.0 ml/min. UV detection was performed at 239 nm. The retention time of Ritonavir was 4.35 minutes and the peak shape was good.

The chromatogram of Ritonavir standard using the proposed method is shown in **(Fig: 2)** system suitability results of the method are presented in **Table-1.**

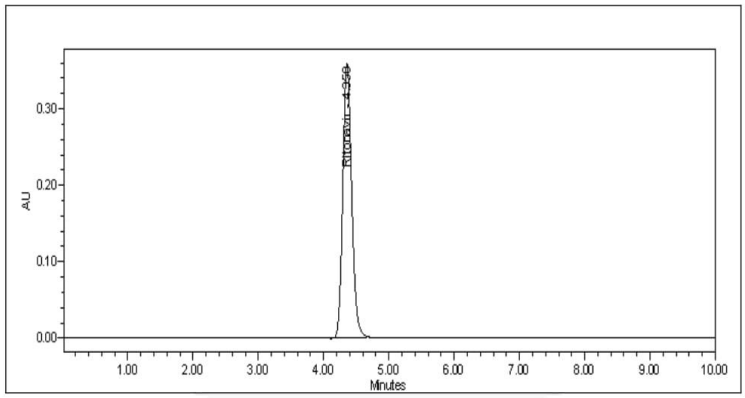

Fig. 2: Chromatogram showing the peak of Ritonavir

METHOD VALIDATION

The developed RP-LC method extensively validated for assay of Ritonavir using the following parameters.

Specificity

Preparation of blank solution:

Water, Acetonitrile were mixed in the ratio of 50:50 and degassed.

Preparation of Placebo solution:

Placebo solution was prepared in duplicate by weighing the equivalent amount of excipients present in the finished drug product and analyzed as per proposed method. Interference due to placebo was evaluated for each of the placebo preparations.

Blank and Placebo interference

A study to establish the interference of blank and placebo were conducted. Diluent and placebo were injected into the chromatograph in the above defined chromatographic conditions and the blank and placebo chromatograms were recorded. Chromatogram of blank solution **(Fig: 3)** showed no peak at the retention time of Ritonavir peak. This indicates that the diluent solution used in sample preparation do not interfere in estimation of Ritonavir in Ritonavir tablets. Similarly, chromatogram of placebo solution **(Fig: 4)** showed no peaks at the retention time of Ritonavir peak. This indicates that the placebo used in sample preparation do not interfere in estimation of Ritonavir in Ritonavir tablets.

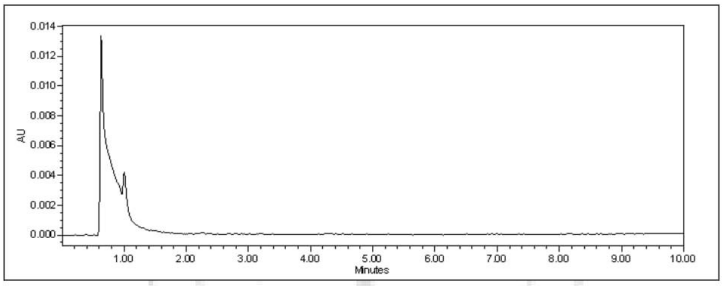

Fig: 3 Chromatogram showing the no interference of diluent for Ritonavir

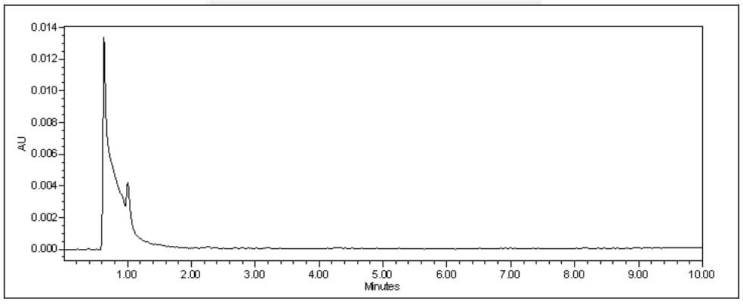

Fig: 4 Chromatogram showing the no interference of placebo for Ritonavir

Table 1: System suitability parameters for Ritonavir by proposed method

Name of the Compound	**Retention Time**	**Theoretical plates**	**Tailing factor**
Ritonavir	4.35	13123	1.2

System precision:

The standard solution was prepared as per the test method, injected into the HPLC system for six times and evaluated the % RSD for the area responses. The chromatogram was shown in **Figure: 5** and data were shown in **Table: 2**

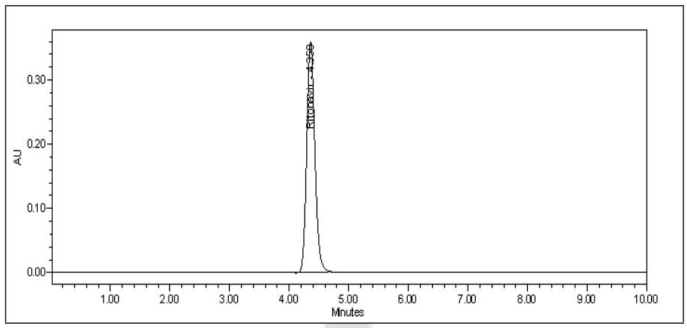

Fig: 5 System precision standard chromatogram

Table: 2 System precision data for Ritonavir

No. of injections	Peak area response
1	3388949
2	3387682
3	3424050
4	3394325
5	3402068
6	3398582
Average	**3399276**
% RSD	**0.4**

Method precision:

The precision of test method was evaluated by doing assay for six samples of Ritonavir tablet as per test method. The content in mg and % label claim for Ritonavir for each of the test

preparation was calculated. The average content of the six preparations and % RSD for the six observations were calculated. The chromatogram was shown in **Figure: 6** and data were shown in **Table: 3**

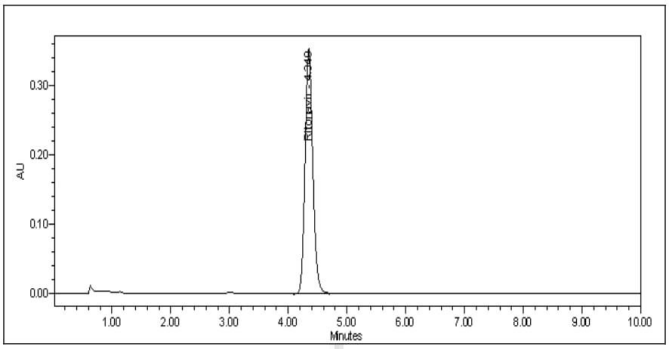

Fig: 6 Method precision sample chromatogram

Table: 3 Method precision data for Ritonavir

Sample Number	% Assay
1	98.2
2	98.1
3	98.5
4	99.4
5	97.7
6	97.9
Mean	**98.3**
% RSD	**0.5**

Linearity of detector response

The standard curve was obtained in the concentration range of 200.0-800.0µg/ml for Ritonavir. The linearity of this method was evaluated by linear regression analysis. Slope, intercept and correlation coefficient [r2] of standard curve were calculated and given in **Fig. 7**

to demonstrate the linearity of the proposed method. From the data obtained which given in **Table: 4** the method was found to be linear within the proposed range.

Table: 4 Linearity studies for Ritonavir by proposed method

Level no.	Linearity concentration	Drug concentration (in ppm)	Response for Ritonavir
1	40%	200	1355584
2	60%	300	2053915
3	80%	400	2711167
4	100%	500	3388949
5	120%	600	4063500
6	140%	700	4659774
7	160%	800	5422334

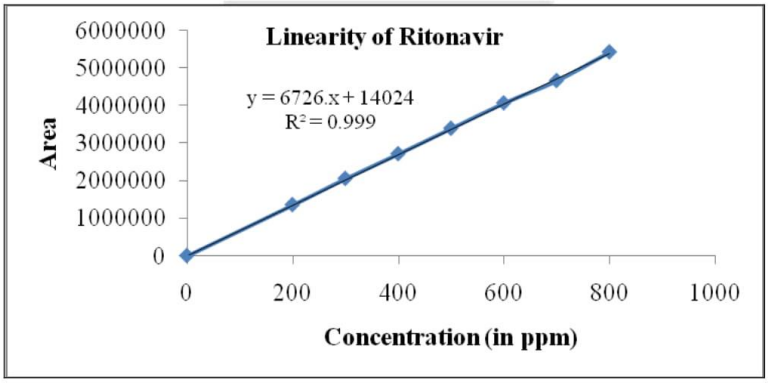

Fig. 7 Calibration curve for Ritonavir

Accuracy

The accuracy of the method was determined on three concentration levels by recovery experiments. The recovery studies were carried out in triplicate preparations on composite blend collected from 20 tablets of Ritonavir, analyzed as per the proposed method. The percentage recoveries with found in the range of 99.5 to 100.2 for Ritonavir. The data obtained which given in **Table: 5** the method was found to be accurate.

Table: 5 Recovery studies for Ritonavir by proposed method

S. No.	% Spike level	Amount added (mg)	Amount recovered (mg)	% Recovery	% Mean recovery	%RSD
1.	50	50.12	50.20	100.2	100.1	0.2
2.		50.06	50.15	100.2		
3.		50.13	50.02	99.8		
1.	100	100.08	100.15	100.1	99.9	0.2
2.		100.02	99.80	99.8		
3.		100.07	99.96	99.9		
1.	150	150.03	149.94	99.9	99.7	0.2
2.		149.98	149.20	99.5		
3.		150.08	149.52	99.6		

CONCLUSION

An RP-HPLC method for estimation of Ritonavir was developed and validated as per ICH guidelines like Accuracy, Precision, Linearity, Specificity and System suitability. The results obtained were within the acceptance criteria.

The proposed method was applied for the determination of Ritonavir in marketed formulation. Hence, the proposed method was found to be satisfactory and could be used for the routine analysis of Ritonavir in tablet dosage form.

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Short communication

Determination of genotoxic impurity in atazanavir sulphate drug substance by LC–MS

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ABSTRACT

A sensitive LC–MS method was developed for the determination of *tert*-butyl 2-[4-(pyridine-2-yl) benzyl] hydrazine carboxylate (GTI-A), a genotoxic impurity in Atazanavir sulphate drug substance. The method was validated as per International Council for Harmonization guidelines, for QL, DL, linearity and accuracy. The QL and DL values obtained were 1.1 ppm and 0.3 ppm respectively. The Correlation coefficient found for the linearity study was 0.999. The % recovery of the added impurity in the range of 96.4–100.4 ensured the accuracy of the method.

1. Introduction

The international regulatory bodies from various regions have been emphasized the determination of impurities in the drug substances and drug products because of their toxicological concern [1]. Genotoxic impurities are those have potential to cause cancer [2]. These impurities (GTIs) carry to a drug substance in the manufacturing process as starting materials, reagents, intermediates, by-products, degradants, etc. [3]. If impurity contains structural alert for mutagenicity, it can be considered as a genotoxic impurity [4]. The European Medicines Agency released guidelines on the control of GTI and ICH also released guidelines on Genotoxic impurities [ICH M7] [4,5]. These guidelines proposed a threshold of toxicological concern value (1.5 μg/day). The limit for the determination of these impurities was set based on the maximum daily dose (MDD) of the drug. Atazanavir sulphate (Fig. 1a) is an HIV-1 protease inhibitor (PI) and sold under the trade name **Reyataz**. The chemical name of atazanavir is [methyl *N*-[(1*S*)-1-{[(2*S*,3*S*)-3-hydroxy-4-[(2*S*)-2-[(methoxycarbonyl)amino]-3,3-dimethyl-*N*′-{[4-(pyridin-2-yl) phenyl]methyl}butane hydrazido]-1-phenylbutan-2-yl]carbamoyl}-2,2-dimethylpropyl] carbamate]. Its molecular formula is $C_{38}H_{52}N_6O_7{\cdot}H_2SO_4$, which corresponds to a molecular weight of 802.9 (sulfuric acid salt). *Tert*-butyl 2-[4-(pyridine-2-yl) benzyl] hydrazine carboxylate (GTI-A) (Fig. 1b) is a chemical used in atazanavir sulphate process at early stage. Since there is a structural alert, it is essential to control and prove that this material is not carried to final stage. Atazanavir sulphate is available in different dosages 150, 200 and 300 mg. Based on the daily dosage, the limit of GTI-A was fixed as 3.8 ppm. The authors attempted to develop an LC–MS method for the determination of GTI-A and validated.

2. Materials and methods

2.1. Chemicals and reagents

The Atazanavir sulphate Drug substance was obtained from Hetero Drugs limited (R&D), Hyderabad, India. The GTI-A (*Tert*-butyl 2-[4-(pyridine-2-yl) benzyl] hydrazine carboxylate) was obtained

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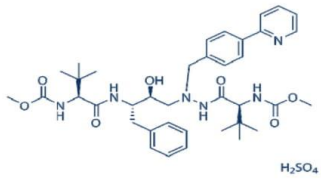
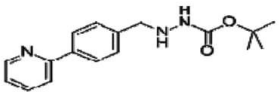


a). Atazanavir sulphate



b). Tert-butyl 2-[4-(pyridine-2-yl)benzyl] hydrazine carboxylate (GTI-A)

Fig. 1. Structures of Atazanavir sulphate and GTI-A.

from Rampex labs (P) ltd, Hyderabad, India. Ammonium formate (AR grade) formic acid (AR grade), high pure acetonitrile and methanol (HPLC grade) were obtained from Merck Life sciences, Mumbai, India.

2.2. Instrumentation

LC–MS analysis was carried out on LC–MS 2010 EV single quadrupole mass spectrometer having LCMS solutions software (Shimadzu Corporation, Kyoto, Japan). The voltages of interface, CDL and detector were set as 4.5 kV, 5 V and 1.9 kV respectively. The temperatures of interface, CDL and heat block were kept as 250 °C, 250 °C and 200 °C respectively. The nebulisation gas flow was 1.5 mL/min.

2.3. Chromatographic conditions

The method was carried out using Symmetry C18, 75 mm length, 4.6 mm id and 3.5 μ particles size (Waters Corporation, Milford, Massachusetts, USA). The eluent was a 0.01 M ammonium formate (pH adjusted to 3.0 ± 0.05, with dilute formic acid), Acetonitrile and methanol in the ratio 50:40:10 (v/v/v). The flow rate, column oven temperature and auto sampler temperature were set as 0.4 mL/min, 30 °C and 10 °C respectively. The injection volume was set as 15 μL.

2.4. Sample preparation

Methanol was used as diluent. The test, atazanavir sulphate concentration was fixed at 1.0 mg/mL based on detector response. The standard solution of GTI-A was prepared with a concentration of 3.8 ppm with respect to the test concentration. Test sample spiked with standard at limit level (3.8 ppm) was prepared by dissolving 10 mg of test sample with standard solution in a 10 mL volumetric flask.

3. Results and discussion

3.1. Method development

The limit for GTI-A in atazanavir sulphate was identified as 3.8 ppm based on the MDD of the drug. There are some literature reports available for the determination of process related and degradant impurities in atazanavir sulphate [6]. No literature is available for the determination of GTI-A, the authors are attempted to develop and validate the method for the determination of GTI-A in atazanvir sulphate. Initially the trials were carried out using HPLC UV method with phosphate buffer and acetonitrile in gradient mode. But, the requirement is the detection of GTI-A at 3.8 ppm, which is very low, the attempts were failed to get the sensitivity. Hence, the authors changed the detection mode to MS, and an LC–MS method was developed. The Mass was identified as 300 (M + 1), different trails were carried out by changing the voltages and temperatures, the conditions were fixed as given in Section 2.2. After several trails studied with different combinations of 0.01 M ammonium formate and acetonitrile and methanol, the mobile phase was finalised as 0.01 M ammonium formate, acetonitrile and methanol in the ratio 50:40:10 (v/v/v). The method was optimized and validated as per the guidelines [7].

3.2. Method validation

The developed method was validated as per ICH guidelines to assess the suitability. Specificity of the method was ensured by mass spectral detection. DL and QL of the method were established by injecting GTI-A standard solution. The S/N ratio of the standard solution was recorded. Then the standard solution was diluted sequentially to obtain DL and QL concentration values such that they yield S/N ratios as 3:1 and 10:1, respectively. These concentrations were confirmed by preparing and injecting the respective GTI-A standard solution with derived concentrations. The linearity of the developed method was verified over a concentration range of 1.1–5.7 ppm (QL, 50%, 75%, 100%, 125%, 150%). Calibration curve was plotted for the peak areas (Y-axis) of GTI-A versus concentrations (X-axis). The slope, intercept and correlation coefficient values were determined by the linear least squares regression analysis (Table 1) and the regression equation is y = 16424x + 3356. The correlation coefficient value was found above 0.999 indicating the best fitness of the calibration curve. System precision was studied by injecting six times of GTI-A standard solution at limit level. Method precision was ensured by injecting six preparations of GTI-A standard solution. Precision at QL was obtained from linearity study. Intermediate precision was studied by preparing QL solution and analysed six different days. %RSD of all the above determinations were calculated and found below 10. This indicated good precision of the method. Test sample was spiked with GTI-A at limit level and QL level for the study of accuracy. These solutions

Table 1
Analytical Method Validation Data.

Parameter	Result
Detection Limit (ppm)	0.3
Quantitation Limit (ppm)	1.1
Linearity Range (ppm)	1.1–5.7
Slope	16424
Intercept	3356
Correlation Coefficient	0.999
Precision at QL Level (% RSD)	2.93
System Precision (% RSD)	0.482
Method Precision (% RSD)	0.916
% Recovery at QL Level	96.4–100.4
% Recovery at Limit Level	90.5–105.6

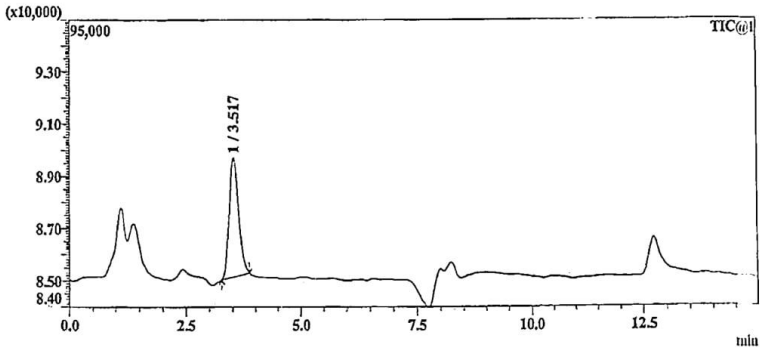


Fig. 2. Test spiked with GTI-A at limit level.

were analysed by the developed method and calculated the percent recovery. The recovery ranged from 80% to 120% indicated good accuracy of the method. The robustness of the method was studied by altering flow rate (by ±0.1 mL), pH of the buffer (±0.2 units) and methanol concentration in mobile phase by 10%. GTI-A standard solution at limit level was injected six times in all the cases and calculated the %RSD. The cumulative % RSD values from method precision (method conditions) and robustness study (altered conditions) were calculated. These values were well within the limit (not more than 15.0%), demonstrated the robustness of the method. Test solution spiked with GTI-A standard solution at limit level was prepared for solution stability study (Fig. 2). This solution was injected six times at different intervals like 0 h, 6 h, 12 h, 24 h and 48 h. The% variation of GTI-A content in the initial and each interval was calculated and found below 10%. This indicated that the solution is stable for a period 48 h. All the validation results were tabulated in Table 1.

4. Conclusion

The findings of our current studies prove that the developed and validated method for the determination of *tert*-butyl 2-[4-(pyridine-2-yl)benzyl] hydrazine carboxylate (GTI-A), a genotoxic impurity in atazanavir sulphate drug substance is a sensitive LC–MS method in respect of QL, DL, linearity and accuracy. This method can be used in Quality control laboratories of pharmaceutical industry if and when required.

Acknowledgements

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Tandem Mass Spectrometric Method for the Estimation of Melxiocam in Plasma Samples: Application to Pharmacokinetic Studies

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A simple sensitive and specific tandem mass spectrometric (LC-MS/MS) method for the determination of meloxicam in human plasma using Phenomenex Gemini C_{18} column (50 mm × 4.6 i.d, 5 µm) was developed. The analyte and the internal standard repaglinide were extracted from plasma by liquid-liquid extraction and a mixture of 5 mM ammonium acetate (pH 5.5 ± 0.3) and acetonitrile in the ratio of 10:90 (v/v) was used as mobile phase. The retention times of meloxicam and internal standard were 0.96 and 1.52 min, respectively. Detection was carried out using API 3200 (MDS Sciex) with a mass spectrometer operating in selected reaction monitoring mode. The flow rate maintained was 0.800 mL/min with a run time of 2.2 min. The method had a lower limit of quantification of 1 ng/mL. The calibration curve was demonstrated to be linear over the concentration range of 1.00 to 2503.85 ng/mL. The within-batch and between batch precision values for meloxicam at lower limit of quantification are 5.8 to 7.9 % and 7.9 % and accuracy are 93.6 to 103.8 % and 97.9 %, respectively. The pharmacokinetic parameters for meloxicam was found to be T_{max}-4.6 h, C_{max}-1014.2 ng/mL, $t_{1/2}$-18.8 h, $AUC_{0\text{-}T}$-10142.0 ng/mL and $AUC_{0\text{-}\infty}$-10333.5 ng/mL. The entire results obtained in the study were well acceptable to a pharmacokinetic study in human volunteers.

Keywords: Meloxicam, LC-MS, Human plasma, Selected reaction monitoring mode.

INTRODUCTION

Meloxicam (MX, Fig. 1), 4-hydroxy-2-methyl-N-(5-methyl-2-thiazole)-2H-1,2-benzothiazine-3-carboxamide-1,1-dioxide, is a potent non-steroidal anti-inflammatory drug (NSAID) of the oxicam derivatives which shows preferential inhibition of cyclo-oxygenase-2 (COX-2) and prostaglandin synthesis. It has definite activity in treating rheumatoid arthritis, osteoarthritis and other joint diseases [1]. Meloxicam binds strongly to serum albumin (> 99 %) and reaches a maximum concentration at 4.5 h after oral administration. Meloxicam is metabolized extensively in liver into four pharmacologically inactive metabolites that are excreted through urine and feces [2] with an absolute bioavailability of 89 %.

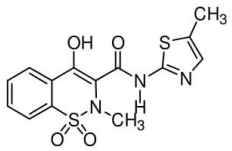

Fig. 1. Structure of meloxicam

Literature survey reveals that only a few HPLC [3-6] and LC-MS [7-13] were reported for the determination of meloxicam from biological fluids either singly or with their degradation products. Among the above mentioned methods of estimation for meloxicam in biological matrix, HPLC methods possesses low sensitivity due to high linear range, which are unsuitable for estimating the nanogram (ng) level of meloxicam while the LC-MS/MS methods are sensitive enough to estimate meloxicam in ng level. Though the reported LC-MS/MS methods are advantageous, it suffers drawbacks such as, use of guard column and high plasma volume for sample preparation [9] and high ammonium formate concentration (15 mM) and a less commonly available instrumentation which is costly [12].

The present work describes a simple, rapid, sensitive and selective method for the determination of meloxicam using commonly available LC-MS/MS system. The current method offers a number of advantages over existing methods: shorter run time, less sample volume, simple sample clean up procedure and cost effectiveness. This method can be applied to pharmacokinetic study of plasma meloxicam concentration after oral administration.

EXPERIMENTAL

The working standard samples of meloxicam and internal standard were gifted by M/s Hetro drug Ltd., (Hyderabad, India). HPLC grade acetonitrile and ethyl acetate were purchased from Merck® Ltd (Mumbai, India). Analytical grade ammonium acetate and acetic acid (GR grade) were purchased from Merck® Ltd (Mumbai, India). The water used for the analysis was prepared by Milli-Q® water purification system (Bangalore, India). Human plasma was obtained from Jeevan-Dhara Blood Bank, Hyderabad, India.

LC-MS/MS conditions: Chromatographic separation was performed by using an isocratic, Shimadzu HPLC equipment consisting of two LC10AT VP pumps, VP CTO-10AS VP column oven, a Phenomenex Gemini C_{18} column (50 mm × 4.6 i.d, 5 µm), with a mobile phase consisting of mixture of 5 mM ammonium acetate (pH 5.5 ± 0.3) and acetonitrile in the ratio of 10:90 v/v at a flow rate of 0.8 mL/min.

Mass spectrometric detection was performed using an API 3200 (MDS Sciex) equipped with an electrospray ion (ESI) source. The mass spectrometer was operated in selected reaction monitoring mode. The spray voltage and source temperature were 5200 V and 450 °C, respectively. Detection was carried at unit resolution for both Q1 and Q3 with scan time 200 ms per channel. Nebulizer gas, curtain gas and gas for collision activated dissociation (CAD) were kept 45, 40 and 6 Psi, respectively for both analyte and internal standard. The mass transition ion pair was selected as 352.0→115.1 for meloxicam and 453.3→230.3 for internal standard. The parent and product ion spectrum for meloxicam are represented in Figs. 2 and 3. The data acquisition software, analyst version 1.4.2 was used for quantification. Method of least squares with weighting $1/X^2$ was used to calculate the peak area ratio of the target ions of the drugs to those of the internal standard and the calibration curve was constructed by plotting peak area ratios of meloxicam against its concentration.

Preparation of standard and quality control solutions: A standard stock solution of meloxicam was prepared by dissolving 5.046 mg of meloxicam in acetonitrile and transferred into 5 mL volumetric flask. The volume was made upto the mark to get a concentration of 1 mg/mL. The solution was then further diluted to achieve standard working solutions of desired concentrations. Internal standard working solution (1 mg/mL) was prepared by dissolving 5.982 mg of repaglinide in acetonitrile, transferred into 5 mL volumetric flask and made upto the mark with acetonitrile. All the working solutions were kept in refrigerator at 1-10 °C and brought to room temperature before use.

Preparation of calibration curve for standard and quality control standards: The standard solutions were used to spike in 100 µL blank plasma samples either for calibration curve or quality control standards of meloxicam during the validation. Calibration curve spiking solutions and quality control spiking solutions were used to spike the screened blank plasma matrix to prepare plasma calibration curve standards ranging from 1.00 to 2503.85 ng/mL and plasma quality control sample ranging from 1.01 to 1935.21 ng/mL. 0.2 mL aliquots of the above plasma calibration curve standards and plasma quality control samples were taken in pre-labelled polypropylene vials, capped tightly and stored in a freezer at -70 °C.

Extraction process of plasma samples for drying: 100 µL plasma samples (calibration curve standards and quality control samples) were transferred to a set of pre-labelled

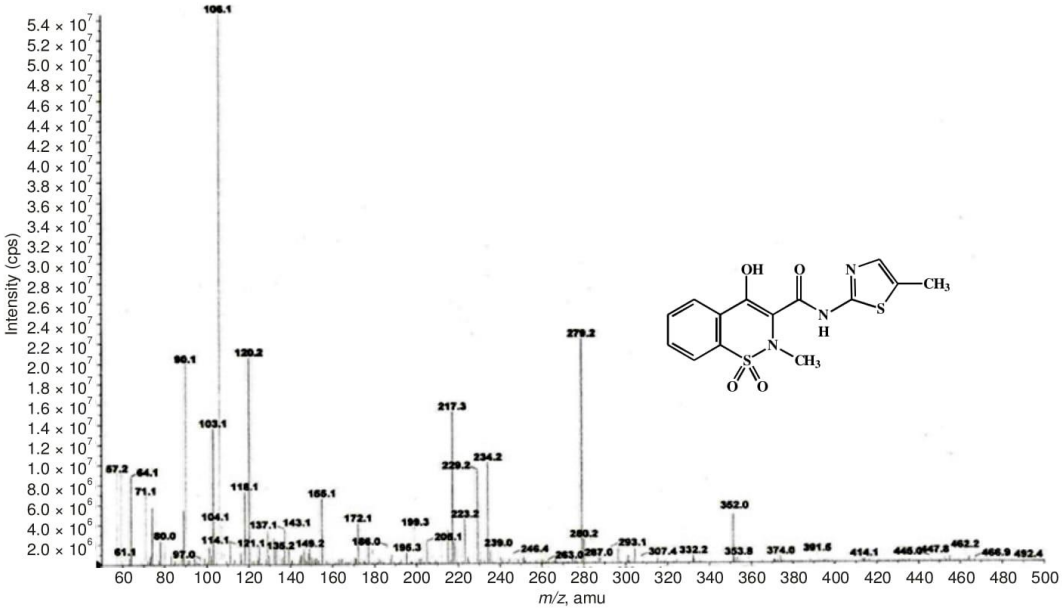

Fig. 2. Mass spectra of meloxicam parent (Q1) masses

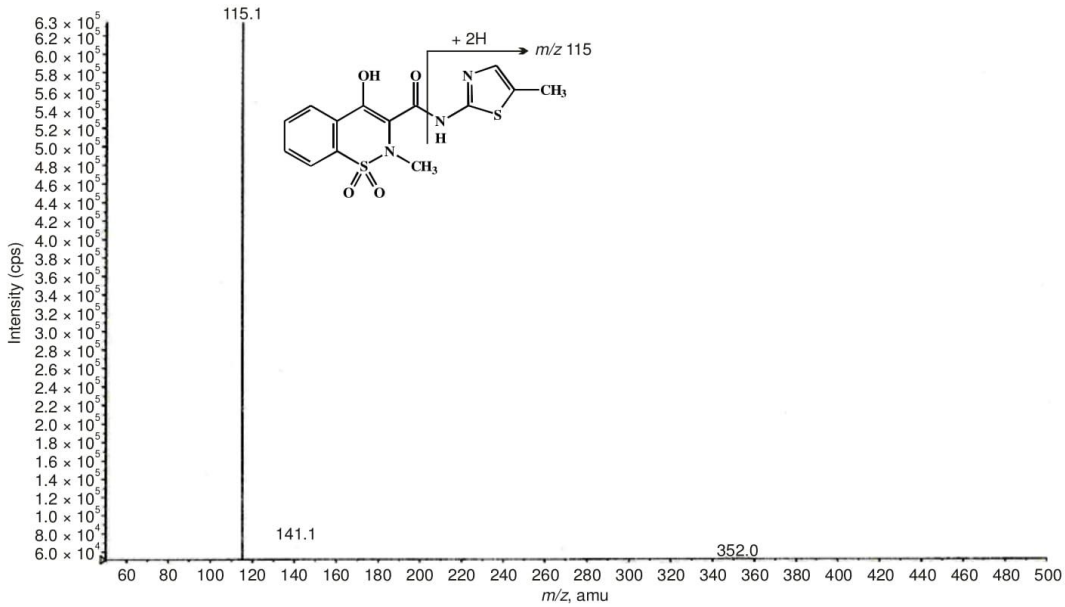

Fig. 3. Mass spectra of meloxicam product ion (Q3) masses

polypropylene tubes containing 50 µL of repaglinide dilution (internal standard; 500 ng/mL) which were vortexed for 10 seconds. All the tubes were pre-treated with 200 µL of 1 % formic acid in water and vortexed. To each of the tubes 2.5 mL of ethyl acetate was added and were further vortexed for 10 min at 2500 rpm on a vibramax unit and then were centrifuged at 4500 rpm for 5 min in a refrigerator centrifuge at 10 °C. From these tubes approximately 2 mL of the supernatant layer was transferred to each of a new set of polypropylene tubes. The contents of the tubes were evaporated in a stream of nitrogen at 50 °C for 15 min and the residues of the dried tubes were reconstituted with 0.4 mL of the mobile phase. The contents of the tubes were vortexed and transferred into auto-sampler vials and then analyzed by Tandem mass spectrometer. An aliquot of 10 µL of the sample was drawn each time from the vials in the auto sampler.

Validation: The validation for the determination of meloxicam in plasma samples was performed in accordance with food and drug administration (FDA) guidelines for bioanalytical method validation [14,15]. The method was validated for its selectivity, linearity, precision, accuracy, recovery and stability. Selectivity was performed by control concentration for meloxicam and at one concentration for internal standard. The % recovery was evaluated by comparing the areas of the extracted quality control samples with equivalent aqueous samples.

The assessment of matrix effect (co-eluting, undetected endogenous matrix compounds that may influence the analyte ionization) constitutes an important and integral part of validation for quantitative LC-MS/MS method for supporting pharmacokinetic studies. It was performed by processing six lots of different normal controlled plasma samples in six replicates (n = 6). Lower quality control (LQC) and higher quality control (HQC) working solutions were spiked with post extraction in duplicate for each lot. The co-efficient of variation (% C.V.) for six values at each level was calculated by taking the mean of the 12 different blank plasma samples (containing K_2EDTA as anti coagulant) to test for interference at retention time of meloxicam and internal standard.

The intra- and inter-run accuracy was determined by replicate analysis of the three quality control levels along with the lower limit of quantification and higher quality control levels. In each of the precision and accuracy batches, six replicates at each quality control level inclusive of the lower limit of quantification and higher quality control levels were analyzed.

Assay precision was calculated by using the formula:

$$CV\ (\%) = (SD/M) \times 100$$

where M is the mean of the experimentally determined concentrations and SD is the standard deviation of M.

The extraction efficiencies of meloxicam and internal standard were determined from the analysis of six replicates at low, medium and high quality value obtained by injecting the post extracted samples prepared in duplicate from each plasma lot. Moreover, the minor enhancement of analyte signal due to endogenous matrix interferences does not affect the quantification of analyte and internal standard peak which was confirmed by the post-column infusion techniques.

As a part of the method validation, stability was evaluated. Analytes were tested using the quality control samples wherever appropriate. The bench top stability values of meloxicam in human plasma was kept at room temperature of about 25 °C, was evaluated for 9-10 h and were 99.9 and 97.4 % at lower quality control and higher quality control samples, respectively.

The freeze thaw stability was conducted by comparing the stability of the samples which was been frozen and thawed over 6 cycles with freshly spiked quality control samples. Six aliquots of each low and high concentration were used for the freeze thaw stability evaluation. For long term stability six replicates of lower quality control and higher quality control samples were spiked in plasma, kept at -70 °C for 51 days. The dry extract stability was conducted by comparing the dried stability samples that had been stored at 10 °C. The dry residue samples were then reconstituted after 47.60 h and compared with freshly spiked quality control samples at low and high concentrations. In addition long-term stability of meloxicam in human plasma was carried by storing the stability samples at a temperature of -70 °C for 51 days and was analyzed along with six replicates of freshly prepared quality control samples at low and high concentrations. The long term stability values obtained for meloxicam were 98.6 % and 101.6 % at low and high concentrations, respectively.

Pharmacokinetic study design: The study was performed in screened male healthy volunteers (n = 6). The ethics committee approved the protocol and the volunteers provided with informed written consent. The 7.5 mg of meloxicam was orally administered. Blood samples were collected after oral administration at a fixed time points of pre dose 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 7, 8, 10, 12, 16, 24, 36, 48, 72, 96 and 120 h in K_2EDTA vacutainer collection tubes (BD Vacutainer®, NJ, USA). The tubes were centrifuged for 20 min at 3000 rpm on a refrigerated centrifuge (Eppendorf® Model 5810 R; USA) at 4 °C and the plasma was collected and were stored at -70 °C until their use. These subject samples were analyzed along with calibration curve and quality control samples. The lower quality control, medium quality control and higher quality control were well distributed along between the subject samples in the analytical batch run; individually 50 % at each quality control level and overall 67 % of all the quality control samples utilized in the analytical batch should pass. The plasma concentration *vs.* time profile of each analyte was analyzed by non-compartmental method using WinNonlin® Version 5.2 (Pharsight Corporation, Mountain View CA, USA).

RESULTS AND DISCUSSION

The aim of this work was to develop and validate a simple, rapid and sensitive assay method for the extraction and quantitation of meloxicam for its pharmacokinetics studies. To achieve this during the method development, different trails were carried out to optimize sample extraction, detection parameters and chromatography. As the pKa of meloxicam is 1.1, in order to maintain it in unionized form and to prevent it from ionization before extraction, the plasma samples were treated with 1 % formic acid and extracted by liquid-liquid extraction. By acidification with 1 % formic acid, the response increased and the best signal with symmetrical peaks were achieved with positive ion electrospray (ESI) mode. A mobile phase containing 5 mM ammonium acetate (pH 5.5 ± 0.3) and acetonitrile in the ratio of 10:90 v/v resulted in improved signal. As a part of method development, matrix effect was determined by post column infusion technique. There was no ion suppression or enhancement observed at the RT of analyte and internal standard. Use of Phenomenex Gemini C_{18} column (50 mm × 4.6 mm i.d, 5 µm) resulted in reduced flow rate and run time of 2.2 min. With the above mentioned optimized parameters, the retention time of meloxicam and internal standard were observed at 0.96 and 1.52 min, respectively.

Selectivity: Meloxicam, chromatogram of the extracted blank, blank + internal standard (ISTD), STD1 (lower limit of quantification) and STD8 (upper limit of quantification) plasma sample are shown in Fig. 4. The standard meloxicam eluted at RT 0.96 min with a sharp and symmetrical peak, while internal standard eluted at 1.52 min. Hence, in the developed method, the RT of both meloxicam and internal standard are significantly less when compared to the methods reported by other researchers [9,10,12]. Further, no interfering peaks of endogenous compounds were observed at RT of analyte or internal standard in blank human plasma containing K_2EDTA as anticoagulant from six different lots.

Linearity: The linearity of the method was determined by a weighted ($1/X^2$, where × is concentration) least square regression analysis of the standard plots associated with the eight point standard curve for meloxicam. The calibration line was linear in the range of 1.00 to 2503.85 ng/mL of the drug as shown in Fig. 5. A straight-line fit made through the data points by least square regression analysis showed a constant proportionality with minimal data scattering. The correlation coefficient (r^2) ranged from 0.9976 to 0.9999 for meloxicam (Table-1).

Lower limit of quantification: The lower limit of quantification is defined as the lowest concentration that could be analyzed with acceptable accuracy and precision of 20 %. The lower limit of quantification of meloxicam was found to be 1 ng/mL, emphasizing its usage in pharmacokinetic study after oral administration.

TABLE-1
BACK CALCULATED CONCENTRATIONS OF MELOXICAM (MX) AND CALIBRATION CURVE (CC) PARAMETERS

STD ID	Meloxicam								Slope (m)	Intercept (c)	r^2
	STD1	STD2	STD3	STD4	STD5	STD6	STD7	STD8			
Conc. (ng/mL)	1.00	2.00	10.02	75.34	251.14	1101.49	1953.00	2503.85			
MX CC1	1.03	1.94	10.11	74.59	244.58	1141.74	1969.30	2431.52	0.0085	0.0258	0.9999
MX CC2	0.94	2.18	9.86	72.63	255.62	1156.50	1962.41	2598.61	0.0082	0.0244	0.9996
MX CC3	1.04	1.89	9.84	77.65	255.74	1199.63	1904.52	2408.62	0.0088	0.3340	0.9999
MX CC4	1.05	1.98	10.44	77.29	269.37	1087.50	1892.49	2551.62	0.0079	0.0273	0.9976
Mean	1.015	1.998	10.063	75.540	256.328	1146.343	1932.180	2497.593			
± SD	0.0506	0.1271	0.2800	2.3724	10.1482	46.2830	39.2943	92.0239			
CV (%)	5.0	6.4	2.8	3.1	4.0	4.0	2.0	3.7			
Nominal (%)	101.5	99.9	100.4	100.3	102.1	104.1	98.9	99.8			

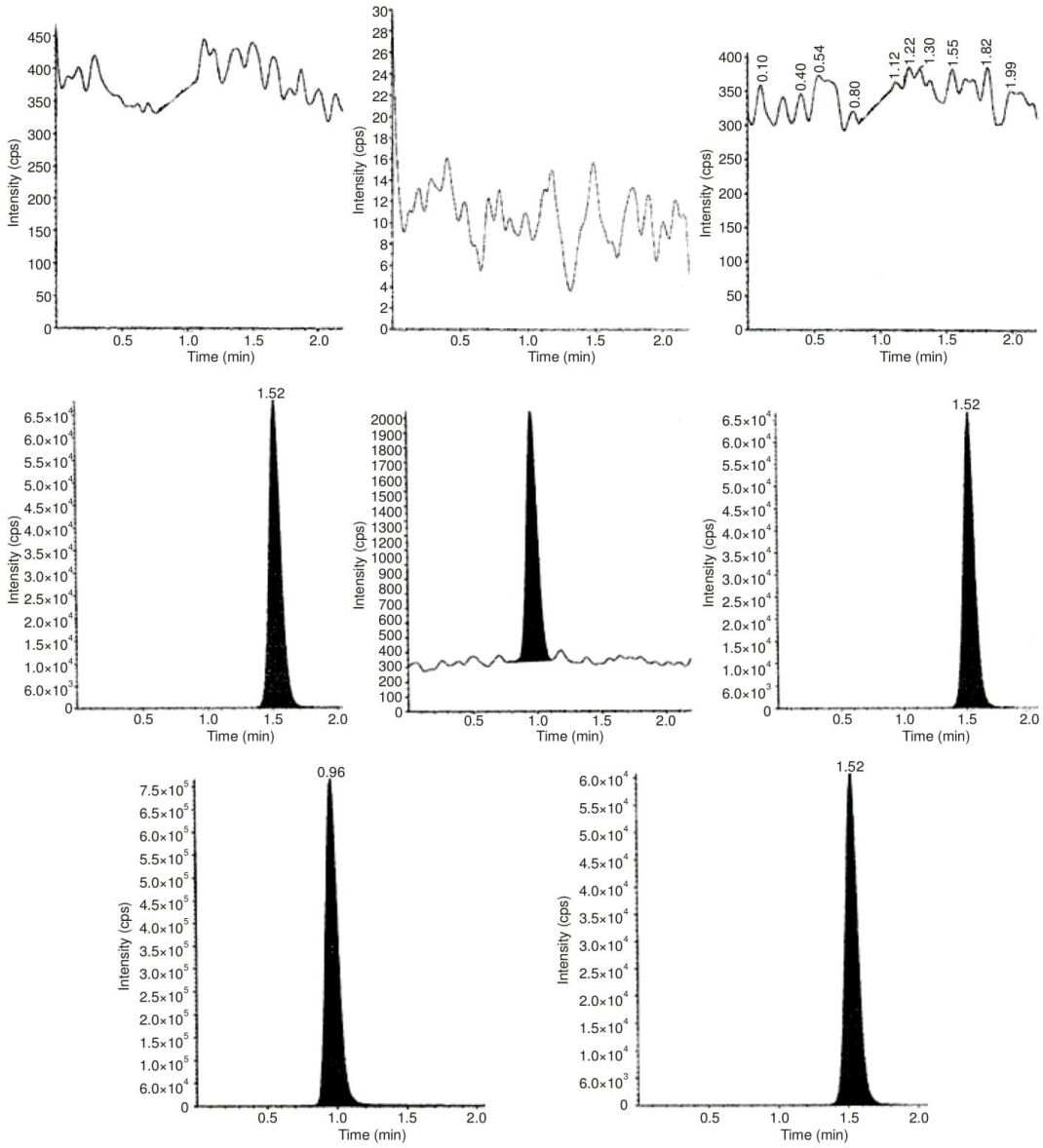

Fig. 4. Meloxicam chromatogram of the extracted Blank, Blank + Internal standard (ISTD), STD1 (lower limit of quantification) and STD8 (upper limit of quantification) plasma sample

Precision and accuracy: The intra-run precision at lower quality control, medium quality control and higher quality control ranged from 2.4 to 7.5 (CV, %) for meloxicam whereas at the lower limit of quantification level it was ranged from 5.8 to 7.9 % and the accuracy was within the range of 93.6-105.2 % for meloxicam across all the four levels tested (Table-2). The inter-run precision and accuracy were determined by pooling all individual assay results of replicate (n = 6) quality control samples over five separate batch runs. The inter-run precision at lower quality control, medium quality control and higher quality control ranged from 3.8 to 5.7 % for meloxicam where as at the lower limit of quantification level it was 7.9 %. The inter run accuracy was within the range of 97.9 to 103.3 % for meloxicam (Table-3).

Recovery: Six replicates at lower quality control, medium quality control and higher quality control concentrations for meloxicam were prepared for recovery determination. The mean recovery for meloxicam was 89.29 %. The % CV obtained

TABLE-2
ACCURACY AND PRECISION (INTRA-DAY) OF MELOXICAM IN HUMAN PLASMA (n = 6)

Batch ID	QC ID	MX LLOQ QC	MX LQC	MX MQC	MX HQC
Nominal conc. (ng/mL)		1.01	2.93	1045.02	1935.21
PA 01	Mean	1.048	2.965	1097.943	2035.738
	SD	0.0828	0.1431	27.4350	87.2554
	CV (%)	7.9	4.8	2.5	4.3
	Nominal (%)	103.8	101.2	105.1	105.2
PA 02	Mean	1.008	2.932	1060.272	2014.288
	± SD	0.0763	0.1350	52.7966	79.8461
	CV (%)	7.6	4.6	5.0	4.0
	Nominal (%)	99.8	100.1	101.5	104.1
PA 03	Mean	0.953	3.083	1024.538	1972.375
	SD	0.0638	0.0829	49.0599	47.8877
	CV (%)	6.7	2.7	4.8	2.4
	Nominal (%)	94.4	105.2	98.0	101.9
PA 04	Mean	0.945	2.828	1058.862	1973.573
	SD	0.0550	0.2124	39.2298	79.3259
	CV (%)	5.8	7.5	3.7	4.0
	Nominal (%)	93.6	96.5	101.3	102.0

QC = Quality control; MX LLOQ QC = Meloxicam lower limit of quantification quality control; MX LQC = Meloxicam lower quality control; MX MQC = Meloxicam medium quality control; MX HQC = Meloxicam high quality control

TABLE-3
ACCURACY AND PRECISION (INTER-DAY) OF MELOXICAM IN HUMAN PLASMA (n = 6)

QC ID	MX LLOQ QC	MX LQC	MX MQC	MX HQC
Nominal conc. (ng/mL)	1.01	2.93	1045.02	1935.21
Mean	0.9888	2.9521	1060.4038	1998.9938
± SD	0.07843	0.16837	48.28257	75.32731
CV (%)	7.9	5.7	4.6	3.8
Nominal (%)	97.9	100.8	101.5	103.3

QC = Quality control; MX LLOQ QC = Meloxicam lower limit of quantification quality control; MX LQC = Meloxicam lower quality control; MX MQC = Meloxicam medium quality control; MX HQC = Meloxicam high quality control

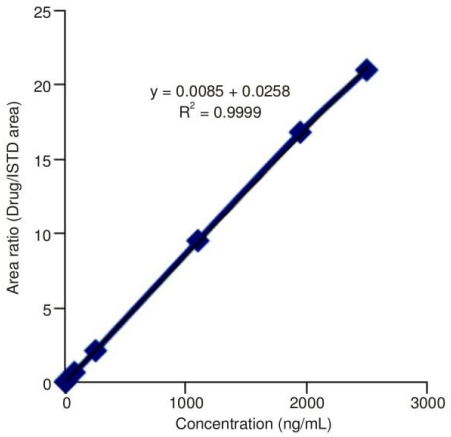

Fig. 5. Calibration curve (linearity) of meloxicam

was within the range of 1.3-7.8 % for meloxicam. The mean recovery for internal standard was 88.8 % with a % CV of 4.6 %.

Stability: The results on stability of meloxicam are presented in Table-4. Bench top, dry extract and process stabilities for meloxicam were investigated at lower quality control and higher quality control levels. The results revealed that meloxicam was stable in plasma for at least 9.10 h at room temperature of about 25 °C and 46.30 h in the auto sampler at 10 °C. It was confirmed that repeated freeze thawing (three cycles) of plasma spiked with meloxicam at lower quality control and higher quality control level did not affect the stability of meloxicam. Dry extract stability was also evaluated for a period of 47.60 h at lower quality control and higher quality control levels. The long term stability results also indicated that the analyte meloxicam was stable in the matrix up to 51 days at the storage temperature of -70 °C. Study on working solution stability proved that they were stable for more than 18.35 h at room temperature (about 25 °C) and stable up to 24.6 days under refrigeration (10 °C).

Pharmacokinetic study: In order to verify the sensitivity and selectivity of this method in a real-time analysis, the present method was used to test for meloxicam in human plasma samples collected from healthy male volunteers (n = 6) in between the age 18-45 years. Institutional review board approval was obtained before study start and all subjects given written informed consent before participation. Each subject received single oral dose of meloxicam 7.5 mg tablets and plasma samples obtained were analyzed for meloxicam. The mean plasma concentration verses time profiles of meloxicam is shown in Fig. 6. The plasma concentration–time data were analyzed by non-compartmental analysis method using the WinNonlin® Software (Version 5.0.1 from Pharsight Corporation, USA) for estimation of pharmacokinetic parameters. The results obtained were shown in Table-5 and matching with the published data.

TABLE-4
STABILITY DATA

Nominal conc. (ng/mL)	Stability	Mean ± S.D, n = 6 (ng/mL)	Precision (CV, %)	Accuracy (%)
2.93 (lower quality control)	Injector stability (10 °C, 46.30 h)	2.912 ± 0.0595	2.0	99.4
	Bench top stability (25 °C, 9.10 h)	3.023 ± 1.1089	3.6	103.2
	Dry extract stability (10 °C, 47.60 h)	2.903 ± 0.1541	5.3	99.1
	Freeze thaw stability (6 cycles)	3.003 ± 0.1663	5.5	102.5
	Long term stability (-70 °C, 51 days)	3.032 ± 0.1270	4.2	103.5
1934.06 (high quality control)	Injector stability (10 °C, 46.30 h)	1947.170 ± 43.7240	2.2	100.6
	Bench top stability (25 °C, 9.10 h)	1931.978 ± 105.945	5.5	99.8
	Dry extract stability (10 °C, 47.60 h)	2096.180 ± 76.0293	3.6	108.3
	Freeze thaw stability (6 cycles)	1992.627 ± 63.0538	3.2	103.0
	Long term stability (-70 °C, 51 days)	2043.380 ± 69.2258	3.4	105.6

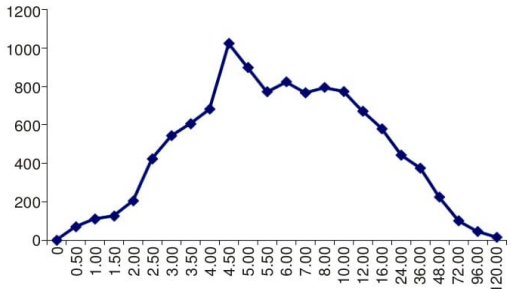

Fig. 6. Mean concentration-Time curve of the 6 volunteers for meloxicam

TABLE-5
PHARMACOKINETIC DATA FOR MELOXICAM

C_{max} (ng/mL)	1014.2
T_{max} (h)	4.6
$t_{1/2}$ (h)	18.8
$AUC_{(0\text{-}T)}$ (ng h/mL)	10142.0
$AUC_{(0\text{-}\infty)}$ (ng h/mL)	10333.5

Conclusion

A simple, selective, rapid and sensitive LC-MS/MS method for the determination of meloxicam in human plasma has been developed. The present method is advantageous over the reported method with a short run time of only 2.2 min as total run time with analyte eluting at 0.96 min for meloxicam and internal standard at 1.52 min, when compared to [10] with total run time of only 3 min and analyte (meloxicam) eluting at 2.06 and internal standard (piroxicam) at 1.82 min. In addition, the developed method makes use of commonly available and cost-effective LC-MS/MS instrument. Excellent specificity and linearity with a lower limit of quantification of 1 ng/mL for meloxicam is an added advantage in this method. As the developed method is both cost and time effective, it is suggested that it can be applied for the routine pharmacokinetic evaluation of meloxicam in human subjects after oral administration of the same.

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RESEARCH ARTICLE

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ADSORPTION STUDIES OF CARBONIZED MALACHRA CAPITATA SAMPLE IN DEFLUORIDATION

OF POTALE WATER

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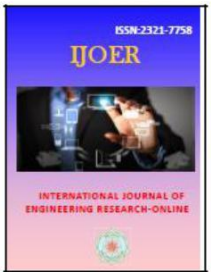


ABSTRACT

The present study demonstrates the development and application of plant based carbon sample (oxidised with nitric acid) prepared from *Sida Rhombifolia* adsorbent for the removal of fluoride in aqueous media. Activated carbon characterized texturally and chemically before and after treatment, using surface area determination in the BET model, SEM-EDX and XPS techniques. The adsorption capacity and the kinetics of Fluoride ion removal was determined by batch adsorption technique. The study was carried out to analyze the defluoridation by contact time variation, adsorbate concentration and effect of pH. The analysis of the isotherm equilibrium data using the Langmuir and Freundlich equations by linear methods showed that the data fitted better with Langmuir model (R^2 > 0.967) and Pseudo-second-order kinetic model best fit for the current adsorption study. Carbonized *Sida Rhombifolia* oxidized sample (SRC) showed a high affinity for fluoride ions compared with other conventional adsorbents, therefore, it can be considered as a potentially good and low-cost bio-adsorbent for removal of fluoride from water compared to other bio-adsorbent.

Key Words: Activated carbon-Surface characterization-Defluoridation-Isotherm study-Kinetics

1. INTRODUCTION

Adsorption is a widely used as an effective

physical method of separation in order to elimination or lowering the concentration of wide range of dissolved pollutants (organics, inorganic) in an effluent. It is big news that activated carbon (AC) is a well-known adsorbent that can be used efficiently for removal of a broad spectrum of pollutants from air, soil and liquids.

Activated carbons are carbonaceous materials that can be distinguished from elemental carbon by the oxidation of the carbon atoms found on the outer and inner surfaces[1]. These materials are characterized by their extraordinary large specific surface areas, well-developed porosity and tunable surface-containing functional groups. For these reasons, activated carbons are widely used as adsorbents for the removal of organic chemicals and metal ions of environmental or economic concern from air, gases, potable water and wastewater.

The high cost of commercial activated carbon restricts its application, so, there is need to undertake studies to substitute the costlier commercial activated carbon with the unconventional, low cost and locally available

Agricultural waste based adsorbents[5]. India is an agricultural country and generates considerable amount of agricultural wastes. Disposal of agricultural by-products is a major economic and ecological issue these days. The conversion of by-products to adsorbents, such as activated carbon, represents a possible outlet. Agricultural by-products are renewable sources of raw materials for activated carbon production because the development of methods to utilize the waste materials is greatly desired and production of activated carbons from waste is an interesting possibility. Successful studies on these materials could be beneficial to the developing countries and could be easily incorporated in development of appropriate technologies[8]. Activated carbons are produced from different precursors, such as wood, peat, brown coal, lignite, various types of hard coal, polymers, agricultural byproducts, and fruit shells[9]. Plant biomass is one of the most promising materials of activated carbons (Discussed in previous chapter). The plant materials can be classified into four types: agricultural waste, wood, bamboo and lignin. The method of preparation activated carbons includes two steps: carbonization and activation. Chemical activation, physical activation and steam-pyrolysis activation are three common activation methods. The last two methods are clean and environmentally-friendly, chemical activation is mature and widely used. Typically, all organic precursors can be converted into activated carbons; however, in most cases, it requires the usage of an activation agent and only a few are commercially attractive. The properties of the final product depend on the nature of raw material used, the nature of activating agent, and the conditions of activation process.

Activated carbon is widely used for the purpose due to the large surface area available for adsorption as a result of its high degree of micro porosity. The presence of activating agents and carbonization conditions influenced the development of pore structures. These materials are characterized by their extraordinary large specific surface areas, well-developed porosity and tunable surface containing functional groups. The surface oxygen functional groups can be easily

introduced to the carbon by different activation methods including dry and wet oxidizing agents like nitric acid (HNO_3). A modified activated carbon containing different functional groups could be used for technological applications. The surface groups can be characterized and identified by more sophisticated techniques such as XPS and TGA-DTA, SEM-EDX etc will contribute significantly to a more precise knowledge about these surface chemical groups.

In order to reduce the production costs, several manufacturers use precursor's like agriwastes and its byproducts. The literature survey clearly indicated the carbons obtained from dried plant biomass carbon (Aerial Parts) of *Malachra Capitata* (in the following text this materials is indicated as 'MCC') is not used as adsorbent for defluoridation of water so far. Hence the author has prepared a low cost carbon from the above raw material and has characterized their physical properties. With the aim of defluoridating material development, characteristic properties of the adsorbent viz., Surface functional groups, surface area etc., which are significant in adsorption mechanisms, are determined. This paper deals with the preparation of activated carbons from the raw material *MCC* surface characterization with sophisticated instrumentation techniques before and after defluoridation and results.

2. MATERIALS AND METHOD

2.1 Raw material for the preparation of adsorbent:

Malachra Capitata mass of plant without flowers was collected in bulk amount, cut into small pieces, dried in sunlight until green colour vanished. Then the material was carbonized in muffle furnace (in absence of air) for about 2 hours at $500^{O}C$. After carbonization, carbon obtained was poured in double distilled water, filtered, washed with cold double distilled water several times and dried in an air oven at $110^{O}C$ for overnight. Then, the carbon was sieved into desired particle sizes (Average size 75μ approximately). Thus obtained carbon product was treated with 0.5 M Nitric acid oxidation. Then the acid treated product was filtered, thoroughly washed with hot distilled water to remove acidity and then thermally activated at $120^{O}C$ for 1 hr in an air oven. After liquid phase oxidation each carbon

was sieved into a particle size in the range of 70-120 mesh sizes Photographic image of prepared active carbons are shown in Figure 1.

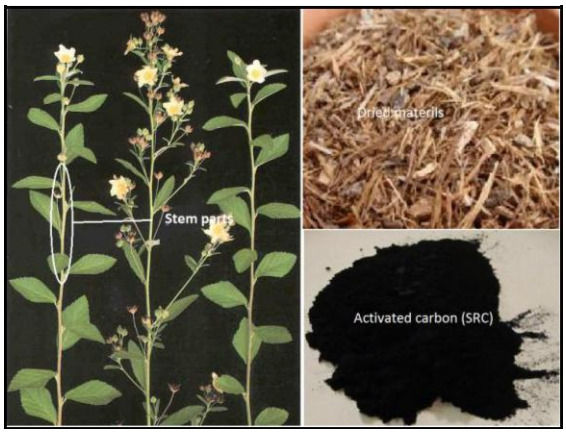


Figure 1: Raw material for the synthesis of SRC activated carbon from *Sida Rhombifolia*

2.2 Chemical characterization: Surface chemical reactions explained by X-ray photoelectron spectroscopy (XPS) and Energy dispersive x-ray difractrometric (EDX) method equipped with SEM.

2.2.1 ***SEM-EDX:*** The surfaces of the powder carbonaceous materials have been stubbed using the double-sided adhesive carbon tape. Samples are coated with the help of platinum coater [JOEL Auto fine coater model, JFC –1600 auto fine coater, Coating time is 120 sec with 20mA] and deposited with a thin layer of platinum on the sample. The microphotographs of these samples were recorded using SEM JEOL model, JSM-5600 equipped with EDX Analyzer, an accelerating voltage of 5 kV, at high vacuum mode. The maximum magnification possible in the equipment is 3,00,000 times with a resolution of 3 nm, typically setting at various magnifications for all the samples of study.

2.2.2 ***X-ray Photoelectron Spectroscopy (XPS):*** The prepared activated carbon samples were analyzed on KRATOS AXIS 165 under 10^{-9} torr vacuum with dual Al-Mg-anodes using Mg Kα radiation. Pass energy of 80eV was used in recording the spectra. X-ray excitation source Mg K (1253.06 eV) and hemi spherical electron analyzer. The samples were dried at 283 k for 24 h before the analysis. Survey and high resolution narrow scans were recorded for C1s, O 1s, and F 1s photoelectron peaks. The atomic concentrations were calculated from the photoelectron peak areas, using Shirley background subtraction20 and sensitivity factors were taken

from PHI21. The obtained XPS spectra were fitted using a nonlinear square method with the convolution of Lorentzian and Gaussian functions after the polynomial background subtraction from the raw data.

***2.2.3 Surface area*:** The BET surface area and pore structure characteristics of the carbon samples were determined by Nitrogen adsorption at 77 K, using Quanta chrome NOVA 2200e, surface area and pore size analyzer. Prior to adsorption measurements,

respective carbon samples were degassed at 150˚C

for a period of 4 hrs, in nitrogen atmosphere[18]. The S_{BET} values of the samples were calculated by the Brunauer, Emmett, and Teller (BET) method using adsorption isotherms in the range 0.05 ≤ relative pressure (P/Po) ≤ 0.30.

2.2.4 The total pore volume was estimated by BJH

Method, from the amount of nitrogen adsorbed at P/P^o 0.95. The micropores volume and average pore width was determined by Dubinin- Radushkevich (DR) equation from the value of nitrogen (77K) adsorption isotherm. The DA plot method was used for the determination of pore diameter. The volume of Mesopores was calculated by subtracting the volume.

2.2.5 ***Fluoride Adsorption Study***: In the present study, the prepared SRC sample utilized for the removal of fluoride from its aqueous solution. The sorption isotherm and kinetics experiments were performed by batch adsorption experiments and were carried out by mixing 0.5 g (obtained by the study of effect of adsorbent dose) of sorbent with 100 mL of water containing sodium fluoride at 10 mg/L as initial fluoride concentration. The mixture was agitated in a thermostatic shaker at a speed of 250 rpm at room temperature. The defluoridation studies were conducted for the optimization of various experimental conditions like contact time, initial fluoride concentration, and fluoride uptake with fixed dosage by varying pH. All of the experiments were carried out at 30˚C ± 1˚C temperature. Fluoride ion concentration was measured with an automatic ion analyzer using the equipment model Orion™ 2109XP Fluoride Analyzer and the pH of the solution was measured by Elico model selective equipment. All other water quality

parameters were analyzed by using standard methods.

The percentage removal of F^- ion and amount adsorbed (in mg/g) were calculated using the following relationships:

$$\frac{\qquad}{}$$

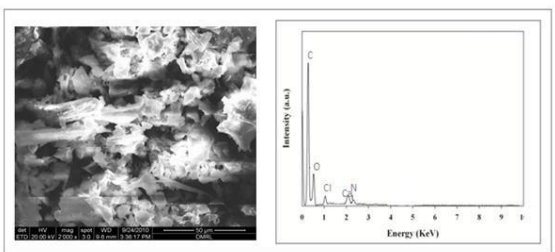
$$[(\qquad)]$$

$$\frac{\qquad}{}$$

where, q_e (g/g) is the solid phase concentration, Ci (g/L) is the initial concentration of fluoride in solution, C_f (g/L) is the final concentration of fluoride in treated solution; V (L) is the volume of the solution, and m (g) is the weight of the adsorbent sample. Blanks without F- ions were used for each series of experiments as controls. All the experiments were performed in triplicate. The linear regression computer program with one independent variable was used for slope and statistical analyses of the data.

3.0 Results and Discussion

3.1 Surface and elemental analysis (EDX): SEM-EDX pictures in Figure 2 (a & b) (before and after defluoridation) of AC's provide information about the distribution of fluoride ion complexes. These pictures present results from the characterization of porous texture and surface chemical elements localizations for the material used. For the elemental microanalysis of SRC sample was analyzed by EDX. These spectra show the presence of C, O, Cl, N and Ca (table 1) and after adsorption F is appeared on adsorbent sample.



Ca K	0.89	0.22
N K	1.37	1.64
Total	100	100

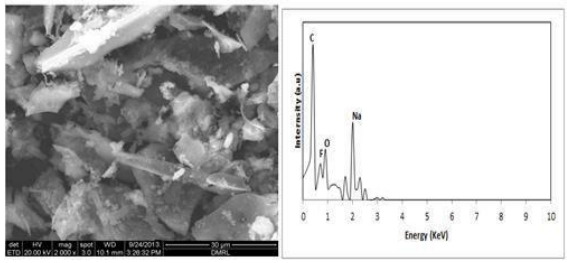


Figure 2(a): SEM-EDX analysis of SRC sample before defluoridation

Table 1 (a): EDX Analysis of SRC sample after Defluoridation

Element	Weight%	Atomic %
C K	80.5	83.5
O K	16.62	14.25
Cl K	0.62	0.24

Figure 2(b): SEM-EDX analysis of SRC sample After defluoridation

Table 1 (b): EDX Analysis of SRC sample after Defluoridation

Element	Weight%	Atomic %
C K	81.31	78.8
O K	14.68	17.21
Na K	0.56	0.28
F K	1.24	1.05

3.2 X- ray Photoelectron Spectroscopy (XPS): XPS is an important surface sensitive tool for the characterization of surface properties of activated carbons which gives vital information from the outer most 3-4nm surface layers of carbon surfaces. This technique was employed with an aim to study the changes on the surface of the activated samples. The XPS survey spectra of the investigated activated carbons indicate the presence of three distinct peaks at 285 eV, 400 eV and 532 eV which can be attributed due to carbon, nitrogen and oxygen, respectively. The C 1s signal of all the samples consists of a major peak at 284.6 eV, which corresponds to a non-functionalized carbon that is the contributions of C as Csp^2 and Csp^3, belonging to the carbon skeleton of the material and the contributions of aliphatic Csp^3 that corresponds to hydrocarbons. The results could be resolved into five individual component peaks representing graphite carbon BE = 284.608 eV, carbon present in alcohol or ether groups 286.513 eV, carbonyl groups BE = 287.294 eV, carbonyl or ester groups BE = 289.410 eV and shake up satellite peaks due to Π-$\Pi*$ transitions in aromatic rings BE = 291.493 eV. The high resolution survey scan for SRC before and after defluoridation shown in Figure 3

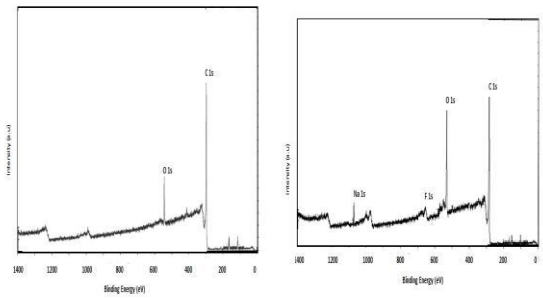


Figure 3: Survey scan of SRC before (left) and after defluoridation (right) in defluoridation process

The surface area and pore volume of activated carbon prepared under optimum conditions were 997 m^2/g during before defluoridation and it was reduces to 758.24 m^2/g after defluoridation indicating the occupying the surface area of adsorbent particle by adsorbate ions (Fluoride). Average pore radius was 9.24 A°. Due to the larger the specific surface area of the adsorbent, the better its adsorption performance as obtained literature[11].

3.4 Effect of contact Time

Contact time plays a very important role in adsorption dynamics. The effect of contact time on adsorption of fluoride onto SRC is shown in Figure 4. Batch adsorption studies using the concentrations 1.5 to 10 mg/L of fluoride solution with 4.0 g/L of the adsorbent were carried out at $30^oC\pm1$ as a function of time to evaluate the de-fluoridation and adsorption rate constants. The adsorption of fluoride increases with time and gradually attains equilibrium after 35 minutes. From Figure 4, the time to reach equilibrium conditions appears to be independent of initial fluoride concentrations. Therefore, 40 minutes was fixed as minimum contact time for the maximum de-fluoridation of the sorbents.

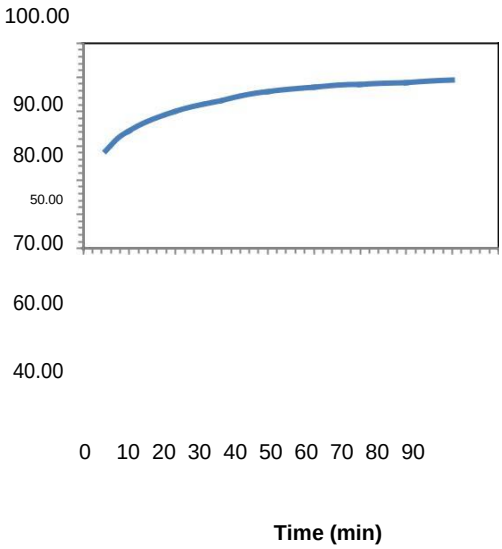


Figure 4: The effect of contact time on adsorption of fluoride onto SRC

Under shaken conditions, the sorption rapidly occurs normally by the diffusion process from the bulk to the surface and the adsorption of fluoride and was controlled by the adsorbent structure and chemical properties [1]. Adsorption of fluoride and was controlled by the adsorbent structure and chemical properties [1]. The F uptake capacity was very slow under static conditions because all the adsorbent sites were vacant. The solute concentration gradient was high and as a result, there was no relative movement between adsorbents and solutions. Later, the F uptake rate by adsorbent was decreased significantly due to the decrease in number of adsorption sites as well as fluoride concentration which supports the possible monolayer formation of fluoride ion on the outer surface [2].

3.5 Effect of initial concentration

The initial Fluoride ion concentration provides an important driving force to overcome resistant encountered when molecules are transferred between aqueous and solid phases [3]. Figure 5 shows that the capacity of the adsorbent material gets exhausted with increase in initial Fluoride ion concentration; this may be probably as a result of the fact that for a fixed adsorbent dose, the total available adsorption sites remain invariable for all the concentrations checked. With increasing concentration, the available adsorption sites become fewer and hence the percent removal of Fluoride ion is dependent upon the initial concentration [4].

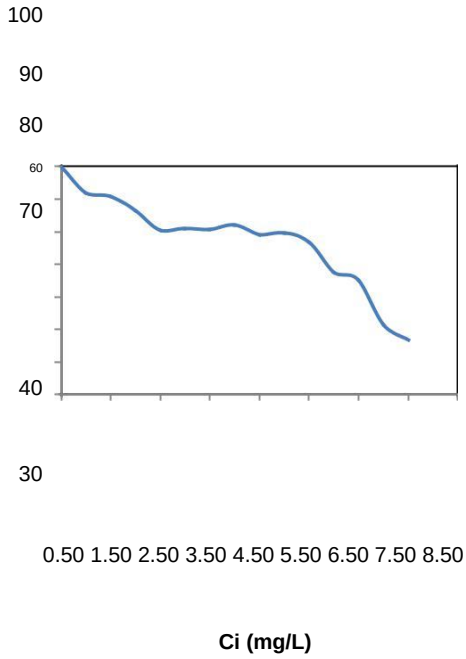


Figure 5: Variation of percent removal of fluoride with increasing the initial concentration

The effect of initial Fluoride ion concentration in the range of 0.5 to 8.0 mg/L Fluoride ion on adsorption efficiency onto SRC was investigated for adsorbents

at optimum conditions and is shown in Figure 5. It is observed from the figure that the percentage Fluoride ion removal decreased with the increase in initial concentration of Fluoride ion. For SRC adsorbent, the initial rate of adsorption is rapid in the first 15 minutes of contact time and it is greater for higher initial F- concentrations. Though the percent adsorption decreased with increase in initial Fluoride ion concentration, the actual amount of Fluoride ion adsorbed per unit mass of adsorbent increased with increase in Fluoride ion concentration in test solution.

There is a strong linear relationship between the equilibrium loading capacity and initial F- concentrations with correlation coefficients greater than 0.9 for SRC adsorbents. This result may indicate that there is a possibility to treat polluted water samples with relatively higher F- concentration, especially by making use of SRC and as adsorbent.

3.6 Effect of pH

To study the influence of solution pH on fluoride removal, the test solutions containing 5 mg/L of fluoride were adjusted to pH values of 4, 5, 6, 7, 8, and 10 using 1 N HCl and 1 N NaOH. Then, 4g/L of SRC sample was added to the test solutions separately and shaken for 30 min. Residual fluoride ion concentration was analyzed in each experiment. The pH of the medium is one of the important parameters which significantly affects the fluoride adsorption. As can be seen in Fig. 6, the removal of fluoride decreases with increasing pH of the solution. An examination of the figure indicates that maximum fluoride removal had occurred in strongly acidic medium (pH 5-6) and fluoride adsorption decreases with increase in pH. However, at neutral pH (pH 6.5) fluoride removal is considerably high, of the order of 81%. In the alkaline range, the fluoride adsorption remains slow. The same trend has been observed for both the adsorbents at their corresponding optimized conditions of adsorbent dose and contact times. In the acidic medium, the surface of the adsorbent is highly protonated, and hence, more fluoride ions can be attracted toward the surface. That is, higher fluoride sorption rate in acidic medium is attributed to strong coulombic force of attraction between positively charged surface and negatively charged fluoride ion. The

repulsion between negatively charged surface (deprotonated) and fluoride ions leads to comparatively low fluoride adsorption in alkaline medium. Similar mechanism for the effect of pH on fluoride adsorption has been indicated in the literature [5-7]. A pH of 6.5, which gives maximum fluoride removal, was taken as an optimal pH for application to real water samples.

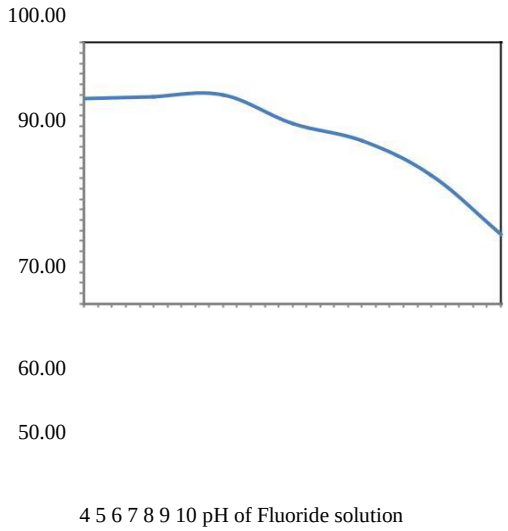


Figure 6: Variation of percent removal of fluoride with increasing the initial pH of adsorbate solution

4.0 Adsorption isotherms

Adsorption isotherms are essential for the description of how fluoride ion concentration will interact with prepared carbons and are useful to optimise the use of activated carbon as an adsorbent and as it provide an approximate estimation of the sorption capacity of the adsorbents.

4.1 Freundlich isotherm

The linearised Freundlich adsorption isotherm, which is of the from (8)

$$\log (q_e) = \log K_f + (1/n) \log C_e$$

Where, K_f and 1/n are the Freundlich constants, qe is the amount of fluoride adsorbed per unit weight of the adsorbent (in mg/g), and if $1/n < 1$ bond energies with surface density, if $1/n > 1$, bond energy decreases with surface density and if $1/n = 1$, all surface sites are equivalent, related to sorption capacity and sorption intensity respectively.

4.2 Langmuir isotherm

The linear form of the Langmuir isotherm can be expressed as,

$$qe = a\ b\ Ce / (1 + b\ Ce),$$

where qe is the amount adsorbed (mg/g) and Ce is the equilibrium concentration of adsorbate (mg/L), a and b are the Langmuir constants related to capacity and energy of adsorption, respectively.

Linear plots of Friundlich and Langmuir Plots at different fluoride concentrations are applied to confirm the applicability of suitable isotherm model for the removal of fluoride ions are shown in Figure 7(a&b) and the isotherm parameters along with the correlation coefficients (r-values) for adsorbents are presented in Table 3. The observed linear relationships as evidenced by r-values close to unity (0.96) confirm that Langmuir isotherm is more applicable.

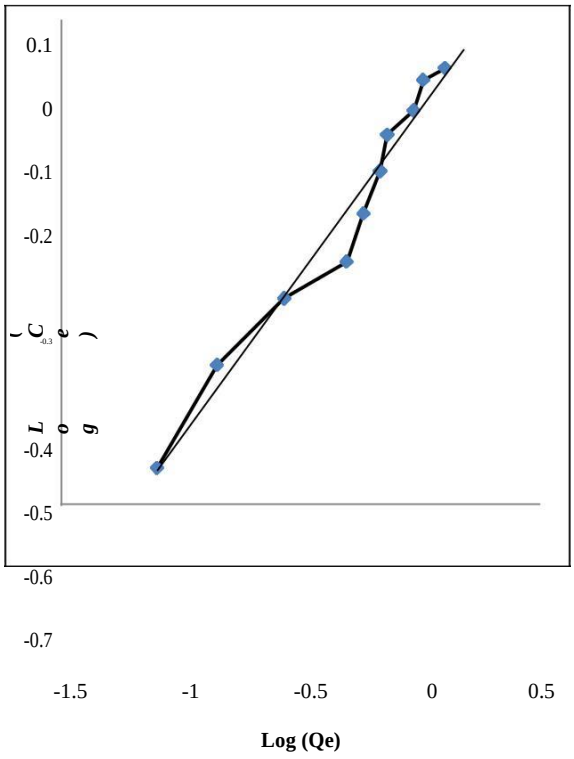
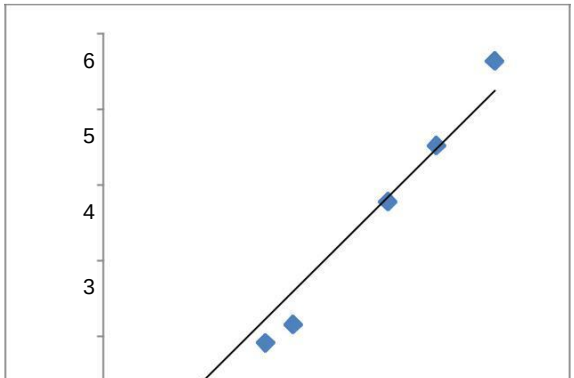


Figure 7a: Freundlich Isotherm model



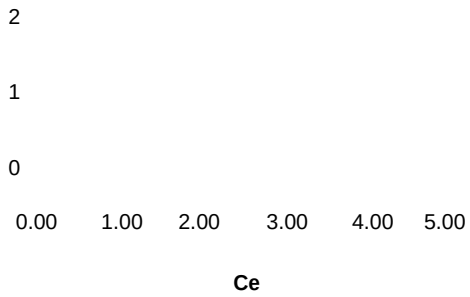


Figure7b: Langmuir isotherm for the removal fluoride by adsorption on SRC

The applicability of Langmuir isotherm model indicates the formation of monolayer coverage of adsorbate on outer surface of the adsorbent.

Further, the essential characteristics of a Langmuir isotherm can be expressed in terms of dimensionless separation factor, and describe the type of isotherm defined by;

$R_L = 1/ (1 + b Ci)$

Where, Ci is the initial concentration of fluoride (in mg/L) and 'b' is the Langmuir constant (in g/L). The separation factor RL indicates the isotherm's shape and the nature of the adsorption process as unfavourable ($R_L > 1$), linear ($R_L = 1$), favourable ($0 < R_L < 1$) and irrereversible ($R_L = 0$). In the present study the values of RL (Table 3) being 0.28 for the adsorbent SRC indicating that the sorption process is favorable for all this low-cost adsorbent. Where *b* and Ci are terms appearing in Langmuir isotherm.

Table 2	Adsorption isotherm parameters	
Isotherm	Isotherm Parameter	Values
	Intercept (K_f)	0.04
	Slope (1/n)	0.543
	R^2	0.89681
Langmuir isotherm	Correlation coeff. (r)	0.969
	R^2	0.93896
	'a' (mg/g)	1.72
	'b' (g/L)	0.19
	R_L	0.51

5.0 KINETIC STUDY OF ADSORPTION PROCESS

The kinetics of sorption describes the solute uptake rate, which in turn governs the residence time of sorption reaction. It is one of the important characteristics in defining the efficiency of sorption(9).

5.1 Pseudo-second-order kinetic model

The pseudo second-order adsorption kinetic rate equation is expressed as (10):

( )

The plot of (*t/qt*) and *t* of Eq. (3.32) should give a linear relationship from which *qe (1/slope)* and k_2 *(slope^2/Intercept)* can be determined from the slope and intercept of the plot, respectively. Available studies have shown that the pseudo-second order rate equation is a reasonably good fit of data over the entire fractional approach to equilibrium and therefore has been employed extensively in the study of adsorption kinetics.

However, it is not uncommon to observe multi linearity on the *t/qe* Vs *t* plot. The trend is usually such that the rate constant decreases with time or

more specifically decreases with increasing solid phase concentration.

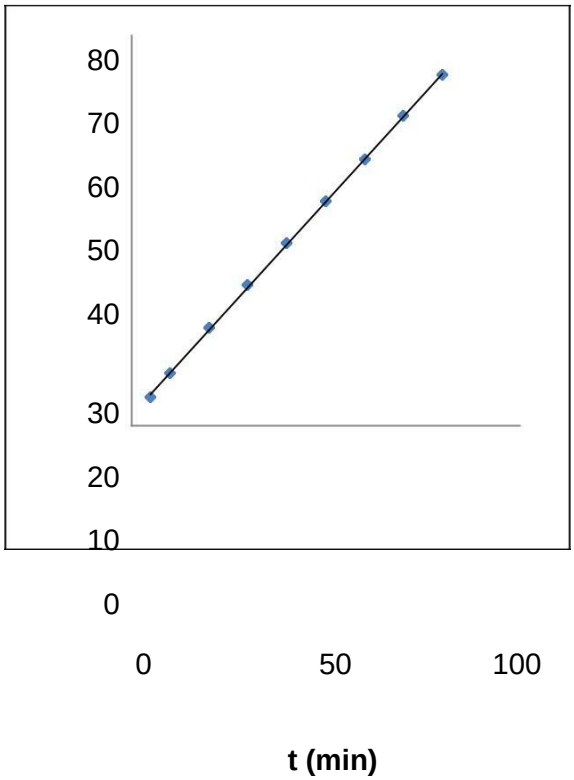


Figure 8: Pseudo-second-order kinetics for the adsorption of fluoride onto SRC

In the present kinetic study (Figure8) the R^2 value for the adsorbent SRC having 0.999 close to unity hence pseudo-second order kinetic equation is fit for the current adsorption study.

Conclusion

It can be concluded that SRC sample has good properties for the sorption of fluoride ions from aqueous solutions. The equilibrium time for removal of fluoride concentration is determined to be 35 min. The fluoride saturation capacity of SRC is 1.38 mg F^-/g at room temperature. The best fitting adsorption isotherm is Langmuir model (R^2 > 0.998), which indicates that fluoride bio-adsorption onto SRC is characterized by physisorption on heterogeneous surfaces. The particle size is an important parameter that affects the sorption for fluoride on SRC since the sorption of these ions increases as the particle size decreases. Finally, this low-cost material can be employed as an adsorbent for fluoride removal from groundwater, in particular in domestic systems where fluoride related problems exist.

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PHYSICO-CHEMICAL ANALYSIS & GIS-APPROACH FOR MAPPING OF GROUND WATER QUALITY-A CASE STUDY

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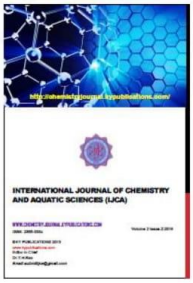
RESEARCH ARTICLE



ABSTRACT

The state of Andhra Pradesh, India falls in water stress area. The primary objective of this study is to examine the spatial distribution of different chemical elements with respect to its contamination level of groundwater quality in Anakapalle rural mandal, Andhra Pradesh, India. This has been determined by collecting 270 water samples in three seasons (summer, monsoon & winter) for period of the year 2013 and subjecting the samples to a comprehensive physico-chemical. The aim of the study is to present the data in GIS (kriging method) environment for better understanding the spatial distribution of each chemical parameter and mapping of the current situation of groundwater quality of Anakapalle rural mandal more than 20 chemical parameters of groundwater are selected and compared to the guideline values presented by world health organization (WHO). The water quality index was developed in order to present the overall water quality of the study area. The chemical Index such as SAR, RSC, and KI, % Na, PI and MR were calculated. The results indicated that PI and MR values revealed more than 50% groundwater samples quality is very poor for drinking as well as irrigation practices also.

Keywords: GIS, Groundwater quality parameters, Ordinary Kriging, Groundwater quality index.

INTRODUCTION

Water pollution is a major environmental concern in India. Among the various source of water, groundwater is considered to be the safe for drinking purposes. Groundwater is used for domestic and industrial water supply and also for irrigation purposes in all over the world. In the last few decades, there has been a tremendous increase in the demand for fresh water due to rapid growth of population and the accelerated pace of industrialization. According to WHO organization, about 80% of all the diseases in human beings are caused by water[1]. Once the groundwater is contaminated, its quality cannot be restored back easily and to device ways and means to protect it. The greater part of the soluble constituents in ground water comes from soluble minerals in soils and sedimentary rocks. The growing urbanization and industrialization and the consequent pollution of surface water sources, also increased the necessity of using groundwater for various domestic and industrial purposes[3].

Water quality assessment involves evaluation of the physical, chemical, and biological nature of water in relation to natural quality, human effects, and intended uses, particularly uses which may affect human health and the health of the aquatic system itself [4]. The use of GIS technology has greatly simplified the assessment of natural resources and environmental concerns, including groundwater. In groundwater studies, GIS is commonly used for site suitability analyses, managing site inventory data, estimation of groundwater vulnerability to contamination,

groundwater flow modelling; modelling solute transport and leaching, and integrating groundwater quality assessment models with spatial data to create spatial decision support systems[5]. A GIS-based study was carried out by various researchers like Ahn and Chon (1999)[6] studied groundwater contamination and spatial relationships among groundwater quality, topography, geology, land use, and pollution sources using GIS in Seoul. Physicochemical aspects of ground water affect quality of water differently in monsoon, summer and winter period. Keeping this in mind, the present study has been therefore designed with the aim to investigate and assess the quality of the surface water in Anakapalle region three seasons of the year 2013 for its suitability by various experimental and theoretical techniques. Considering the above aspects of groundwater contamination and use of GIS in groundwater quality mapping, the present study was undertaken to map the groundwater quality in Anakapalle revenue subdivision (Figure 1), Andhra Pradesh, India. This study aims to visualize the spatial variation of certain physico-chemical parameters through GIS.

Need of the Study

In India, numerous technical and non-technical reports concerning water conservation strategies are available. For example, Survey of India (SoI) topo sheets, Geological survey of India (GSI) surface geological maps, Central Ground Water Board (CGWB) hydro-geologic, water quality, and depth to water maps, all are available only at a scale of 1:25,000 or smaller. These technical maps can best act as primary data sources for decision making at global to regional (district) scale. However, in practice most of the water conservation strategies are to be implemented at regional to local scale. This work bridge the gap between scientific and scale issues by analyzing topographical, hydro-geological, and quality parameters at village scale in a scientific manner. The objective of this user guide is to aid water conservation strategies at village scale through geo-physical and water quality investigations.

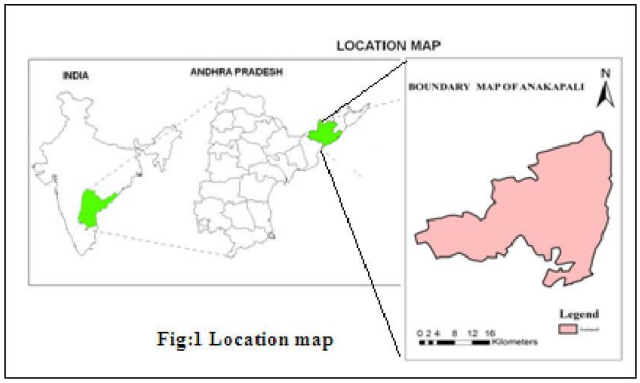


Fig:1 Location map

Study Area

The study area Anakapalle mandal is located in Visakhapatnam district of Andhra Pradesh state in India. Anakapalle is a municipality and sub-district (Mandal) with 31 villages, population of about 1.9 lakh among them about 93 thousand (50%) are male and about 94 thousand (50%) are female. The study area is located between longitude17.6913°N; latitude 83.0039°E on the banks of River Sarada and is covered in the survey of India topographical map numbers 56H65 K/10,11,13,14,15M 65 O/1 and O/2. The area is under influence for fast development of urban agglomeration and industrial growth with mega industries for petroleum, Pharma parks. The present research is carried out in 31 villages of Anakaplle mandal from Summer Season to winter in three different seasons [(summer (April-May); Monsoon (August-September)-winter (November-December)] and tabulated in Table 1.

Table 1:Sampling Locations with Coordinate Location and type of water samples

Table 1:Sampling Locations with Coordinate Location and type of water samples

		Coordinate Location		Type of water sample/no of samples								
S.No	Villages	Longitude (N)	Latitude (E)	Year 2011			Year 2012			Year 2013		
				Summer	Monsoon	Winter	Summer	Monsoon	Winter	Summer	Monsoon	Winter
1	Allikhanudupalem	17° 44' 12.8436"	82° 58' 3.468"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
2	Bhatlapudi	16° 15' 29.4912"	80° 53' 51.1548"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
3	Chintanippula Agraharam	17° 42' 8.1216"	83° 1' 41.0952''	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
4	Golagam	17° 41' 5.2224"	83° 2' 0.4272''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
5	Gopalapuram	17° 41' 22.5276"	82° 59' 51.8388"	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
6	Jagannadhapuram	16° 42' 32.796"	81° 27' 48.9672"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
7	Koduru	17° 41' 22.5276"	82° 59' 51.8388"	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
8	Kondupalem	17° 43' 54.102"	83° 1' 41.0952''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
9	Koppaka	16° 45' 2.1996"	81° 1' 47.7048''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
10	Kunchangi	17° 43' 35.8896"	82° 56' 37.8348"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
11	Kundram	17° 43' 24.2004"	82° 55' 9.2244''	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
12	Makavaram	17° 41' 22.5276"	82° 59' 51.8388"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
13	Mamidipalem	17° 45' 44.5464"	82° 59' 7.6848''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
14	Maredupudi	17° 41' 6.5796"	83° 3' 53.9892''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
15	Maredupudi Agraharam	17° 40' 19.758"	83° 3' 3.258"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
16	Marturu	17° 43' 55.1208"	83° 0' 55.1664''	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
17	Mettapalem	17° 24' 19.7316"	82° 53' 37.4316"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
18	Papayya Palem	17° 43' 52.7304"	83° 1' 2.4204''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
19	Papayya Santha Palem	17° 44' 33.0612"	83° 0' 4.3956''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
20	Pisinikada	17° 40' 37.164"	82° 58' 47.01''	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
21	Rajupalem	17° 41' 22.5276"	82° 59' 51.8388"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
22	Rebaka	17° 42' 27.2592"	83° 0' 43.0776''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
23	Sampathipuram	17° 40' 28.1136"	82° 56' 43.8684"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
24	Sankaram	17° 41' 9.6684"	83° 1' 36.2604''	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
25	Seethanagaram	17° 10' 35.9652"	81° 41' 33.09''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
26	Tagarampudi	17° 45' 11.7864"	82° 57' 7.8192''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
27	Thummapala	17° 42' 51.8616"	82° 59' 49.8876"	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
28	Valluru	17° 41' 22.5276"	82° 59' 51.8388"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
29	Venkupalem	17° 18' 1.2456"	80° 5' 48.4476''	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)
30	Vetajangalapalem	17° 40' 52.1256"	82° 55' 52.7952"	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)	BW (1)	BW/HP(1)	BW (1)
31	Vooderu	17° 45' 32.2056"	82° 59' 55.4784"	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)	BW (2)	BW/HP(1)	BW (2)

*HP: Hand Pump/*BW=Bore well

MATERIAL AND METHOD

GIS-Spatial prediction methods

Geographic information system (GIS) is most effective tool to provide better information for the consumers, policy makers and this helps for taking quick decision. For representing the spatial distribution of sampling locations, the coordinates have been found using the Google Earth satellite view. The interpolation of the water sample values has been done by ordinary kriging interpolation technique in the ArcGIS9.2 software.

ORDINARY KRIGING[12]

Kriging is a linear predictor, meaning that a prediction at any location is obtained as a weighted average of the neighbouring data. The weights used in the kriging estimation are computed so that the variance between the estimated value and the unknown value is minimized**.** Ordinary kriging assumes a constant, but unknown mean, and estimates the mean value as a constant in the searching neighbourhood. Ordinary kriging is mathematically defined as:

$Z(s)=\mu+\varepsilon(s)$

where Z(s) is the value at that location; s is a sampled location; μ is the constant mean and ε(s) are random errors with spatial dependence. The predictor is generated as a weighted sum of the data mathematically defined by the following equation

$\hat{Z}(s_o)=\sum_{i=1}^{N} \lambda_i Z(s_i)$

where so is the prediction location; N is equal to the number of measured values that will be used to predict the value at the unknown location; λi is an unknown weight for the measured value at the i^{th} location, and Z(s*i*) is the measured value at the i^{th} location.

Water quality index [10]

In this study, for the calculation of water quality index, thirteen important parameters were chosen. The WQI has been calculated by using the standards of drinking water quality recommended by the World Health Organization (WHO), Indian council of Medical Research (ICMR) and Bureau of Indian Standards (BIS) has been used for the calculation of WQI of the water body.

The Water Quality Index (WQI) was computed using 10 water quality parameters viz. pH, Total Dissolved Solids, Turbidity, Total Hardness, Fluoride, Chloride, Nitrate, Iron, Sulphate and Dissolved Oxygen of groundwater samples in three seasons on average. WQI indicates a single number like a grade that expresses the overall water quality at a certain area and time based on several water quality parameters.

$W_i = 1/ S_i$

Where, Wi is weightage factor and Si is the highest permitted value of parameter as given by WHO.

$Q_i = \{[(V_{actual} - V_{ideal})/ (V_{standard} - V_{ideal})]*100\}$

Where, Qi is quality rating of parameter, V_{actual} is the mean value of a parameter as obtained from analysis of field samples, $V_{standard}$ is value of water quality parameter as proposed by WHO, V_{ideal} is zero for all parameters except pH where $V_{ideal} = 7$.

$WQI = W_i * Q_i$

The Piper Trilinear Diagram (PTD)[11] is most useful to understand the chemical relationships and problems about the geochemical evolution among groundwater. The chemical quality data of the investigated area are plotted on Pipers Trilinear Diagram for graphical analysis (Figure 9).

Sampling location

Water samples collection: 270 water samples collected during three seasons from Summer Season-Winter in regular intervals in 31 villages/panchayats of Anakapalle sub district. Differential Global Positioning System (DGPS - Trimble) was used to determine the geo-coordinate points of the sampling locations. The samples are collected after pumping the well or bore hole for at least an hour. After collection of the samples, the samples are preserved and shifted to the laboratory analysis. Chemical analysis was carried out to determine PH, EC, TDS, TH, Ca, Mg, Na, K, CO_3, HCO_3, Cl-, NO_3, SO_4, Fluoride etc., parameters (Table2) by following standard procedure (APHA-1995)[7] compared with standard values recommended by WHO[8].

Table 2: Physico-chemical analysis of water sample (average data on 126 water sample values/year wise data)

	Season	pH	EC	Turbidity	TDS	TH	Ca?	Mg?	Na?	K?	Cl	CO3?	HCO3?	NO3?	SO4?	F?	DO	BOD	COD
2011	Monsoon	8.14	2696.19	1.82	1634.43	587.09	158.10	46.24	100.93	4.37	578.39	412.41	386.64	36.09	411.19	0.64	2.46	0.39	1.30
	Winter	7.87	2481.85	1.72	1601.03	573.55	156.81	41.26	77.82	4.39	530.59	401.19	352.36	31.55	377.37	0.55	2.27	0.34	1.20
	Summer	7.53	2459.85	1.69	1568.19	569.56	157.80	41.24	84.15	4.07	500.38	399.61	372.10	26.29	350.67	0.47	2.28	0.34	1.19
	Average	7.85	2545.96	1.74	1601.22	576.73	157.57	42.91	87.63	4.28	536.45	404.40	370.37	31.31	379.74	0.55	2.34	0.36	1.23
2012	Monsoon	8.41	3463.88	1.84	2154.43	672.18	175.28	53.96	119.22	5.50	826.77	447.75	381.84	36.55	424.61	0.74	2.55	0.42	1.29
	Winter	8.11	3227.29	1.73	2003.89	615.22	158.49	50.87	113.01	6.02	790.15	427.30	423.34	32.04	400.55	0.68	2.42	0.42	1.21
	Summer	7.80	3043.68	1.63	1905.36	587.89	143.74	51.41	103.45	6.15	798.10	418.18	390.43	28.67	364.94	0.59	2.26	0.35	1.12
	Average	8.11	3244.95	1.73	2021.23	625.10	159.17	52.08	111.89	5.89	805.01	431.08	398.54	32.42	396.70	0.67	2.41	0.40	1.21
2013	Monsoon	8.28	2412.45	1.78	2354.41	836.37	201.85	60.74	86.19	6.39	553.26	400.34	452.37	57.31	389.64	0.96	2.50	0.43	1.30
	Winter	8.00	2283.93	1.67	2257.95	758.69	204.15	56.15	77.25	5.69	513.77	396.69	412.26	49.02	385.20	0.81	2.38	0.37	1.27
	Summer	7.66	2230.98	1.62	2215.30	745.22	200.60	56.61	77.75	6.34	505.42	412.11	431.00	45.41	361.37	0.74	2.21	0.37	1.18
	Average	7.98	2309.12	1.69	2275.89	780.09	202.20	57.83	80.40	6.14	524.15	403.05	431.88	50.58	378.74	0.84	2.36	0.39	1.25

The pH, electrical conductivity (EC) and total dissolved solids (TDS) values in samples were recorded in the field itself using Elico Model portable pH-EC-TDS meter instrument. Samples were analyzed in the laboratory for the major ionic concentrations employing standard methods[7]. Concentrations of major cations like Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Sodium (Na^{+}) and Potassium (K^{+}) were determined by flame atomic absorption spectrophotometer and the concentration of major anions chloride (Cl^{-}), sulphate (SO_4^{2-}) have been determined by ion chromatography. Bicarbonate (HCO_3^{-}) was determined by acid titration with HCl.

Irrigation water quality[13]

The overall irrigational water quality of the samples collected, certain parameters have been derived. These include – (i) Sodium Adsorption Ratio (SAR), (ii) Soluble Sodium Percentage (SSP), (iii) Permeability Index (PI), (iv) Residual Sodium Carbonate (RSC), (v) Magnesium Adsorption Ratio (MAR) and (vi) Kelly's Ratio/Index (KR/KI). These parameters help to evaluate the irrigational as well as domestic suitability of ground water in the study area.

Sodium adsorption ratio (SAR): The sodium adsorption ratio (SAR) was calculated using the following equation:

$SAR^* = (Na^{+})/ \{[(Ca^{2+}) + (Mg^{2+})]/2\}^{1/2}$

Soluble sodium percentage (SSP): It is calculated by the following equation:

$SSP^* = [(Na^{+} + K^{+})] / [Ca^{2+} + Mg^{2+} + Na^{+} + K^{+}] \times 100$

Permeability index (PI): The permeability of soil is affected by sodium, calcium, magnesium and bicarbonate contents of irrigation water. Doneen[14] calculated the permeability index based on the formula

PI*= {[Na + (HCO_3)1/2)]*100}/ (Ca+ Mg+ Na)

Residual sodium carbonate (RSC): The Residual Sodium carbonate (RSC) is calculated according to[12]: RSC* = (CO_3 + HCO_3) – (Ca + Mg)

Magnesium Adsorption Ratio (MAR) is used for calculating the magnesium hazard caused when it is in equilibrium in groundwater. Magnesium Adsorption Ratio (MAR) is calculated by the equation as:

MAR* = (Mg / (Ca + Mg) × 100

Kelly's index (KI): Kelly [15] devised an equation for the sodium problem in water.

KI*= Na/ (Ca + Mg)

*All concentrations are in meq/L.

RESULTS AND DISCUSSION

Contamination of the groundwater of the Anakapalle Mandal ground water is a major continuing problem not only due to the existence of different point and non-point contaminating sources but also due to the high vulnerability of the aquifer to pollution. Human activities such as the unmanaged handling and dumping of solid wastes, the improper disposal of wastewater, and the concentrated agricultural practices have contributed to the current deteriorating quality of Anakapalle mandal ground water quality. The major ion chemistry of the area showing various quality parameters are given in the Table 2 and types of samples, GPS location of samples given in Table1.

The pH (hydrogen ion concentration) of water is very important indicator of its quality as it depends on the presence of phosphates, silicates, borates, fluorides and some other salts in dissociated form. In general waters having pH between 6.5 and 8.5 are categorized as suitable, whereas waters with pH 7.0 to 8.0 are highly suitable for all purposes. In the present investigation all water samples in three seasons from Summer Season to Winter are within the permissible limits (Table 2)

Electrical conductivity of water is also an important parameter for determining the water quality. It is a measurement of water's capacity for carrying electrical current and is directly related to the concentration of ionized substance in the water. In the present study, EC values of ground water ranged in three seasons in between 2459 µmhos/cm to 2696 µmhos/cm with mean value of 2545 µmhos/cm in Summer Season; between 3043 µmhos/cm to 3463 µmhos/cm with mean value of 3244 µmhos/cm during monsoon and between 2230 µmhos/cm to 2412 µmhos/cm with mean value of 2309 µmhos/cm during Winter seasons. Distribution of EC in samples is shown in Figure 2.

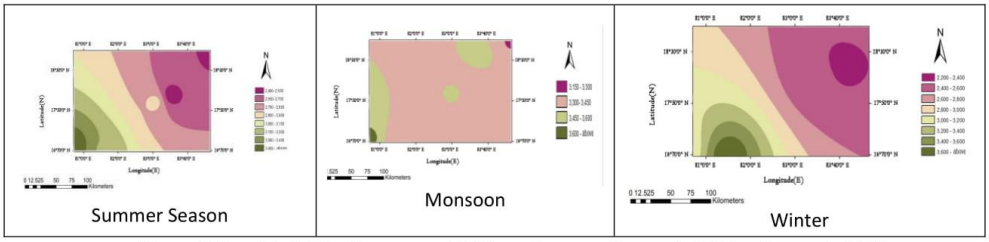


Figure 2: Special distribution maps of EC from Summer Season to Winter Season in 2013

Total dissolved solids (TDS) concentrations is the primary indicator of the total mineral content in water and are related to problems such as excessive hardness. TDS in the water samples of the study area varied from 1568 mg/Lto 1634 mg/Lwith mean value of 1601 mg/Lduring Three seasons of Summer Season.where as in monsoon these values are varied from 1905 mg/Lto 2154 mg/Lwith mean value of 2021mg/L and in Winter 2215 mg/Lto 2354 mg/Lwith mean value of 2275 mg/l. The higher values of TDS are attributed to application of agricultural fertilizer contributing the higher concentration of ions into the groundwater. The distribution of TDS in the surface water samples of the study area is depicted in Figure 3.

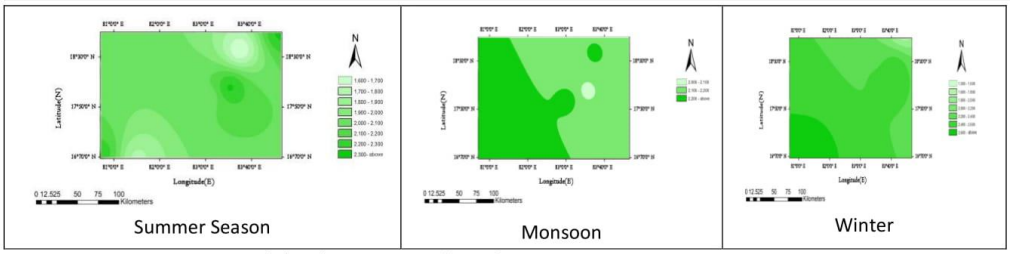


Figure 3: Special distribution maps of TDS from Summer Season to Winter Season in 2013

In groundwater hardness is mainly contributed by bicarbonates, carbonates, sulphates and chlorides of calcium and magnesium. So, the principal hardness causing ions are calcium and magnesium. The acceptable limit of total hardness is 300 mg/Whereas the maximum limit is 600 mg/L[8]. The hardness of analyzed water samples varied from 119.20 to 135.11 mg/Las $CaCO_3$. The highest value of total hardness 780 mg/L was observed in Winter water samples and in Monsoon season of Winter (836.37 mg/L) (table 1). other values vary between 567 mg/L to 587 mg/L with an average of 576 mg/Lin monsoon and in values vary between 587 mg/Land 672 mg/L with an average of 625 mg/L(Table 2). Within the three period waters winter sample is much harder compared to other seasons as evident from figure 4 which depicts the spatial distribution of hardness during both the periods.

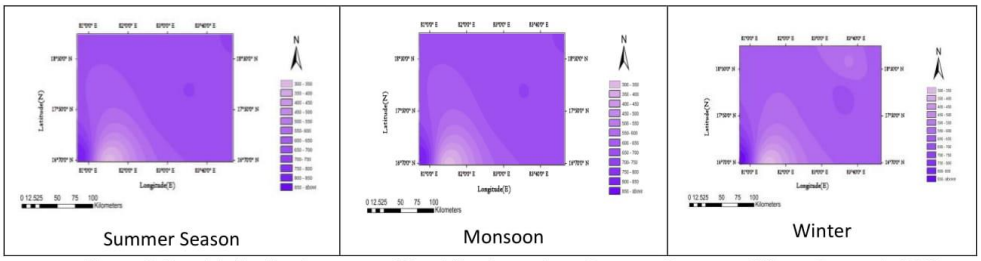


Figure 4: Special distribution maps of Total Hardness from Summer Season to Winter Season in 2013

The chloride content in most of the samples taken from hand pump and few samples from bore well have high chloride concentration and some much higher the permissible limit of 200 mg/l. This may be due to its wide distribution in natural environment. Calcium (Ca) ion concentration in Summer Season with an average value of 157 mg/L, in monsoon it was 159 mg/Land in winter it was 202. The desirable limit of Calcium (Ca) for drinking water is specified by BIS (1991) as 75 mg/Land a maximum permissible limit of 200 mg/L. It is observed that Anakapalle all samples were within the permissible limit except in winter. Magnesium (Mg) concentration varies from 42 mg/l(Summer Season), 52 mg/L(monsoon) and 57 mg/Lin Winter. According to BIS (1991) the desirable values of Mg is 30 mg/Land a maximum permissible limit of 100 mg/l. All samples were within the desirable limit. Presence of DO in water may be due to direct diffusion from air and photosynthetic activity of autotrophs. Oxygen can be rapidly removed from the waters by discharge of oxygen demanding wastes. It is the most important parameter in evaluating water quality.

The DO values obtained in the present study are found within the standards for drinking water. Bio-Chemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are the parameter used to assess the pollution of surface water and ground waters. The values obtained for both these parameters are well within permissible levels (Table 2).

The concentration of chloride is the indicator of sewage pollution and also imparts laxative effect. Porosity soil and permeability also plays a key role in building up the chlorides concentration. The chloride content of studied water samples was exceeding the permissible limit of 250 mg/L prescribed by WHO. In present study, the results of chlorides in all sampling sites from 536 (Summer Season),805 (monsoon) and 824 mg/L(Winter). when compared with seasonal changes, higher values observed in Monsoon seasons (Figure). But in all seasons Cl^- concentration it was within the maximum limit of BIS (1000 mg/L).

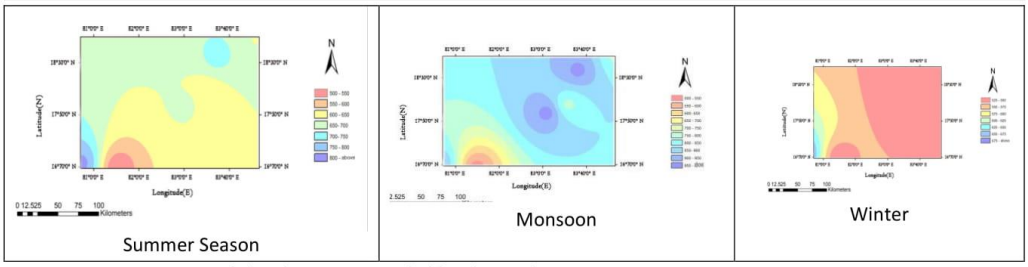


Figure 5: Special distribution maps of Chloride ion from Summer Season to Winter Season in 2013

Sulphate ion will affect the taste of water present in high concentrations (>400mg/L). Sulphate ions do not have any significant detrimental effect on plants and animals. It is essential nutrient for plants. Excess sulphate concentration increases salinity and hardness of water. At levels above 1000 mg/L, sulphate in drinking water can have a laxative effect. As per the BSI standards desirable limit is 200mg/L maximum limit is 400mg/L. Sulfate ion varied from 350-424 mg/L(from Summer Season to Winter Season in 2013). Three seasons of Summer Season and monsoon exceeding the permissible limit. Sulphate cannot readily be removed from drinking water, except by expensive process such as distillation, reverse osmosis or electro dialysis. Figure 6 shows the spatial distribution of 3 periods respectively.

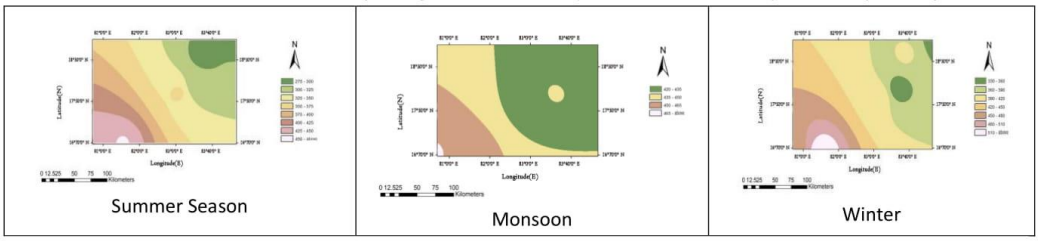


Figure6 : Special distribution maps of sulphate ion from Summer Season to Winter Season in 2013

Sodium is the most abundant element of the alkali-earth group in the earth crust with average value 2.5%. BIS (1991) & WHO (2006) have not given any guideline limit for sodium and potassium in drinking water. Sodium concentration ranged between 80 mg/L to 111 mg/L from Summer Season to Winter (Fig.7). Potassium ion concentration may be harmful to human nervous and digestive system. Potassium concentration ranged between 4 to 6 mg/L from Summer Season to winter (Fig.8). The concentration of potassium in the study area is very low. It is not feasible to assess the suitability of water for drinking purpose as no agency have given any standard with respect to potassium.

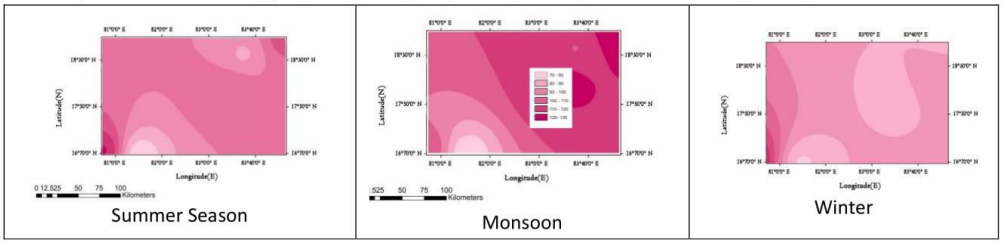


Figure 7: Special distribution maps of Sodium ion from Summer Season to Winter Season in 2013

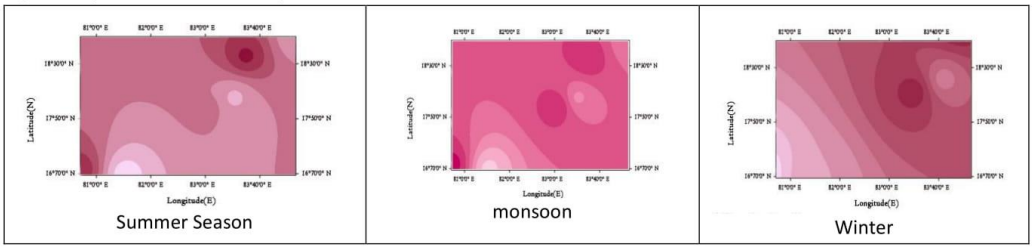


Figure8: Special distribution maps of Potassium ion from Summer Season to Winter Season in 2013

Generally water bodies polluted by organic matter exhibit higher values of nitrate. The concentration of nitrate depends on the activity of nitrifying bacteria which in turn get influenced by DO. In the present study water samples from different sampling stations within the permissible level (40mg/l) except monsoon and winter seasons of Winter (>40mg/l). The high concentration of nitrate in the study area is due to the dumping of solid wastes into the vacant lands. Very few heavy metals are analysed and fallen within the permissible limit.

The suitability of water for drinking purpose is determined from Piper's[16] Trilinear Diagram. It is the graphical representation of chemistry of water samples. The cations and anions are represented by separate ternary plots. The ternary plot is then extrapolated onto the diamond diagram. Piper diagram can predict the water type in three ways – bicarbonate type, sulphate type and chloride type. The bicarbonate type is considered suitable for both drinking and agricultural purpose. Sulphate type is suitable for irrigation. Based on Pipers diagram, the groundwater facies of the area are categorized as alkaline earths exceed alkalies and weak acids exceed strong acids and carbonate hardness exceeds 50%, i. e. chemical properties of water are dominated by alkaline earths and weak acids, few samples also show that no cation – anion pair exceed 50 %.

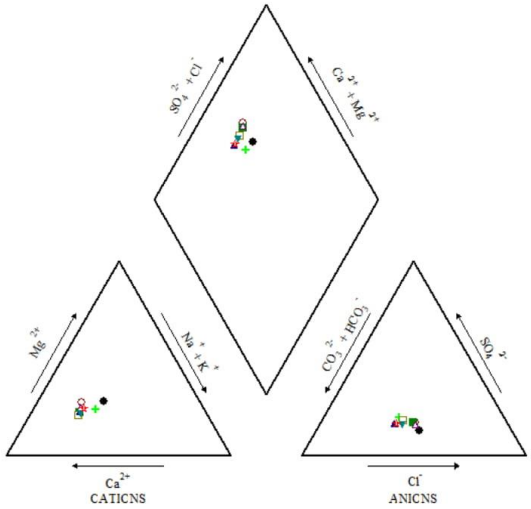


Figure 9: Pipers Trilinear Diagram for graphical analysis

Quality evaluation for agriculture

The water quality for irrigational practices is considered under the following as follows:

SSP: When concentration of sodium ion is high in irrigated water, it tends to be absorbed by clay particles, dispersing magnesium and calcium ions. This exchange process of sodium in water for $Ca^{2+}$and Mg^{2+} in soil reduces the permeability and eventually results in soil with poor internal draining. As per Todd (1980) SSP values are categorised into suitable (<200) and Unsuitable (>200). Anakapalle ground water fallen suitable category because calculated values for three seasons s and three seasons are less than 200.

KR: Water having KR value less than 1 is considered suitable for irrigation. All samples have KR values less than 1; hence the water is fit for irrigation.

Magnesium Adsorption Ratio (MAR) is used for calculating the magnesium hazard caused when it is in equilibrium in groundwater. MAR is broadly classified into 2 groups. Less than 50 values of groundwater are considered to be suitable for irrigation whereas greater than 50 values are unsuitable. In the present water analysis all samples have the values less than 50; hence the water is fit for irrigation.

Permeability index (PI): The permeability of soil is affected by sodium, calcium, magnesium and bicarbonate contents of irrigation water. Doneen (1964) calculated the permeability index and categorized into 3 types (Table 3). Based on these values calculated values fallen with the second category (80-100).

Residual Sodium Carbonate (RSC): RSC has been calculated to determine the hazardous effect of carbonate and bicarbonate on the quality of water for agricultural purpose. When the sum of carbonates and bi-carbonates is in excess of calcium and magnesium, there may be a possibility of complete precipitation of calcium carbonate and magnesium carbonate. The concentration of Ca and Mg decreases relative to sodium and the SAR index will be bigger. This will cause an alkalizing effect and increase the pH. Table 3 indicated that the computed RSC values range from 2.32 (summer), 2.45 (monsoon) and 2.74 (winter) meq/l with an average of 2.48 meq/l revealed that 97% of the samples are within the marginally safe water category as far as RSC is concerned. Figure 10 & 11 shows the spatial distribution of carbonate and bi carbonate concentrations in three seasons

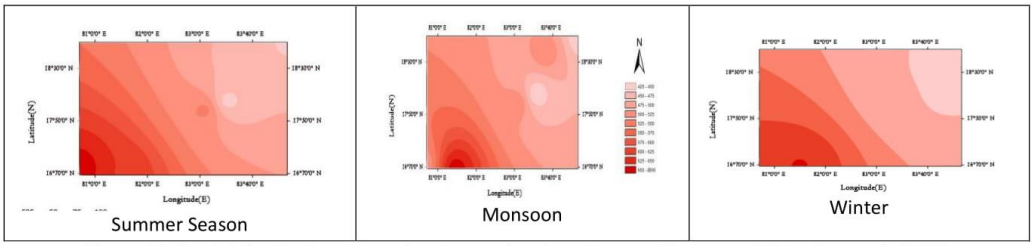


Figure 10: Special distribution maps of carbonate ion from Summer Season to Winter Season in 2013

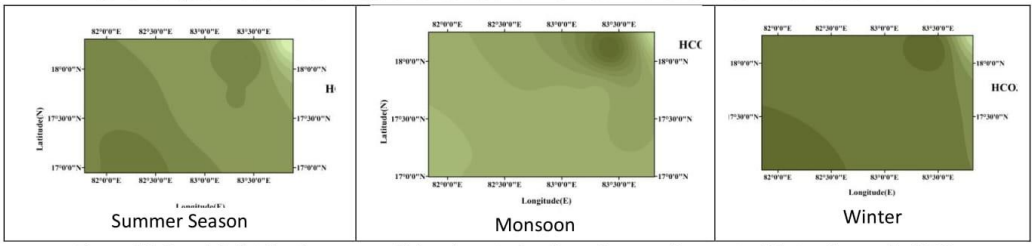


Figure 11: Special distribution maps of bi carbonate ion from Summer Season to Winter Season in 2013

Fluoride ion levels

Groundwater containing fluoride has drawn worldwide attention because of its effect on human health. Fluoride is a trace element typically present in water at levels from 0.1 to 1.5 mg/L. About 62 million people in India are affected with dental, skeletal and /or nonskeletal fluorosis (Sujatha, 2014). Variation in fluoride in collected water sample were 0.68 to 0.92 mg/L approximately 45% (Monsoon); 0.88 to 1.05 mg/L approximately 40% of total collected samples in winter season and 1.52mg/L to 1.94 mg/L of fluoride concentration was observed in 16% of total water samples and identified that need of urgent defluoridation process in summer seasons respectively and figure 12 shows the spatial distribution of 3 periods respectively

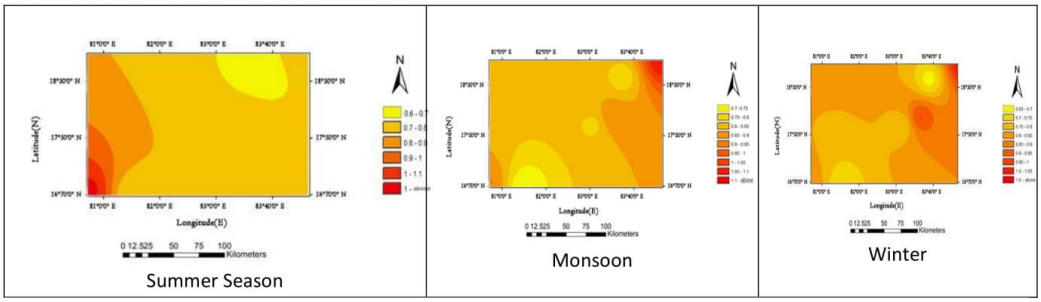


Figure 12: Special distribution maps of Fluoride ion from Summer Season to Winter Season in 2013

Water quality index (WQI)

A water quality index is a means to summarize large amounts of water quality data into simple terms for reporting to management and the public in a consistent manner. The present water quality shows poor quality in three seasons. Variation in water quality index in collected water sample were 74.5 mg/L(Summer Season) 74.82 mg/L

(Monsoon), 74.9 mg/L(Winter) and 74.757 mg/L(on average of three seasons) respectively. The water needs further treatment and then can be used for the drinking purpose. The reason of these values of WQI may be the higher values of TDS, Total Hardness etc.,

Table 3: Classification of Samples according to standards specified for different water quality parameters in three years on average values.

.	Range	Class	Year 2011	Year 2012	Year 2013	Average
SAR (Richards 1954)	<20	Excellent	4.67	5.84	6.82	5.777
	20-40	Good				
	40-60	Permissible				
	60-80	Doubtful				
	>80	Unsafe				
TH (Sawyer and McCarty, 1967)	<75	Soft				
	75-150	Moderate				
	150-300	Hard				
	>300	Very Hard	576.73	625.10	780.09	660.64
RSC (Raghunath 1987)	<1.25	Safe				
	1.25-2.50	Marginally suitable	2.32	2.4		2.487
	>2.50	Unsuitable			2.74	
MAR (Raghunath 1987)	<50	Suitable	21.56	24.653	22.241	22.818
	>50	Unsuitable				
SSP (Todd 1980)	<200	Suitable				
	>200	Unsuitable	315.9	357.97	249.69	307.85
KI (Kelly 1963)	<1.0	Suitable	0.423	0.53	0.309	0.421
	>1.0	Unsuitable				
PI (Doneen 1964)	<80	Good				
	80-100	Moderate				
	100-120	Poor	158.963	157.958	150.478	155.8
WQI (Horton 1965)	0-25	Excellent				
	26-50	Good				
	51-75	Poor	74.5	74.82	74.9	74.757
	76-100	Very Poor				
	> 100	Unfit for Drinking				

CONCLUSIONS

On the basis of hydrochemical studies, it may be concluded that the quality of groundwater in certain parts of Anakapalle sub district is affected and not fit for human consumption. In the study area, many of ionic concentrations in the groundwater are at higher levels indicating that they are problematic in one way or the other, if they are consumed without proper treatment. It is significant to note that ground waters of variable quality exist in this area and the quality of the groundwater is being deteriorated in some parts. This is mainly because of percolation from sewage, waste disposal sites and industrial effluents, As the waters are of very hard type, they may pose problem for domestic use also, in particular washing of clothes because of their adverse action with soap and hence, water softening processes for removal of excess hardness is needed. If this is not feasible, it is recommended that these waters may be used only for some industrial and other purposes

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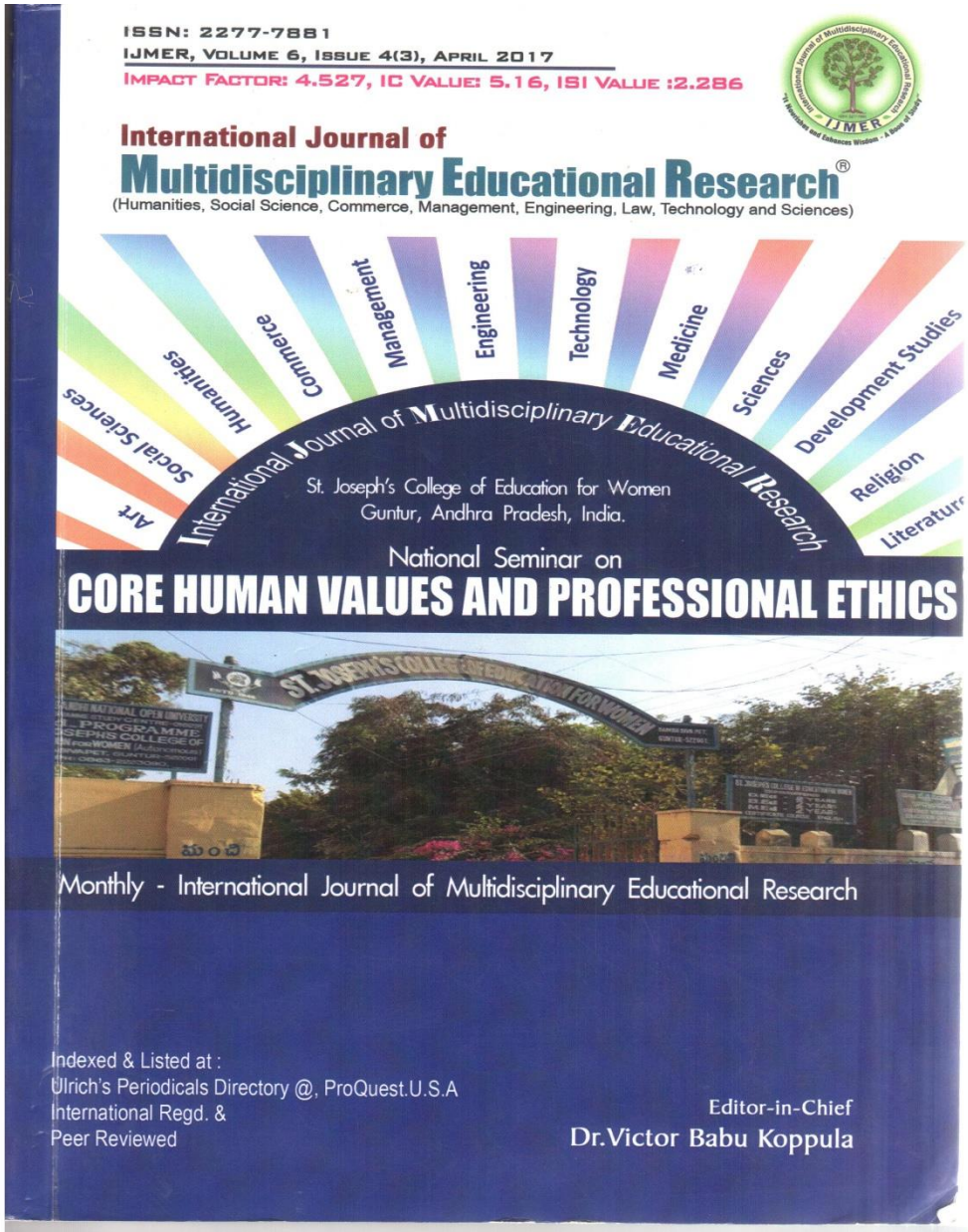

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BASIC HUMAN VALUES - BIBLICAL PERSPECTIVE

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Introduction:

Ethics is the branch of philosophy which examines right and wrong moral behavior, moral concepts and moral language. Different ethical theories give various answers to the question "What is the greatest value?" The values and behavior vary for individuals and groups as Ethical theories are closely related to social groups, religious practices and time. Some concepts (e.g. homosexual marriages, abortions etc.) were made legal in some countries basing on the demand of the people. Thus the meaning of these words has become relative. We are living in a world of deteriorating human values and ethics. Everyone talks about values and standards, but very few take a stand to follow.

Christian Ethics:

According to the Bible, man was created in the image and likeness of God. This clearly states that God has given His moral attributes like love, grace, kindness, truth, justice, impartiality, righteousness, faithfulness, holiness etc. to human beings. Moreover, He gave man discerning and decision making power. But, Adam the first man, simply disobeyed God's command by eating the forbidden fruit, paving way for lawlessness and separated from God. By this act of violating God's command man lost his moral attributes and his thoughts became polluted. From then onwards the human heart has become corrupted and declining of values was initiated. Adam's son Cain killed his brother Abel due to jealousy. Throughout the Bible God instructed His children to live with Integrity and love, to do justice and observe professional ethics. Jesus in His famous Sermon on the Mount spoke of the moral and ethical standards to be adopted by His followers. Many eminent personalities of the world under the influence of Jesus' teachings lived exemplary lives, achieved great things and remained real heroes for the next generations. The Father of our Nation,

Mahatma Gandhi was one such example, who adopted the weapon of nonviolence to achieve freedom for the country.

The essence of the Ten Commandments is summarized into two by Jesus in the New Testament. The first one is "love your God with all your heart, all your soul and all your entire mind" and the second one is "love your neighbor as thyself" (Mark 12:28-31) made part of the theological centerpiece of Christian ethical perspective. This is illustrated with the parable of the Good Samaritan which praises action to help any human in need. Jesus' in His earthly life practiced what he had preached and exposed to us a model to follow. He is a perfect human being and a great teacher of all times. He expects us to be perfect as He is (Mt 5:48). This is nothing but living with values following His footsteps.

The Christian values and ethics "are reflected in the Bible, originate from the transfer of knowledge about God and humankind through biblical understanding". A teacher has to strive to combine the core of Christianity and human services together to enrich the power of care and service to the student by providing the highest quality service available to them with respect to their own culture, diversity, religion, and needs. The primary mission of a teacher is to adhere to the core values of Christianity to promote high quality service and care, along with promoting the well-being, best interest, and diversity of the student. Thus an educator "upholds the integrity and ethics of the profession, partakes in constructive criticism of the profession, promotes student and community well-being, and enhances his own professional growth". The mission of the teacher is based on a set of core values that provide a diverse, unique, and respected perspective for the professional and the profession. Core values, and the principles that flow from them, must be balanced within the context and complexity of the human experience. These core values also allow the professional to keep God as a central figure in all aspects of the profession by allowing them to stay faithful to their Christian values.

Ethical Principles:

As teachers it is our principal responsibility to inculcate ethical values and principles in the students. Realizing this, the University Grants Commission introduced human values and professional ethics in the curriculum. To impart these values, we have to practice them, since

"values are caught not taught". Thus the mission of a human resource trainer is based on a set of core values that are

Service:

A teacher's primary goal is to serve the students, especially those in need. Teachers are "to be servant minded and servant leaders in the same way Christ came to serve humankind". Teachers are expected to provide some voluntary services utilizing some of their professional skills.

Integrity:

A teacher should be trustworthy and honest. He should stand firm on his/her Christian teachings which uphold the values of truth, honesty, and responsibility. Thus he/she also support the ethical practices of the organization which they are associated with.

Respect:

A teacher should respect a person's worth, background, origin, and cultural and ethnic diversity. Teacher should reach out to each student with care, compassion, empathy, and genuine Christian love while keeping in mind any differences in cultural and ethnic diversity with the greatest amount of respect. Also support students' self-determination, provide encouragement for self-advocacy, and ability to change, learn, grow, and address their own needs.

Love:

A teacher should love students in the same way that God loves us. Teacher should not judge students but serve them with the same love God provides for them with respect to ethical boundaries. Teacher should be compassionate towards student's problems and needs.

Competence:

A teacher should work continuously to improve his/her knowledge, skills, and area of expertise through classes, research, training, workshops, and conferences in order to apply the highest performance of service and care for the students.

Social Justice:

A teacher should focus primarily on areas such as poverty, unemployment, discrimination and other forms of social injustices as

root community problems that need prompt attention, and do so with a focus on change towards improvement. He/she should support sensitivity to and knowledge about oppression.

Impartiality:

A teacher should be fair-minded to treat all the students equally without any prejudice.

Commitment:

Commitment to the profession is a prerequisite for a teacher.

Dedication:

A teacher will be a role model only when he/she is dedicated to the well-being of his/her students.

These core values allow the professional to keep God as the central figure in all aspects of the profession by allowing them to stay faithful to their Christian values. The Bible is the universal and fundamental source of ethics and an authority for moral discernment and judgment. Various issues today are informed by Biblical passages in the Old and New Testaments, thus they can be taken as guidelines for better living. Many students of this generation are influenced tremendously by peer groups in negative aspects and are becoming a threat to the society. Apart from this the advancements in Science and Technology like internet and social networks are misused by the present day youth ultimately resulting in a barbarian society. They are going astray and living without a goal or purpose in their lives. Some are creating problems to their parents also. Some are ending their lives. At this juncture the only ray of hope for a better society is role models who live by values in their roles as parents, teachers, friends, mentors, leaders and rulers.

The society is fully corrupted and is always looking for short cuts. Unjust gain / unfair victory are short-lived and do not give real joy. Living with Integrity, honesty and living for truth may be very difficult, but give true joy and peace. The victory of AAP in Delhi is a good example of common man's hope for value based government.

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HUMAN VALUES AND PROFESSIONAL ETHICS

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Introduction

value : A value is defined as a principle that promotes well-being or prevents harm." Another definition is: Values are our guidelines for our success—our paradigm about what is acceptable."

The five core human values are:

(1) Right conduct,

(2) Peace,

(3) Truth,

(4) Love, and

(5) Nonviolence.

Human Values: Human values are a set of emotional rules; people follow to make the right decisions in life. When values are used in a professional setting, they are called ethics. Values are used in every day decision making at work and at home. Good values instil a sense of integrity, honesty and diligence in people

Ethics: Ethics is the word that refers to morals, values, and beliefs of the individuals, family or the society.It is different from non-moral problems, when dealing with issues and controversies. Thirdly, ethics refers to a particular set of beliefs, attitudes, and habits of individuals or family or groups concerned with morals. Fourth, it is used to mean 'morally correct'

A profession is a vocation founded upon specialized high educational training, the purpose of which is to supply objective counsel and service to others, for a direct and definite compensation. • Professional ethics encompass the personal and corporate standards of behaviour expected of professionals.

TYPES OF ETHICS

Meta-ethics

Normative ethics

Applied ethics

COMPONENTS OF ETHICS

- Honesty
- Integrity
- Transparenc
- Accountability
- Confidentiality
- Objectivity
- Respectfulness
- Obedience to law

CODES OF ETHICS : The codes of ethics are guidelines for specific group of professionals to help them perform their roles, to know how to conduct themselves, and to know how to resolve various ethical issues. O The codes of ethics help the professionals to apply moral and ethical principles to the specific situations encountered in professional practice. O These codes convey the rights, duties, and obligations of the members of the profession

Basic guidelines of value education

The subject that enables us to understand what is valuable for human happiness is called value education. In order to qualify for anyone course on value education. The following guidelines for the content of the course are important:

universal : It needs to be applicable to all human beings irrespective of caste, creed, nationalities,religion etc.. for all times and regions.

Rational: It has to appeal to human reasoning. It has to be amenable to reasoning and not based on dogmas or blind beliefs.

Natural and verifiable: It has to be naturally acceptable to the human being who goes the course and when we live on the basis of such values it leads to our happiness.

All encompassing: value education is aimed at transforming our

consciousness and living. Hence it needs to cover the dimensions(thought, behaviour, work and realization) and levels(individual, family, society,nature and existence) of human life and profession

Need for value education

The subject that enables us to understand 'what is valuable' for human happiness is called value education,Need for value education is:

1)Correct identification of our aspirations

2)Understanding universal human values

3)Complimentarily of values and skills.

4)Evaluation of our beliefs

5)Technology and human values

Self-exploration: . Self exploration is the process to find out what is valuable to me by investigating within myself, what is right for me, true for me, has to be judged within myself.

For self exploration we need two expects:

1. **Natural acceptance**: Natural acceptance implies unconditional and total acceptance of the self, people and environment.
2. **Experiential validation**: Experiential validation is a process that infuses direct experience with the learning environment and conten

Terms svatva, swatantrata and swarajya

This process of self exploration helps us to identify our swatva and through that acquiring swantantrata and swarajya. Swatva means innateness of self – the natural acceptance of harmony. Swatantrata means being self- organized – being in harmony with oneself Swarajya means self-expression, self- extension – living in harmony with others Swatva Swatantrata Swarajya The swatva is already there, intact in each one of us. By being in dialogue with it, we attain swantantrata enabling us to work for swarajya. Living in contradiction, means we are not self-organized and living with pre-conditionings where we have assumed certain things, have accumulated desires without having first

evaluated them, then it means we are partantra.

Happiness

Happiness may be defined as being in harmony/synergy in the state/ situation that I live in. "A state or situation in which I live, if there is harmony in it then I like to be in that state/situation. The state of liking is happiness." Happiness is a state of mind or feeling characterized by contentment, love, satisfaction, pleasure or joy. Happiness may be described as consisting of positive emotions and positive activities. There may be three kinds of happiness:

Pleasure,

Engagement,

Meaning.

Prosperity

The feeling of having or making available more than required physical facilities is prosperity. Almost all of us feel that wealth alone means prosperity and try to explain this phenomenon on this nonexistent or half fact. We are trying to achieve happiness and prosperity by maximizing accumulation and consumption of physical facilities. It is becoming anti-ecological and anti-people, and threatening the human survival itself. For prosperity, two things are required-

1. Identification of the required quantity of physical facilities, and

2. Ensuring availability / production of more than required physical facilities.

Present vision of a happy and prosperous life: We are trying to achieve happiness and prosperity by maximizing accumulation and consumption of physical facilities. It is becoming anti-ecological and anti-people, and threatening the human survival itself. Some of the consequences of such trend are summarized below:

At the level of individual – rising problems of depression, psychological disorders, suicides, stress, insecurity, etc.

At the level of family – breaking of joint families, mistrust, and conflict between older and younger generations, insecurity in relationships, divorce, dowry tortures, etc.

At the level of society – growing incidence of terrorism and naxalism, rising communalism, spreading caste ism, racial and ethnic struggle, wars between nations, etc.

At the level of nature – global warming, water, air, soil, noise etc. pollution, resource depletion of minerals and mineral oils, etc

Work ethic Work ethic is a set of values based on hard work and diligence. It is also a belief in the moral benefit of work and its ability to enhance character. A work ethic may include being reliable, having initiative, or pursuing new skill

Criticism of work ethic Countercultural groups, most notably slacker, hippie and hacker communities, have challenged these values in recent decades, characterizing them as submissive to authority and social convention, and not valuable in and of themselves, but only if it brings a positive result. An alternative perspective has arisen in recent years, suggesting that the work ethic is being subverted in a broader, more mainstream and more readily marketed-to proportion of society. This perspective has given rise to the phrase "work smart"

Service learning Service-Learning is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities.

Civic virtue Civic virtue is the moral underpinning of how a citizen behaves and is involved in society. It is a standard of righteous behavior in relation to a citizens' involvement in society. A individual may exhibit civic virtue by voting, volunteering and organizing other community activities.

Respect for others Respect for others is based on self-respect. It really is following the Golden Rule: Do unto others as you would have others do unto you. Being a polite and courteous person makes one a rare individual in today's world. Politeness, and a genuine concern for the rights and feelings of others in our society seems to have slammed the door in our faces. A culture of rudeness has become a feature of modern society

Valuing Time: A first step in good time management is to understand the value of your time. If you are employed by someone else, you need to understand how much your employer is paying for your time, and

how much profit he or she expects to make from you. If you are working for yourself, you should have an idea of how much income you want to bring in after tax. By working these figures back to an hourly rate, this gives you an idea of the value of your time. By knowing the value of your time, you should be able to tell what tasks are worthwhile to perform, and which tasks give a poor return. This helps you cut away the low value jobs, or argue for help with them.

Peaceful living: Our principle of 'Peaceful living' centers on the ethical and sustainable application of technologies which would aim to provide basic needs for everyone without compromising the planet's resources. Sustainability Sustainability can be expressed as meeting present ecological, societal, and economical needs without compromising these factors for future generations.

Spirituality: Spirituality is the concept of an ultimate or an alleged immaterial reality, an inner path enabling a person to discover the essence of his/her being; or the "deepest values and meanings by which people live. Spiritual practices, including meditation, prayer and contemplation, are intended to develop an individual's inner life. Spiritual experiences can include being connected to a larger reality, yielding a more comprehensive self; joining with other individuals or the human community; with nature or the cosmos; or with the divine realm. Spirituality is often experienced as a source of inspiration or orientation in life.

LIMITATIONS OF CODES OF ETHICS : Codes of ethics are broad guidelines, restricted to general phrases. The codes cannot be applied directly to all situations. Engineering codes often have internal conflicts, since several entries in codes overlap with each other, which may result in moral dilemmas. The codes cannot serve as the final moral authority for professional conduct.

MEDICAL ETHICS : Medical Code of Ethics is the document establishing the ethical rules of behaviour of physicians and dental practitioners, defining the priorities of their professional work, showing the principles in the relations with patients, other physicians and the rest of community.

LEGAL ETHICS O Legal ethics encompasses an ethical code governing the conduct of persons engaged in the practice of law and persons more generally in the legal sector.

CODES OF ETHICS FOR LAWYERS Competency (having required knowledge to handle client's case) Maintaining good communication with clients O Advise and counsel her clients O Protecting Client Property Honesty (with clients, judges and other parties)

CODES OF ETHICS FOR CLIENTS Completely provide the information to our lawyer O Maintaining good communication with lawyer O Do not harm the opposing party O Do not deal directly with the opposing party O Honesty (with lawyer, judges and other parties)

CODES OF ETHICS FOR JUDGES: Analyse all the data that are provided O Should not be partial O Should give the correct judgment O Should complete the case on time

CODES OF ETHICS FOR TEACHERS :Teachers are duly licensed professionals who posses dignity and reputation with high moral values as well as technical and professional competence.

Posses and actualize full commitment and devotion to duty. O Shall not engage in the promotion of any political, religious, or other partisan interest.

- 1. The Teacher and the State

- 2. The Teacher and the Community O Provide leadership and initiative to actively participate in community movements.

ENVIRONMENTAL ETHICS :Environmental ethics is the study to explore the ethical roots of the environmental movement and to understand what ethics tells us about our responsibility to the environment.

MARKETING ETHICS : Marketing ethics is the area of applied ethics which deals with the moral principles behind the operation and regulation of marketing. Some areas of marketing ethics (ethics of advertising and promotion) overlap with media ethics.

JOURNALISM ETHICS : Journalism ethics and standards comprise principles of ethics and of good practice as applicable to the specific challenges faced by journalists.

Five Ethical Principles (cont'd)Five Ethical Principles

1)Respect Autonomy .

2)Do No Harm

3)Benefit Others

4)Be Just

5)Be Faithful

Conclusion:

Human values can usefully be understood and experienced as attractors. How 'strange' they are considered as attractors depends on the appreciation of the distinction between the four different classes of values derived from an interpretation of complexity studies. In one sense, all values may be seen as attracting in a strange manner -- especially when simplistic understanding is avoided.

Professional ethics express what a professional society is about. They are an emblem to focus on, to support, to identify with and to advocate for. Our Code expresses who we are, what we do, and shows how our profession functions for the good of all. Our areas of work are related specialties. Those who are unqualified have the potential to do harm.Although ethics is a word with multiple connotations, what professional ethics are about is sociological. Professional ethics are always a matter of work and who is qualified to perform what task for which clients. Professional ethics should ultimately be for the benefit of those who are served by those who labor in professional occupations. Our Code reflects our profession's relationships with the larger society and, it is anticipated, the present update will be officially adopted by our affiliated professional organizations and state affiliates

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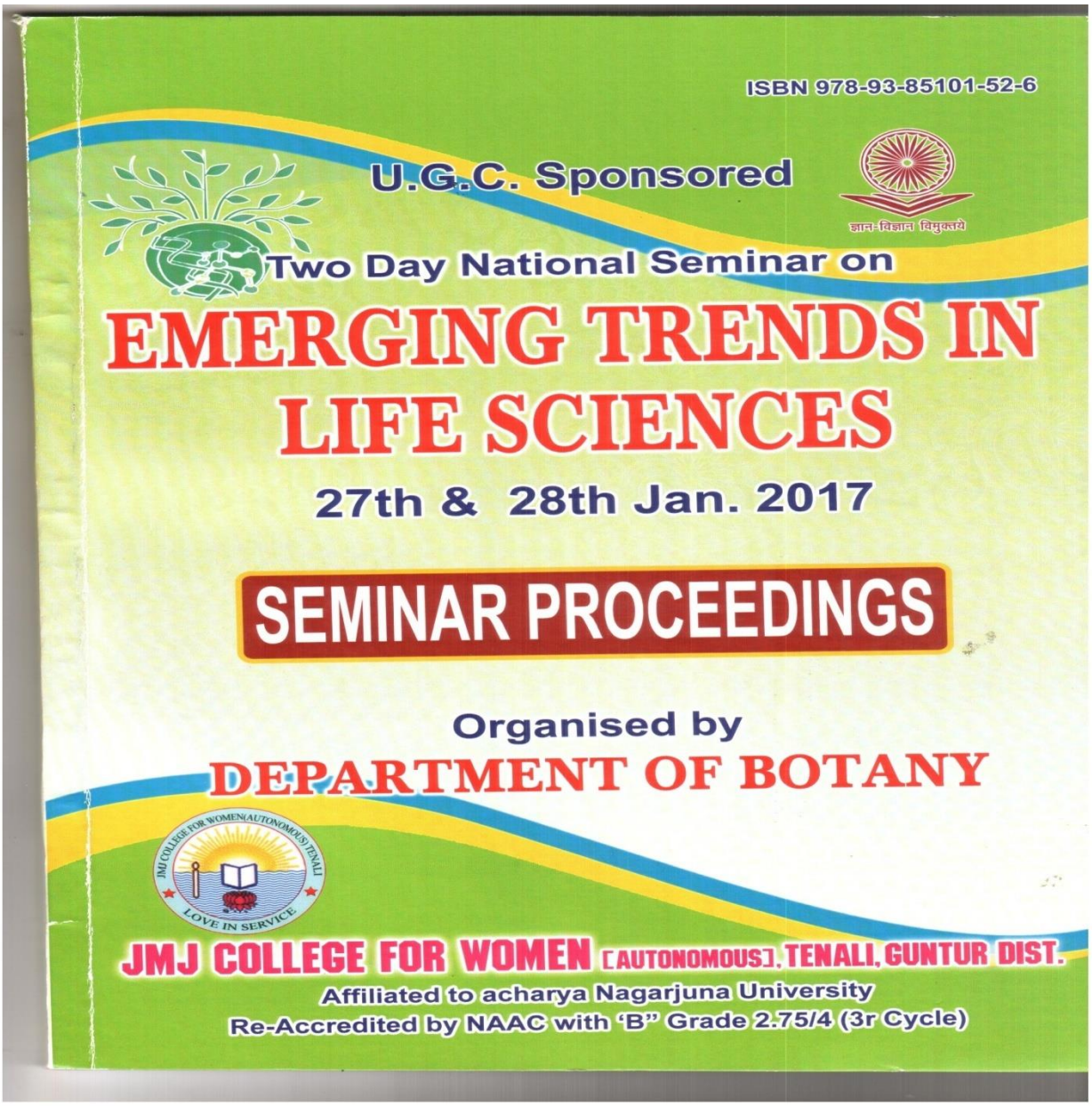
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CONTENTS

ANTIDIABETIC STUDIES OF THE CRUDE METHANOLIC EXTRACTS OF LEAVES AND FLOWERS OF BUTEA MONOSPERMA, (LAUM.), A MEDICINAL PLANT, USING WISTAR RATS.

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ABSTRACT

The present study investigates the antidiabetic potential of Butea monosperma leaves and flowers on biochemical profile in alloxan-induced [200mg/kg] diabetic rats. The effects of methanolic fraction of Butea monosperma on body weight, blood glucose, total protein, serum creatinine and blood urea were examined in control and experimental groups of animals. Rats with fasting plasma glucose (FPG) range of 280–350 mg/dl were considered diabetic and included in the study. 15th day results showed significant increase in fasting plasma glucose levels in STZ-control ($p<0.01$) rats when compared with normal control group of animals, and same was significantly reversed by methanolic extracts treated and Glibenclamide treated groups. The antihyperglycemic action of methanolic active fraction of flowers results from the potentiation of insulin release from existing beta cells of the islets of Langerhans. By this it was confirmed that methanolic active fraction of B.monosperma leaves showed effective result in anti diabetic activities in a safe manner at the single dose 50 mg/kg b.wt than that of the flower extract Body weight was significantly decreased in the diabetic control group when compared with normal group. Oral administration of methanolic active fractions of B.monosperma leaves and flowers for 45 days significantly increased ($P<0.05$) the body weight in diabetic groups, respectively among which leaf extract showed better result. During the present study the different doses of active fractions of B.monosperma leaves and flowers, did not exert any toxic effect and it can be concluded that B.monosperma active fractions are not lethal in the usual range of oral anti-diabetic drug i.e. 50mg to 2000mg/kg b.wt in experimental animal models. The 100 mg/kg b.wt dose of active fraction of B.monosperma flowers and 50 mg/kg b.wt of active fraction of B.monosperma leaves are considered to be safe.

Key words :

Butea monosperma, antidiabetic activity, Oral Glucose Tolerance test, methanol extract.

INTRODUCTION

The use of medicinal herbs for the treatment of liver diseases has a long history, starting with the Ayurvedic treatment, and extending to the Chinese, European and other systems of traditional medicines. Medicinal herbs are significant source of pharmaceutical drugs. Latest trends have shown increasing demand of phytodrugs. Medicinal herbs and extracts prepared from them are widely used in the treatment of liver diseases like hepatitis, cirrhosis, and loss of appetite. Medicinal herb is a biosynthetic laboratory, for chemical compounds like glycosides, alkaloids, flavonoids, bianthraquinones, resins, and oleoresins, etc. one such important medicinal plant is Butea monosperma. Though in the tribal areas and in the village's people claim that the medicinal plants are efficacious, scientific validation is wanting. There is an urgent need for the scientific experimental study. In this research study an attempt has been made to scientifically prove the anti-diabetic potential of this plant.

1. CHEMICAL CONSTITUENTS

Flower – Triterpene ,several flavonoids butein, butin, isobutrin, coreopsin, isocoreopsin (butin 7-glucoside), sulphurein, onospermoside(butein 3-e-D-glucoside) and isomonospermoside, chalcones,aurones, isobutyine, , palasitrin, 3',4',7- trihydroxyflavone. Myricyl alcohol, stearic, palmitic, arachidic and lignoceric acids glucose, fructose, histidine, aspartic acid, alanine and phenylalanin Leaves - Glucoside, Kino-oil containing oleic and linoleic acid, palmitic and lignoceric acid. Materials and methods

2. COLLECTION OF ANIMALS

Male Wistar rats weighing 110-150g were obtained from National Institute of Nutrition, Hyderabad, India. They were acclimatized to laboratory conditions for a week prior to the initiation of the experiment, four groups of animals (each group contain 6 animals) were kept in each cage (45 x 30 cm). The cages were maintained in a clean and hygienic condition and the animals were fed with a standard laboratory diet (Godrej Agro Food Industries, Bangalore, India) and tap water (Fujiwara et al., 1994). Twelve hours before the start of the experiment, rats were deprived of food, but given free access to water.

2.1. PREPARATION OF LEAF EXTRACT

The whole plant will be shade dried and subjected to size reduction to get a coarse powder. The powdered material will be subjected to successive extraction in a Soxhlet apparatus, using methanol (90%) as solvent at 50°. The extract will be then evaporated on a rotary evaporator. The same procedures are followed to the extraction of Methanol and Ethyl acetate.

2.2. Experimental induction of diabetes

Diabetes mellitus was induced by single intraperitoneal injection of freshly prepared Streptozotocin (STZ) (30 mg kg-1 b.w.) in 0.1 M citrate buffer (pH – 4.5) in a volume of 1 ml /kg b.w. Rats were supplied with 5% glucose solution for 48 h after STZ injection in order to prevent hypoglycemia. The control animals were treated with citrate buffer (pH – 4.5). Diabetes was developed and stabilized in these STZ treated rats over a period of 7 days. The control animals were treated with citrate buffer (pH-4.5). After 7 days of STZ administration, plasma glucose levels of each rat were determined. Rats with fasting plasma glucose (FPG) range of 280–350 mg/dl were considered diabetic and included in the study. Blood was collected by sinocular puncture

Effect of Butea monsperma on Fasting Plasma Glucose and plasma insulin levels in STZ-induced diabetic rats- 15 day study: Rats were divided in to 7 groups of 6 rats each. Group 1 normal control rats received vehicle alone (Dimethylsulfoxide [DMSO] 0.5%; 1ml/kg b.w.). Group 2, 3 normal rats received orally 100 and 200 mg/kg b.w. of Butea monsperma . Group 4 diabetic control rats received vehicle alone. Group 5 & 6 diabetic rats received orally 100 and 200 mg/kg. b.w. of ethyl acetate and methanol extracts respectively. Group 7 diabetic rats received commercial drug Glibenclamide. Blood samples were collected periodically in all the experimental groups.

3. RESULT

Experimental design 1

Group 1 – normal rats treated with vehicle alone

Group 2 – streptozotocin induced diabetic rats treated with vehicle alone

Group 3- Streptozotocin induced diabetic rats+ butea monosperma leaf extract (100 mg/kg)

Group 4- STZ induced diabetic rats + B.M flower extract (100 mg/kg)

Group 5 -STZ induced diabetic rats + Glibenclamide (600 µg/kg bw)

Values are expressed in Mean±S.D

Table 1. Effect of *Butea monosperma* on fasting blood glucose in normal and stz-diabetic rats.

	Group I	Group II	Group III	Group IV	Group V
Day 1	90±6.05	93.6±3.90a	413.5±5.79	452.5±6.99b	448.5±4.71b
Day 15	91±6.13	92.16±2.91a	410.3±7.3	332.5±6.9b	278.16±7.42:
Day 30	91.5±5.79	90.5±6.8a	389.8±5.39	157.3±7.11a	141.5±7.95a
Day 45	91.83±8.27	92.6±4.81a	366±7.23	138.6±4.71a	131.5±6.02a

Each value is mean ? SD for 6 rats in each group .a: p<0.05 by comparison with normal rats.

b: p<0.05 by comparison with streptozotocin diabetic rats.- : No significance

Biochemical Parameters

4. Statistical analysis

All values are expressed as mean ± SEM, statistical significance was analysed using one way ANNOVA followed by Turkey-Krammer multiple comparison test. The data were considered significant at P<0.05

5. STUDY DESIGN- 3 REPORT

5.1. BODY WEIGHT

Initial & final body weights of all the animals were observed normal and values were shown in table 1. Body weight was significantly decreased in the diabetic control group when compared with normal group. Oral administration of methanolic active fractions of B.monosperma leaves and flowers for 45 days significantly increased (P<0.05) the body weight in diabetic groups, respectively among which leaf extract showed better result. (Ref: Table 1 and Figure 1)

Table 1: Effect of B.monosperma on body weight in control and STZ-diabetic rats.

Body Weight	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII
Initial BodyWeight (g/100 g) (Day 1)	165.61±2.18	165.21±4.15	164.74±3.33	164.74±3.35	166.74±5.67	166.76±3.68	167.08±3.48
Final Body Weight (g/100 g) (Day 45)	164.22±4.26	160.27±5.44	158.25±5.41	143.67±1.53	150.83±2.11	151.88±6.99	154.34±5.35

Each value is mean ± SD for 6 rats in each group.

Table 2: Effect of B.monosperma on oral glucose tolerance in control and STZ-diabetic rats.

Blood glucose (mg/dl) Time (min) after glucose administration

Blood Glucose	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII
Initial	70.20±1.59	70.79±3.90	71.46±3.67	70.71±2.73	71.03±3.82	69.83±1.45	70.31±1.32
1h	70.30±1.23	72.53±3.10	71.94±2.99	144.46±3.85a	b121.60±1.66	b103.88±4.39	ab 95.07±3.23
2h	70.56±2.71	71.70±2.86	71.30±2.29	136.42±4.25 a	b101.35±4.45	b92.21±3.54	a b 82.09±3.46
3h	71.47±3.64	72.18±3.17	72.67±2.13	131.96±4.09	b95.99±4.90	b81.69±4.96	a b77.36±4.27

Each value is mean ± SD for 6 rats in each group.p<0.05 by comparison with normal rats.

a. p<0.05 by comparison with STZ- diabetic rats.

Table 3: Effect of B.monosperma on serum and tissue total Hexose levels in control and STZ-diabetic rats.

Total	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII
Cholesterol (mg/dl)	93.70±3.13	99.63±1.11	98.29±4.09	212.08±3.39	b133.88±1.38	b102.2±1.38	ab112.35±1.73
Triglyceride (mg/dl)	16.45±1.06	17.53±1.85	17.29±1.1.41	47.76±24.62	b24.62±2.23	b22.31±3.14	ab21.19±2.99
Free fatty (mg/dl)	70.23± 2.67	75.71±3.96	74.72±4.14	135.91±3.82	b108.59±4.33	b86.50±2.79	ab82.55±2.88

Each value is mean ± SD for 6 rats in each group.

a: p<0.05 by comparison with normal rats.p<0.05 by comparison with STZ- diabetic rats. - : No significance. a- ìmol of pyruvate liberated per hour b-

b: ìmol of phenol liberated per minute c- ìmol of p-nitroanilide liberated per minute.

Table 5: Effect of B.monosperma on serum HDL, LDL and VLDL levels in control and STZ-diabetic rats.

Group	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII
HDL-Cholesterol (mg/dL)	51.76±3.5	50.91±2.72	51.53±2.29	a26.60±1.75	b37.42±2.37	b39.94±1.07	ab45.54±4.06
LDL-Cholesterol (mg/dL)	30.76±1.4	34.09±1.49	80.85±1.09	a51.90±2.28	b38.39±3.19	b35.86±4.02	ab34.85±2.69
VLDL-Cholesterol (mg/dL)	18.56±1.89	20.37±2.07	20.84±2.06	a38.46±3.43	b25.50±3.16	b23.08±2.63	ab21.57±3.51

Each value is mean ± SD for 6 rats in each group. p<0.05 by comparison with normal rats.

a. p<0.05 by comparison with STZ- diabetic rats. - : No significance.a- ìmol of pyruvate liberated per hour;

ìmol of phenol liberated per minute; c- ìmol of p-nitroanilide liberated per minute

5.2. HISTOPATHOLOGICAL EXAMINATION

The animals were sacrificed after each experiment, liver, kidney and spleen were dissected and rinsed in physiological saline water and fixed in 10% buffered neutral formalin for 48 h and then with bovine solution for 6 h and processed for paraffin embedding. Sections of 5µm thickness were taken using a microtome. The sections were processed in alcohol-xylene series and stained with haematoxylin and eosin (Galigher et al., 1971) and subjected to histopathological examination

6. DISCUSSION

ANTIHYPERGLYCEMIC EFFECT OF METHANOLIC ACTIVE FRACTIONS OF B.MONOSPERMA LEAVES AND FLOWERS

The increased level of FPG in STZ-diabetic rats was lowered by oral administration of methanolic active fraction of B.monosperma leaves and flowers for 45 days. The antihyperglycemic action of methanolic active fraction of B.monosperma flowers results from the potentiation of insulin release from existing beta cells of the islets of Langerhans In streptozotocin induced diabetic rats, the levels of cholesterol, free fatty acid and triglycerides are elevated in liver, kidney, heart and brain. Similarly, Ravi et al., (2004) have reported the increased levels of tissue lipids in STZ-induced diabetic rats.

In our study, oral administration of methanolic active fractions of B.monosperma leaves, flowers and glibenclamide significantly ($p < 0.05$) decreased the tissue lipid (TC, TG and FFA) levels. The observed hypolipidemic effect may be because of decreased cholesterogenesis and fatty acid synthesis. Also it may be due to improving the level of insulin secretion. Literature has shown flavonoids, alkaloids and terpenoids to be the active hypoglycemic principle in many medicinal plants with blood glucose and lipids-lowering attributes (Oladele et al., 1995). Onabanjo et al., (1993) reported that the presence of alkaloids in the plant aqueous extract, may account for the observed hypoglycemic and hypolipidemic effects. Significant lowering of total cholesterol and raise in HDL cholesterol is a very desirable biochemical state for prevention of atherosclerosis and ischemic conditions (Luc & Fruchart, 1991).

Conclusion

During the present study the different doses of active fractions of B.monosperma leaves and flowers, did not exert any toxic effect during the present study. From the present study, it can be concluded that B.monosperma active fractions are not lethal in the usual range of oral anti-diabetic drug i.e. 50mg to 2000mg/kg b.wt in experimental animal models. The 100 mg/kg b.wt dose of active fraction of B.monosperma flowers and 50 mg/kg b.wt of active fraction of B.monosperma leaves are considered to be safe which is confirmed by our observation.

Another important objective of this study was the anti-inflammatory activity of methanolic active fraction of Butea monosperma leaves. It was proved that the three different doses methanolic active fractions of Butea monosperma leaves (50, 100, 250 mg/kg b.wt) showed significant dose dependent anti-inflammatory activity on FCA induced inflammation in Wistar rats by normalizing the paw volume, paw thickness and body weight. The results were comparable with the reference drug Prednisolone (10 mg/kg P.O).

By this it was confirmed that methanolic active fraction of B.monosperma leaves showed effective result in anti diabetic activities in a safe manner at the single dose 50 mg/kg b.wt than that of the flower extract and this leaf extract had a promising result with anti-inflammatory activity.

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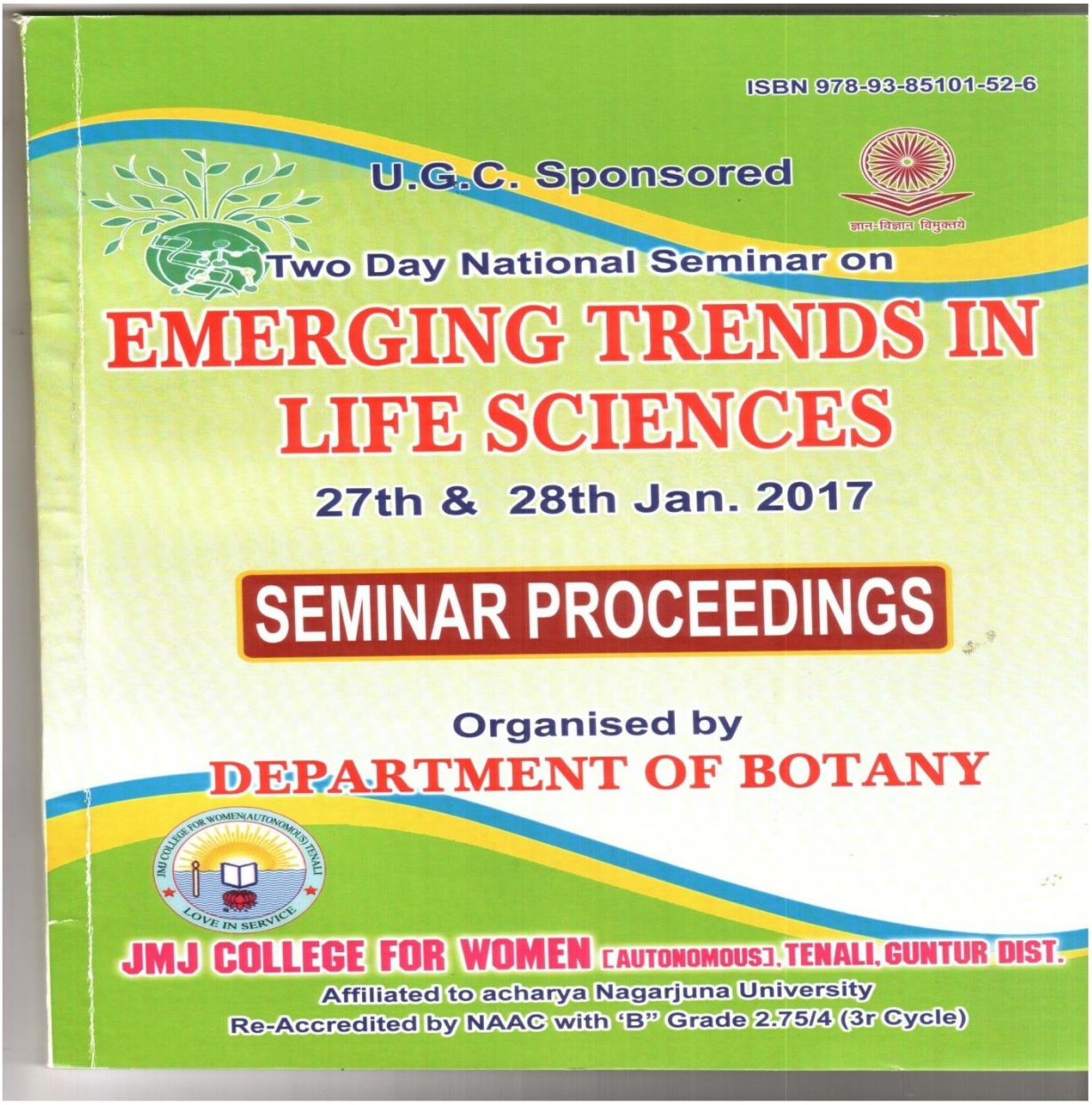
DEPARTMENT OF ZOOLOGY

44. Mrs.M.Aruna and Ms. M. Adilakshmi published a paper on" **Threats to aquatic biodiversity**" in national seminar on"Emerging trends in life sciences" held at JMJ College for women,Tenali on 27th & 28th January 2017, with ISBN No-978-93-85101-52-6



CONTENTS

THREATS TO AQUATIC BIODIVERSITY

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ABSTRACT

Aquatic biodiversity has enormous economic and aesthetic value and is largely responsible for maintaining and supporting overall environmental health. Humans have long depended on aquatic resources for food, medicines, and materials as well as for recreational and commercial purposes such as fishing and tourism. Aquatic organisms also rely upon the great diversity of aquatic habitats and resources for food, materials, and breeding grounds.Factors including overexploitation of species, the introduction of exotic species, pollution from urban, industrial, and agricultural areas, as well as habitat loss and alteration through damming and water diversion all contribute to the declining levels of aquatic biodiversity in both freshwater and marine environments. As a result, valuable aquatic resources are becoming increasingly susceptible to both natural and artificial environmental changes. Protecting the world's freshwater resources requires diagnosing threats over a broad range of scales, from global to local. Thus, conservation strategies to protect and conserve aquatic life are necessary to maintain the balance of nature and support the availability of resources for future generations.

Key words:

Overexploitation, pollution, habitat loss, declining

INTRODUCTION

Biodiversity or Biological Diversity a sum of all the different species of animals, plants, fungi, and microbial organisms living on Earth and the variety of habitats in which they live. Each species is adapted to its unique niche in the environment, from the peaks of mountains to the depths of deep-sea hydrothermal vents, and from polar ice caps to tropical rain forests. According to the definition of the Convention on Biological Diversity, biodiversity is the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Aquatic biodiversity can be defined as the variety of life and the ecosystems that make up the freshwater, tidal, and marine regions of the world and their interactions. Aquatic biodiversity encompasses freshwater ecosystems, including lakes, ponds, reservoirs, rivers, streams,

groundwater, and wetlands. It also consists of marine ecosystems, including oceans, estuaries, salt marshes, sea grass beds, coral reefs, kelp beds, and mangrove forests. Aquatic biodiversity includes all unique species, their habitats and interaction between them. It consists of phytoplankton, zooplankton, aquatic plants, insects, fish, birds, mammals, and others. Protecting the world's freshwater resources requires diagnosing threats over a broad range of scales, from global to local. Here we present the first worldwide synthesis to jointly consider human and biodiversity perspectives on water security using a spatial framework that quantifies multiple stressors and accounts for downstream impacts. We find that nearly 80% of the world's population is exposed to high levels of threat to water security. Massive investment in water technology enables rich nations to offset high stressor levels without remedying their underlying causes, whereas less wealthy nations remain vulnerable. A similar lack of precautionary investment jeopardizes biodiversity, with habitats associated with 65% of continental discharge classified as moderately to highly threatened. The cumulative threat framework offers a tool for prioritizing policy and management responses to this crisis, and underscores the necessity of limiting threats at their source instead of through costly remediation of symptoms in order to assure global water security for both humans and freshwater biodiversity. Other threats to biodiversity and to ecosystems include: the over-harvesting of plant and animal species; the introduction of non-native species; and pollution. Many types of human-caused pollution are a threat—the release of excessive amounts of nitrates and phosphates from sewage and agricultural run-off; persistent organic pollutants that can concentrate in food webs (and in our own tissues) and adversely affect hormonal and reproductive function; pharmaceuticals used by people and in livestock production that are toxic to wildlife; acid rain; heavy metals; herbicides and pesticides; and plastics.Still further threats come from: excessive ultraviolet radiation from depletion of the stratospheric ozone layer that can damage the DNA and proteins of land-based, freshwater, and marine organisms; war and conflict that can result in habitat destruction, over-hunting, and pollution; and climate change.

Threats to Aquatic Biodiversity

Human activities are causing species to disappear at an alarming rate. Aquatic species are at a higher risk of extinction than mammals and birds. Losses of this magnitude impact the entire ecosystem, depriving valuable resources used to provide food, medicines, and industrial materials to human beings. Runoff from agricultural and urban areas, the invasion of exotic species, and the creation of dams and water diversion have been identified as the greatest challenges to freshwater environments (Allan and Flecker 1993; Scientific American 1997). Overexploitation of aquatic organisms for various purposes is the greatest threat to marine environments, thus the need for sustainable exploitation has been identified by the Environmental Defense Fund as the key priority in preserving marine biodiversity. Other threats to aquatic biodiversity include urban development and resource-based industries, such as mining and forestry that destroy or reduce natural habitats. In addition, air and water pollution, sedimentation and erosion, and climate change also pose threats to aquatic biodiversity.

1. **Overexploitation of species** — Overexploitation of species affects the loss of genetic diversity and the loss in the relative species abundance of both individual and /or groups of interacting species. The population size gets reduced because of disturbances in age structure and sex composition. Efficient gears remove quick growing larger individuals . consequently, the proportion of slow growing ones increases and the average size of individuals in a population decreases. Over-fishing causes change in the genetic structure of fish populations due to loss of some alleles. Thus, genetic diversity gets reduced .

2. **Habitat modification** — Physical modification of habitat may lead to species extinction. This is mainly caused due to damming, deforestation, diversion of water for irrigation and conversion of marshy land and small water bodies for other purposes. Construction of dams on river impedes upstream migration of fishes and displaces populations from their normal spawning grounds and separate the population in two smaller groups. Deforestation leads to catchment area degradation due to soil erosion which results into sedimentation and siltation. This not only affect the breeding ground of aquatic organisms but cause gill clogging of small fishes also.

3. **Pollution load** — Four forms of pollutants can be distinguished-

i. **Poisonous pollutants** — Agrochemicals, metals , acids and phenol cause mortality, if present in a high concentration and affect the reproductive functionality of fish (Kime, 1995).

ii. **Suspended solids** — it affects the respiratory processes and secration of protective mucus making the fish susceptible to infection of various pathogens.

iii. **Seewage and organic pollutants** — They cause deoxygenation due to eutrophication causing mortality in fishes.

iv. **Thermal pollution** — It cause increase in ambient temperature and reduce dissolved oxygen concentration leading to death of some sensitive species.

These factors affect the aquatic biodiversity directly or indirectly. Excessive mortality of organisms due to any of these factors may lead to two type of effects â€" i) extinction of the species / populations ii) reduction of population size.

6 Greatest Threats to Aquatic Biodiversity

1. Habitat Loss and Degradation
2. Invasive species
3. Population Growth
4. Pollution
5. Climate Change
6. Overfishing

1. **Habitat loss and degradation**: (Threats to Aquatic Biodiversity) - Dams change the habitat both above and below; disrupt fish that swim upstream to spawn

2. **Invasive species**: (Threats to Aquatic Biodiversity) - An introduced species can become invasive if it thrives in its new habitat.Zebra mussels are filter feeders and clear the water. But change the habitat for native species.

3. **Population growth**: (Threats to Aquatic Biodiversity) - Humans live near water sources for a variety of reasons – Transportation — drinking water supply – recreation - Increasing population leads to increasing pressure on aquatic resources.

4. **Pollution:** (Threats to Aquatic Biodiversity)

- Boat traffic interferes with communication in marine mammals.

- Nutrient runoff from fertilizers results in eutrophication

- Discarded plastics wash up on beaches and are ingested by birds and mammals.

5. **Climate change:** (Threats to Aquatic Biodiversity)

- Some forests in some coastal habitats vulnerable to changes in sea levels.

- During the past 100 years, sea levels have risen by 4-8 inches.

6. **Overfishing :** (Threats to Aquatic Biodiversity)

Many of the world's fisheries are being harvested at an unsustainable rate.

Threats to Freshwater Species ƒ 20% of freshwater fishes extinct or in serious decline ƒ Extinct/at-risk salmon/steelhead runs outnumber healthy by 3:1 ƒ In CA, 57% of fish species are extinct or declining (Moyle and Williams) ƒ Aquatic species worse-off than terrestrial ƒ Top 6 stressors (most aquatic species face multiple threats): 1) Habitat removal/damage 2) Invasive species (limit recovery more than historical) 3) Altered sediment loads 4) Altered hydrologic regime (flow, depth, temperature) 5) Altered nutrient inputs 6) Toxic contaminants (limit recovery more than historical) ƒ Top 4 sources: Agriculture (56%); Municipal land-use (34%); Power generation (21%); Exotic species (18%—higher for current source) ƒ Agricultural non-point pollution perceived as bigger threat in East; invasive species and loss of surface water bigger in West

Listing, critical habitat designation, recovery plans: Listing ƒ Initiated by private actors through petition or FWS (NOAA Fisheries for marine species) through candidate conservation program ƒ Species will then be listed as either "threatened" or "endangered" ƒ FWS promulgated regulations that automatically extend "endangered" protections to "threatened" species Critical Habitat ƒ Specific geographic area essential for species recovery that may require special management/conservation ƒ Federal agencies required to consult FWS on projects that affect

Prohibiting Take : No person may "take" a listed species, or engage in trade ƒ "Take": Harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. ƒ Extended by regulation to include habitat modification

Habitat Conservation Planning: ƒ Authorized by Section 10 of the ESA; 1982 Amendments ƒ Habitat Conservation Plan is a legally binding document, which details actions that a landowner must take to improve species habitat ƒ In return, landowner receives "incidental take permit"; allows harm to species in areas not protected in HCP American River Steelhead and Chinook (King) Salmon

Anadromous Fish Biology

Species

ƒ Chinook/king; coho/silver; sockeye/red; chum/dog; humpback/pink ƒ Also Steelhead and coastal cutthroat ƒ Anadromous fish return to their home streams to spawn; leads to genetic variation and specialized life-history strategies ƒ semelparous—they die after spawning once (salmon). ƒ Iteroparous—Fish that can spawn more than once; return to the river several times (steelhead) ƒ Significant differences between age and seasonal timing of spawning, how far they go up river, how far the travel in open ocean ƒ Habitat requirements: Clean, cold water, overhead to protect juveniles, aerated gravel to hold eggs and provide dissolved oxygen **Evolutionarily Significant Units** ƒ Collection of one or more salmon populations that share similar genetic, ecological, and life history traits and have a different evolutionary trajectory from salmon in other ESUs. ƒ Salmon ESUs are considered to be "distinct population segments" under the federal Endangered Species Act (ESA). ƒ The biological definition of ESU set up by NMFS; biological definition for "runs" (although some ESUs encompass multiple runs)

Threats to Anadromous Fish

Historical Harvesting Patterns ƒ Cultural symbol in the Pacific Northwest ƒ One estimate says historic harvest by Native A mericans in Columbia River was 42 million pounds; today, 5-8 million for all harvesting ƒ Native Americans had cultural institutions for harvesting ƒ European arrival creates open access fishery: fish traps, gillnetting, fish wheels, canneries, open water commercial ƒ State wildlife laws are first to respond; banning certain techniques and setting catch limits ƒ Treaties in place are supposed to preserve Native American fishing rights ƒ Hatcheries now produce majority of harvested fish; hatcheries important to fish production but reduce genetic diversity/fitness

Current Threats ƒ Lots of regional variation (e.g., Sacramento river irrigation problems vs. Columbia) ƒ Mining, agriculture, logging blocking and silting streams ƒ Surface water impoundments (flow and temperature, Klamath) ƒ Dams (especially on Columbia; above Bonneville Dam, only 50 miles of freeflowing river; Grand Coulee Dam extinguished the big Chinooks) ƒ NW hydropower is cheap; but 75-85% loss of anadromous runs has major economic costs ($372 million annually?) Columbia River Land Use Columbia River Major Dams 21 Corps, 8 Reclam. Dams; BPA markets power Hundreds of other smaller public and private projects Generates 22,512 Megawatts, or 44.8% of energy demand The Coordinated Columbia River System

Threats to marine biodiversity

Biodiversity loss has become one of the greatest environmental concerns of the last century, owing to increasing pressure on the environment by humans combined with the realisation that our activities can seriously threaten the future sustainability of marine species and ecosystems. Marine biodiversity in Europe is threatened by the fact that many of the goods and services provided by marine ecosystems are exploited in a non-sustainable way. In some cases, marine ecosystems are threatened to the extent that their structure and function is being jeopardised.

The most serious threats to marine biodiversity are:

Human activities seriously threaten the future sustainability of marine species and ecosystems.

- Over exploitation - recreational and commercial
- Pollution
- Habitat destruction and fragmentation
- Non-native species invasions
- Global climate change

Threats to marine biodiversity have widespread social, economic, and biological consequences, the combination of which could threaten our own existence, including:

- Economic losses through unemployment and reduced productivity
- Dramatic reductions in the numbers of many popular edible fish and shellfish
- Extinction of species that might be useful in developing new medicines
- Reduced ability of ecosystems to respond to disaster, both natural (floods) and man-made (pollution)
- Accelerated global climate change
- Social and political instability

Conclusion :

Protecting and restoring aquatic biodiversity-1. Wetlands 2. Managing Invasive Species, 3. Removing Dams

1.Wetlands: (protection and restoring) - to maintain the important functions of wetlands, state and federal governments have implemented plans to mitigate wetland loss.- when a wetland is lost, one should be created in its place.

Managing invasive species : (protection and restoring)- the u.s. and canada governments manage the sea lamprey by applying a chemical to kill sea lamprey larvae and by sterilizing adults. - the states working on plans to stop migration of the asian carp.

Removing dams: (protection and restoring) - because of the environmental impacts of dams, there has been a push to rehabilitate rivers by removing dams where possible.- this an expensive attempt.

though biodiversity loss is occurring at a rapid rate, examples from all over the world show that people are beginning to make choices and take actions that benefit biodiversity. however, we need more action if further biodiversity loss is to be averted. It's important to carefully consider the choices you make and their impacts, and to encourage other groups such as businesses and governments to do the same. The rest of this guide will help inform you about issues to consider, steps you can take and examples of positive action for biodiversity.

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APPLICATIONS OF BIOTECHNOLOGY

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ABSTRACT

Biotechnology is the use of living systems and organisms to develop or make products, or "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use". Depending on the tools and applications, it often overlaps with the (related) fields of bioengineering, biomedical engineering, bio-manufacturing, molecular engineering, etc. For thousands of years, humankind has used biotechnology in agriculture, food production, and medicine. The term is largely believed to have been coined in 1919 by Hungarian engineer Károly Ereky. In the late 20th and early 21st centuries, biotechnology has expanded to include new and diverse sciences such as genomics, recombinant gene techniques, applied immunology, development of pharmaceutical therapies, bioinformatics, bioprocess engineering, biorobotics, chemical engineering and diagnostic tests.

Key words:

bioengineering, bioinformatics, bioprocess engineering, biorobotics, pharmaceutical therapies,

DEFINITION

The wide concept of "biotech" or "biotechnology" encompasses a wide range of procedures for modifying living organisms according to human purposes, going back to domestication of animals, cultivation of the plants, and "improvements" to these through breeding programs that employ artificial selection and hybridization. Modern usage also includes genetic engineering as well as cell and tissue culture technologies. Biotechnology also writes on the pure biological sciences (animal cell culture, biochemistry, cell biology, embryology, genetics, microbiology, and molecular biology). In many instances, it is also dependent on knowledge and methods from outside the sphere of biology including: bioinformatics, bioprocess engineering, biorobotics, pharmaceutical therapies.

Biotechnology is the research and development in the laboratory using bioinformatics for exploration, extraction, exploitation and production from any living organisms and any source of biomass by means of biochemical engineering where high value-added products could be planned (reproduced by biosynthesis, for example), forecasted, formulated, developed, manufactured, and marketed for the purpose of sustainable operations (for the return from bottomless initial investment on R & D) and gaining durable patents rights (for exclusives rights for sales, and prior to this to receive national and international approval from the results on animal experiment and human experiment, especially on the pharmaceutical branch of biotechnology to prevent any undetected side-effects or safety concerns by using the products).

History:

Before the time of Charles Darwin's work and life, animal and plant scientists had already used selective breeding. Darwin added to that body of work with his scientific observations about the ability of science to change species. These accounts contributed to Darwin's theory of natural selection.For thousands of years, humans have used selective breeding to improve production of crops and livestock to use them for food. In selective breeding, organisms with desirable characteristics are mated to produce offspring with the same characteristics. For example, this technique was used with corn to produce the largest and sweetest crops.

In the early twentieth century scientists gained a greater understanding of microbiology and explored ways of manufacturing specific products. In 1917, Chaim Weizmann first used a pure microbiological culture in an industrial process, that of manufacturing corn starch using Clostridium acetobutylicum, to produce acetone, which the United Kingdom desperately needed to manufacture explosives during World War I.

Biotechnology has also led to the development of antibiotics. In 1928, Alexander Fleming discovered the mold Penicillium. His work led to the purification of the antibiotic compound formed by the mold by Howard Florey, Ernst Boris Chain and Norman Heatley – to form what we today know as penicillin. In 1940, penicillin became available for medicinal use to treat bacterial infections in humans.

The field of modern biotechnology is generally thought of as having been born in 1971 when Paul Berg's (Stanford) experiments in gene splicing had early success. Herbert W. Boyer (Univ. Calif. at San Francisco) and Stanley N. Cohen (Stanford) significantly advanced the new technology in 1972 by transferring genetic material into a bacterium, such that the imported material would be reproduced. The commercial viability of a biotechnology industry was significantly expanded on June 16, 1980, when the United States Supreme Court ruled that a genetically modified microorganism could be patented in the case of Diamond v. Chakrabarty. Indian-born Ananda Chakrabarty, working for General Electric, had modified a bacterium (of the Pseudomonas genus) capable of breaking down crude oil, which he proposed to use in treating oil spills. (Chakrabarty's work did not involve gene manipulation but rather the transfer of entire organelles between strains of the Pseudomonas bacterium.

Rising demand for biofuels is expected to be good news for the biotechnology sector, with the Department of Energy estimating ethanol usage could reduce U.S. petroleum-derived fuel consumption by up to 30% by 2030. The biotechnology sector has allowed the U.S. farming industry to rapidly increase its supply of corn and soybeans—the main inputs into biofuels—by developing genetically modified seeds which are resistant to pests and drought. By boosting farm productivity, biotechnology plays a crucial role in ensuring that biofuel production targets are met. Biotechnology has applications in four major industrial areas, including health care (medical), crop production and agriculture, non food (industrial) uses of crops and other products (e.g. biodegradable plastics, vegetable oil, biofuels), and environmental uses.
For example, one application of biotechnology is the directed use of organisms for the manufacture of organic products (examples include beer and milk products). Another example is using naturally present bacteria by the mining industry in bioleaching. Biotechnology is also used to recycle, treat waste, clean up sites contaminated by industrial activities (bioremediation), and also to produce biological weapons.

Branches of biotechnology:

Bioinformatics is an interdisciplinary field which addresses biological problems using computational techniques, and makes the rapid organization as well as analysis of biological data possible. The field may also be referred to as computational biology, and can be defined as, "conceptualizing biology in terms of molecules and then applying informatics techniques to understand and organize the information associated with these molecules, on a large scale."[1] Bioinformatics plays a key role in various areas, such as functional genomics, structural genomics, and proteomics, and forms a key component in the biotechnology and pharmaceutical sector.

Blue biotechnology is a term that has been used to describe the marine and aquatic applications of biotechnology, but its use is relatively rare.

Green biotechnology is biotechnology applied to agricultural processes. An example would be the selection and domestication of plants via micropropagation. Another example is the designing of transgenic plants to grow under specific environments in the presence (or absence) of chemicals. One hope is that green biotechnology might produce more environmentally friendly solutions than traditional industrial agriculture. An example of this is the engineering of a plant to express a pesticide, thereby ending the need of external application of pesticides. An example of this would be Bt corn. Whether or not green biotechnology products such as this are ultimately more environmentally friendly is a topic of considerable debate.

Red biotechnology is applied to medical processes. Some examples are the designing of organisms to produce antibiotics, and the engineering of genetic cures through genetic manipulation.

White biotechnology, also known as industrial biotechnology, is biotechnology applied to industrial processes. An example is the designing of an organism to produce a useful chemical. Another example is the using of enzymes as industrial catalysts to either produce valuable chemicals or destroy hazardous/polluting chemicals. White biotechnology tends to consume less in resources than traditional processes used to produce industrial goods.[citation needed]

The investment and economic output of all of these types of applied biotechnologies is termed as "bioeconomy".

Medicine:

In medicine, modern biotechnology finds applications in areas such as pharmaceutical drug discovery and production, pharmacogenomics, and genetic testing (or genetic screening).DNA microarray chip – some can do as many as a million blood tests at once. **Pharmacogenomics** (a combination of pharmacology and genomics) is the technology that analyses how genetic makeup affects an individual's response to drugs. It deals with the influence of genetic variation on drug response in patients by correlating gene expression or single-nucleotide polymorphisms with a drug's efficacy or toxicity. By doing so, pharmacogenomics aims to develop rational means to optimize drug therapy, with respect to the patients' genotype, to ensure maximum efficacy with minimal adverse effects. Such approaches promise the advent of "personalized medicine"; in which drugs and drug combinations are optimized for each individual's unique genetic makeup. Biotechnology has contributed to the discovery and manufacturing of traditional small

molecule pharmaceutical drugs as well as drugs that are the product of biotechnology – biopharmaceutics. Modern biotechnology can be used to manufacture existing medicines relatively easily and cheaply. The first genetically engineered products were medicines designed to treat human diseases. To cite one example, in 1978 Genentech developed synthetic humanized insulin by joining its gene with a plasmid vector inserted into the bacterium Escherichia coli. Insulin, widely used for the treatment of diabetes, was previously extracted from the pancreas of abattoir animals (cattle and/or pigs). The resulting genetically engineered bacterium enabled the production of vast quantities of synthetic human insulin at relatively low cost. Biotechnology has also enabled emerging therapeutics like gene therapy. The application of biotechnology to basic science (for example through the Human Genome Project) has also dramatically improved our understanding of biology and as our scientific knowledge of normal and disease biology has increased, our ability to develop new medicines to treat previously untreatable diseases has increased as well.

Genetic testing allows the genetic diagnosis of vulnerabilities to inherited diseases, and can also be used to determine a child's parentage (genetic mother and father) or in general a person's ancestry. In addition to studying chromosomes to the level of individual genes, genetic testing in a broader sense includes biochemical tests for the possible presence of genetic diseases, or mutant forms of genes associated with increased risk of developing genetic disorders. Genetic testing identifies changes in chromosomes, genes, or proteins.[24]Most of the time, testing is used to find changes that are associated with inherited disorders. The results of a genetic test can confirm or rule out a suspected genetic condition or help determine a person's chance of developing or passing on a genetic disorder. As of 2011 several hundred genetic tests were in use. Since genetic testing may open up ethical or psychological problems, genetic testing is often accompanied by genetic counseling.

Agriculture:

Genetically modified crops ("GM crops", or "biotech crops") are plants used in agriculture, the DNA of which has been modified with genetic engineering techniques. In most cases the aim is to introduce a new trait to the plant which does not occur naturally in the species. Examples in food crops include resistance to certain pests, diseases, stressful environmental conditions, resistance to chemical treatments (e.g. resistance to a herbicide, reduction of spoilage, or improving the nutrient profile of the crop. Examples in non-food crops include production of pharmaceutical agents, bio fuels,]and other industrially useful goods, as well as for bioremediation. Farmers have widely adopted GM technology. Genetically modified foods are foods produced from organisms that have had specific changes introduced into their DNA with the methods of genetic engineering. These techniques have allowed for the introduction of new crop traits as well as a far greater control over a food's genetic structure than previously afforded by methods such as selective breeding and mutation breeding. Commercial sale of genetically modified foods began in 1994, when Calgene first marketed its Flavr Savr delayed ripening tomato. To date most genetic modification of foods have primarily focused on cash crops in high demand by farmers such as soybean, corn, canola, and cotton seed oil. These have been engineered for resistance to pathogens and herbicides and better nutrient profiles. GM livestock have also been experimentally developed, although as of November 2013 none are currently on the market. There is a scientific

consensus that currently available food derived from GM crops poses no greater risk to human health than conventional food, but that each GM food needs to be tested on a case-by-case basis before introduction. Nonetheless, members of the public are much less likely than scientists to perceive GM foods as safe. The legal and regulatory status of GM foods varies by country, with some nations banning or restricting them, and others permitting them with widely differing degrees of regulation. GM crops also provide a number of ecological benefits, if not used in excess.

Industrial

Industrial biotechnology (known mainly in Europe as white biotechnology) is the application of biotechnology for industrial purposes, including industrial fermentation. It includes the practice of using cells such as micro-organisms, or components of cells like enzymes, to generate industrially useful products in sectors such as chemicals, food and feed, detergents, paper and pulp, textiles and biofuels. In doing so, biotechnology uses renewable raw materials and may contribute to lowering greenhouse gas emissions and moving away from a petrochemical-based economy.

Environmental:

The environment can be affected by biotechnologies, both positively and adversely. Vallero and others have argued that the difference between beneficial biotechnology (e.g. bioremediation to clean up an oil spill or hazard chemical leak) versus the adverse effects stemming from biotechnological enterprises (e.g. flow of genetic material from transgenic organisms into wild strains) can be seen as applications and implications, respectively. Cleaning up environmental wastes is an example of an application of environmental biotechnology; whereas loss of biodiversity or loss of containment of a harmful microbe are examples of environmental implications of biotechnology.

Regulation:

The regulation of genetic engineering concerns approaches taken by governments to assess and manage the risks associated with the use of genetic engineering technology, and the development and release of genetically modified organisms (GMO), including genetically modified crops and genetically modified fish. There are differences in the regulation of GMOs between countries, with some of the most marked differences occurring between the USA and Europe. Regulation varies in a given country depending on the intended use of the products of the genetic engineering. For example, a crop not intended for food use is generally not reviewed by authorities responsible for food safety. The European Union differentiates between approval for cultivation within the EU and approval for import and processing. While only a few GMOs have been approved for cultivation in the EU a number of GMOs have been approved for import and processing. The cultivation of GMOs has triggered a debate about coexistence of GM and non GM crops. Depending on the coexistence regulations incentives for cultivation of GM crops differ.

Conclusion:

There is a clear need for the science community to do more research in a number of areas, for companies to make good choices in terms of transgenic design and plant hosts, and to develop products that meet wider societal wishes. Finally, the regulatory system should continue to operate so that it is sensitive to the degree of risk and uncertainty, recognizes the distinctive features of GM, divergent scientific perspectives and associated gaps in knowledge, as well as taking into account the conventional breeding context and baselines. FAO supports a science-based evaluation system that would objectively determine the benefits and risks of each individual GMO. This calls for a cautious case-by-case approach to address legitimate concerns for the bio-safety of each product or process prior to its release. The possible effects on biodiversity, the environment and food safety need to be evaluated, and the extent to which the benefits of the product or process outweigh its risks assessed. The evaluation process should also take into consideration experience gained by national regulatory authorities in clearing such products. Careful monitoring of the post-release effects of these products and processes is also essential to ensure their continued safety to human beings, animals and the environment. Science cannot declare any technology completely risk free. Genetically engineered crops can reduce some environmental risks associated with conventional agriculture, but will also introduce new challenges that must be addressed. Society will have to decide when and where genetic engineering is safe enough.

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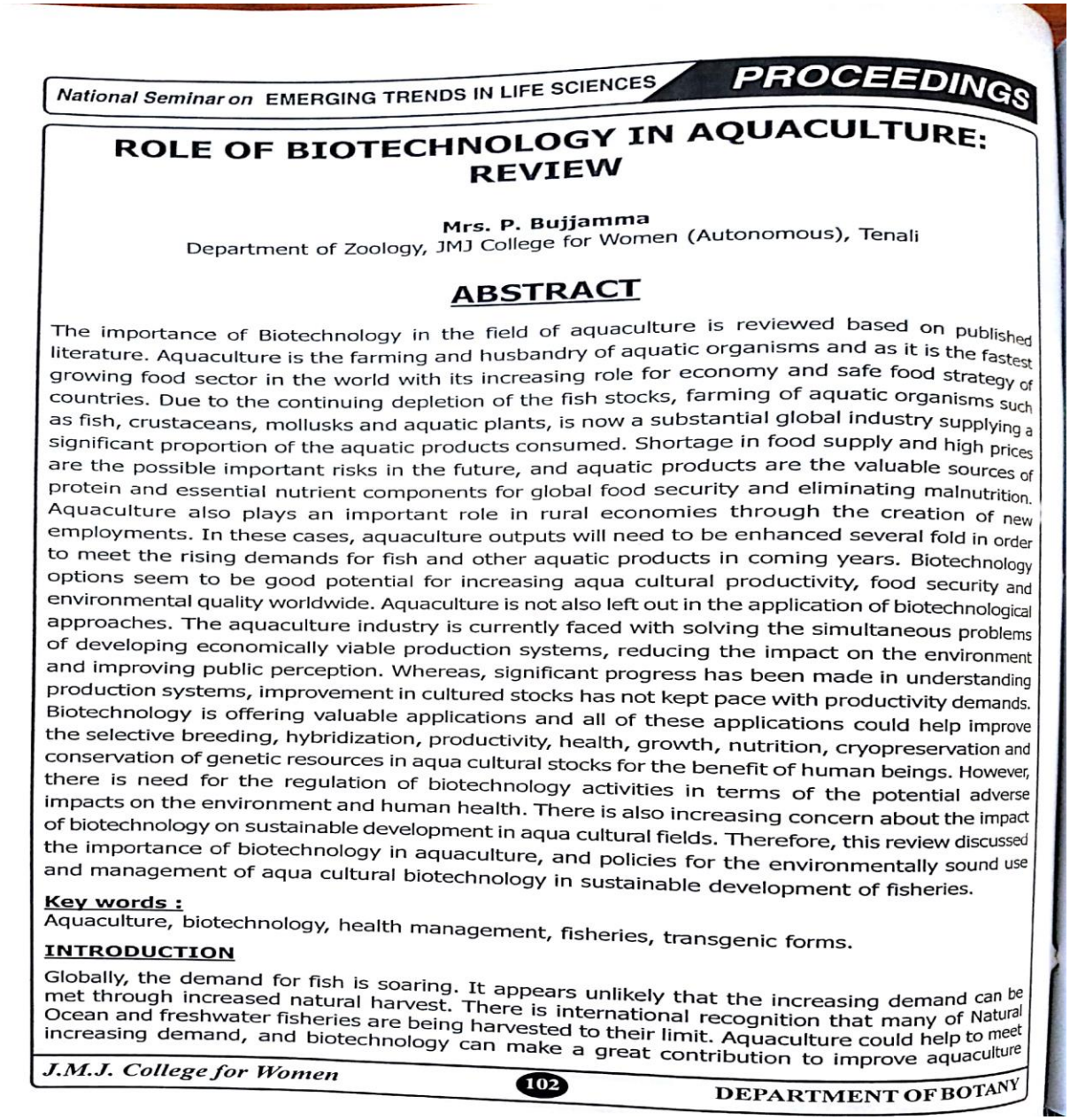

ROLE OF BIOTECHNOLOGY IN AQUACULTURE: REVIEW

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ABSTRACT

The importance of Biotechnology in the field of aquaculture is reviewed based on published literature. Aquaculture is the farming and husbandry of aquatic organisms and as it is the fastest growing food sector in the world with its increasing role for economy and safe food strategy of countries. Due to the continuing depletion of the fish stocks, farming of aquatic organisms such as fish, crustaceans, mollusks and aquatic plants, is now a substantial global industry supplying a significant proportion of the aquatic products consumed. Shortage in food supply and high prices are the possible important risks in the future, and aquatic products are the valuable sources of protein and essential nutrient components for global food security and eliminating malnutrition. Aquaculture also plays an important role in rural economies through the creation of new employments. In these cases, aquaculture outputs will need to be enhanced several fold in order to meet the rising demands for fish and other aquatic products in coming years. Biotechnology options seem to be good potential for increasing aqua cultural productivity, food security and environmental quality worldwide. Aquaculture is not also left out in the application of biotechnological approaches. The aquaculture industry is currently faced with solving the simultaneous problems of developing economically viable production systems, reducing the impact on the environment and improving public perception. Whereas, significant progress has been made in understanding production systems, improvement in cultured stocks has not kept pace with productivity demands. Biotechnology is offering valuable applications and all of these applications could help improve the selective breeding, hybridization, productivity, health, growth, nutrition, cryopreservation and conservation of genetic resources in aqua cultural stocks for the benefit of human beings. However, there is need for the regulation of biotechnology activities in terms of the potential adverse impacts on the environment and human health. There is also increasing concern about the impact of biotechnology on sustainable development in aqua cultural fields. Therefore, this review discussed the importance of biotechnology in aquaculture, and policies for the environmentally sound use and management of aqua cultural biotechnology in sustainable development of fisheries.

Key words :
Aquaculture, biotechnology, health management, fisheries, transgenic forms.

INTRODUCTION

Globally, the demand for fish is soaring. It appears unlikely that the increasing demand can be met through increased natural harvest. There is international recognition that many of Natural Ocean and freshwater fisheries are being harvested to their limit. Aquaculture could help to meet increasing demand, and biotechnology can make a great contribution to improve aquaculture

yields. Aquacultural animals are particularly well suited for research in biotechnology. Experimentation is facilitated by the availability of large numbers of gametes (germ cells), use of external fertilization, and ease of in vitro rearing of embryos. In addition, many aquatic animals can be treated with hormones during development to induce sterility or functional sex reversal thus simplifying experimental procedures. The agenda for modern biotechnology in aquaculture seems very similar to that of livestock and agriculture. Remarkable achievements have been made in the recent past in increasing production of crops, livestock and poultry through genetic and biotechnological tools. The potential areas of biotechnology in aquaculture include the use of synthetic hormones in induced breeding, production of monosex, uniparental and polyploid population, molecular biology, transgenic fish, gene banking, improved feeds and health management and development of natural products from marine organisms (Lakra and Ayyappan, 2002). Biotechnology provides powerful tools for the sustainable development of aquaculture, fisheries, as well as the food industry. Increased public demand for seafood and decreasing natural marine habitats have encouraged scientists to study ways that biotechnology can increase the production of marine food products, and making aquaculture as a growing field of animal research. Biotechnology allows scientists to identify and combine traits in fish and shellfish to increase productivity and improve quality. Scientists are investigating genes that will increase production of natural fish growth factors as well as the natural defense compounds marine organisms use to fight microbial infections. Modern biotechnology is already making important contributions and poses significant challenges to aquaculture and fisheries development. It perceives that modern biotechnologies should be used as adjuncts to and not as substitutes for conventional technologies in solving problems, and that their application should be needed in driven rather than technology-driven (Trivesh Mayekar et al., 2013). The use of modern biotechnology to enhance production of aquatic species holds great potential not only to meet demand but also to improve aquaculture. Genetic modification and biotechnology also holds tremendous potential to improve the quality and quantity of fish reared in aquaculture. There is a growing demand for aquaculture; biotechnology can help to meet this demand. As with all biotechnologically-enhanced foods and aquaculture will be strictly regulated before approved for market, biotechnological aquaculture also offers environmental benefits. When appropriately integrated with other technologies for the production of food, agricultural products and services, biotechnology can be of significant assistance in meeting the needs of an expanding and increasingly urbanized population in the next millennium. Successful development and application of biotechnology are possible only when a broad research and knowledge base in the biology, variation, breeding, agronomy, physiology, pathology, biochemistry and genetics of the manipulated organism exists. Benefits offered by the new technologies cannot be fulfilled without a continued commitment to basic research. Biotechnological programmes must be fully integrated into a research background and cannot be taken out of context if they are to succeed (Trivesh Mayekar et al., 2013). Indian fisheries and aquaculture are the important sector of food production, providing nutritional security to the food basket, contributing to the agricultural exports and engaging about fourteen million people in different activities. With diverse resources ranging from deep seas to lakes in the mountains and more than 10% of the global biodiversity in terms of fish and shellfish species, the country has shown continuous and sustained increments in fish production since independence. Constituting about 4.4% of the global fish production, the sector contributes to 1.1% of the Gross Domestic Product (GDP) and 4.7% of the agricultural GDP. The total fish production of 6.57 million metric tones. Presently has nearly 55% contribution from the inland sector and nearly the same from culture fisheries. Fish and fish products have presently emerged as the largest group in agricultural exports of India (Marine products export review-MPEDA. April 2006-March2007). The potential area of biotechnology in aquaculture include the use of synthetic hormones in induced breeding, transgenic fish, gene banking, uni-parental and polyploidy population and health management, (Shankar Murthy and Kiran 2013).

Concept of sustainable development in aquaculture

Since the publication of the World Conservation Strategy, the concept of 'sustainable development' has received increasing importance in most policy areas. A widely used definition of the concept is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987). The Rio declaration of 1992 clarified that governments have a global responsibility for resolving conflicts over the environment in ways that protect the interest of humanity and nature. One good example of international obligations that has included the concept is the Convention of Biodiversity (CBD). With regard to aquaculture, recommendations for employment of sustainability can be found in the Holmenkollen guidelines for sustainable aquaculture (1999), in the Norwegian ministry of fisheries and costal affairs strategy for an environmental sustainable seafood industry (2009), and in the EU communication; A strategy for the sustainable development of European aquaculture (2002).

Critics of the concept of sustainable development have, however, argued that the concept is elusive, and highly varying views persist among both scientists and regulators with regard to what the concept constitutes and implications by implementation. The main contested values and practices of sustainable development are: what values are important within sustainable development and how to set priorities between them, and how to achieve maintenance and preservation of nature and biodiversity versus a just society and economic development (Kamara et al., 2006). For example, the rapid spread of aquaculture has raised concern about land-use change in coastal areas, impacts on wild fish by escapees, environmental pollution, and extensive use of marine resources for fish feed production. A conceptual framework for sustainable aquaculture has been presented from three perspectives: environmental, economic and sociological (Caffey et al., 1998). This implies that introduction of modern biotechnology must be explored both with regard to the adequacy of present approaches and with regard to the problem solving nature of the new technology. Moreover that there needs to be an awareness that application of modern biotechnology in aquaculture also influences socio-economic values as employment, income, and local economic activity as well as ethics, which are all important elements of sustainability as understood by most users. Hence, sustainabledevelopment requires a renewed focus on stakeholders and their needs; it demands clearer understanding of stakeholders perspectives and public concerns as well as attention to issues of institutional structure and representation in decision-making processes (Anne Ingeborg Myhr et al., 2011).

Selection of IPN-resistant fish (Aqua Gen, 2010). So called marker assisted selection (MAS) can double genetic gain for traits that cannot be measured on selection candidates (e.g. disease resistance), because it utilizes the between family variance, and may also contribute to reduce inbreeding. For MAS, quantitative trait loci (QTL) must be mapped and their effect determined. This is not the case for genomic selection (GS), where the effects of a large number of loci are first estimated using a test group. Selection can then be carried out on genome wide breeding values of the breeding candidates predicted as the sum of the marker effects estimated, assuming an additive genetic model (Meuwissen et al., 2001). However, the high genotyping cost for GS has so far limited its application in aquaculture breeding. Therefore, a scheme with pre-election of parents for growth combined with selective genotyping of large and pooled family groups has been suggested to obtain high accuracies while reducing number of genotypes and costs many fold (Sonesson et al., 2010). Furthermore, application of new tools of molecular genetics for gaining understanding about genetic regulation of complex traits such as disease resistance may be important (Anne Ingeborg Myhr et al., 2011). The growth in aquaculture has been accompanied with an increase in diseases caused by pathogens that includes a wide range of bacterial, viral, parasitic and fungal infections. At present diseases in aquaculture are causing big economic problems and are affecting animal welfare significantly. The high density of fish together with the

effective pathogen transportation in water creates favorable living conditions for these pathogens. Hence, diseases tend to multiply in farm environments, a situation that represents potential ecological threats both to the farmed fish in itself and to the farm environment including wild fish. In salmon aquaculture disease prevention with antibiotics and chemicals was for many years the solution preferred. However, the potential pollution associated with chemicals and the excessive use of antibiotics together with the emergence of multiple resistances to antibiotics created concerns and initiated a search for alternative ways, as selection for increased disease resistance, to deal with the problem. Selection for increased disease resistance in fish has mainly been based on challenge tests carried out under controlled conditions. Challenge-tested fish cannot be used as parents for the next generation of elite salmon, meaning that selection cannot be applied directly on the breeding candidates. To circumvent this problem, geneticists have been searching for genes controlling the degree of resistance to different diseases. Markers for such genes may be ideal criteria forselection, because they can be applied directly without requiring challenge testing. Thus, the accuracy of selection can be increased while the need to sacrifice fish in challenge tests is reduced (Anne Ingeborg Myhr et al., 2011). Selection for genetic disease resistance has been emphasized in Norwegian salmon breeding since 1995. In 2007, Moen et al. (2009) identified markers for a gene that explains most (80%) of the genetic variation in resistance to infectious pancreatic necrosis (IPN) in both fry and post-smolts. Based on these findings, Aqua Gen has developed and applied a tool using these markers for selecting IPN-resistant fish directly. This tool can, with very high accuracy, determine whether individual fish have zero, one or two copies of the gene variant (allele) that give high resistance. This approach may also be useful for pancreas disease (PD), which is an important economic disease of farmed Atlantic salmon that cause significant losses through mortality and reduced production (SalmoBreed, 2011). Currently, salmon lice (Lepeophtheirus salmonis) represent a major health and welfare problem in the salmon industry. Furthermore, it is also an ecological problem, since the lice multiply in fish farms, and then spread to the wild salmon population. Chemical treatment is commonly used to combat the lice, but use of biological measures such as cleaner fish has increased lately due to development of resistant lice to the chemicals. However, moderate genetic variation has been shown for resistance to the salmon louse, and thus it may be possible to reduce problems caused by lice through selective breeding programs (Kolstad et al., 2005). Breeding for disease and parasite resistance in Norwegian salmon and trout is considered to be important for the fish themselves, producers and consumers alike and would increase the sustainability of the industry, and the know-how could be transferred to other aquaculture species (Anne Ingeborg Myhr et al., 2011).

Application of molecular genetics in aquaculture breeding

The two areas of modern biotechnology that has been expected to have most significant impact on genetic improvement of aquaculture species are DNA markers and transgenics (Hayes and Andersen, 2005). A DNA marker is an identifiable physical location on a chromosome whose inheritance can be monitored (Hyperdictionary, 2003). A comprehensive overview of DNA markers and linkage mapping together with a discussion of potential applications of DNA markers in aquaculture breeding programmes is given by Hayes and Andersen (2005). Furthermore, whole genome sequencing and application of genomics in aquaculture breeding programs is discussed by Quinn et al. (2011). As mentioned, DNA markers have already been applied in aquaculture breeding for direct and highly accurate selection of IPN-resistant fish (Aqua Gen, 2010). So called marker assisted selection (MAS) can double genetic gain for traits that cannot be measured on selection candidates (e.g. disease resistance), because it utilizes the between family variance, and may also contribute to reduce inbreeding. For MAS, quantitative trait loci (QTL) must be mapped and their effect determined. This is not the case for genomic selection (GS), where the effects of a large number of loci are first estimated using a test group. Selection can then be carried out on genome wide breeding values of the breeding candidates predicted as the sum of the marker

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Microbial Technology for Aquaculture

Aquatic habitats contain diverse microbial communities and their role in detritus food webs and organic mineralization, particularly through bacteria has been well studied. Microbiological studies delineate the tropic interactions and define the nutrient and energy flow patterns providing specific tools for environmental modifications as also products that could be substitutes for chemical inputs or mechanical devices. Microbial technology for aquaculture comprising aspects of

biofertilization, microbial processing of organic matter, use of probiotics and enhancement of feed digestibility, detritus enrichment and shortening of food chains for better energy transfer rates, genetic up gradation of bacterial strains, biofiltration and waste recycling as also techniques pertaining to post-harvest technology hold great promise in improving aquaculture productivity, on a sustainable basis (Ayyappan, 1994; Lakra and Ayyappan, 2002).

Biotechnology and Aquaculture Health Management

Any technique that uses living organisms or substances from these organisms to make or modify a product or to improve plant or animal or to develop microorganism for specific uses, can be termed biotechnology. Biotechnology involves microbes or cells derived from plants and animals for efficient production of useful products for mankind. Today, there is a wide application of biotechnology in human medicine and animal husbandry in the area of diagnosis, prophylaxis and therapy. Aquaculture industry has undergone a sea change world over in the last decade. The important needs of the industry are production of fast growing disease resistant varieties, development of cheap and effective vaccines, disease diagnostic methods, cell lines and probiotics. Efforts on these lines have already begun and results are highly promising. Some of the biotechnologies employed in aquaculture health management are hybridoma technology, cell culture, subunit vaccine, diagnostics, bioremediation, probiotics and transgenic fish (Shankar, 2002).

Biotechnology and Fish Health Management

Disease problems are a major constraint for development of aquaculture. Biotechnological tools such as molecular diagnostic methods, use of vaccines and immuno stimulants are gaining popularity for improving the disease resistance in fish and shellfish species world over. For viral diseases, avoidance of the pathogen is very important. In this context, there is a need to have rapid methods for detection of the pathogens. Biotechnological tools such as gene probes and polymerase chain reaction (PCR) are showing great potential in this area. Gene probes and PCR based diagnostic methods have been developed for a number of pathogens affecting fish and shrimp (Karunasagar and Karunasagar, 1999). In case of finfish aquaculture, a number of vaccines against bacteria and viruses have been developed. Some of these have been conventional vaccines consisting of killed microorganism but new generation of vaccines consisting of protein subunit vaccines, genetically engineered organisms and DNA vaccines are currently under development. In the vertebrate system, immunization against disease is a common strategy. However, the immune system of shrimp is rather poorly developed. Biotechnological tools are helpful for development of molecules, which can stimulate this immune system of shrimp. Recent studies have shown that the non specific defense system can be stimulated using, microbial products such as lipopolysarcharides, peptidoglycans or glucans (Itami et al., 1998). Among the immunostimulants known to be effective in fish, glucan, chitin and levamisole enhance phagocytic activities and specific antibody responses (Sakai, 1999; Lakra and Ayyappan, 2002).

Hybridoma Technology and Importance of Monoclonal Antibodies

Hybridoma technology for production of monoclonal antibodies (MAbs) has contributed significantly to aquaculture. Monoclonal antibodies are being employed in disease diagnosis, pathogen classification, epidemiological analysis and development of vaccines. Conventionally, antiserum (polyclonal antibodies) is prepared in rabbits for use in diagnostics, serotyping and vaccine development. Rabbits are immunized with a purified antigen with an adjuvant in 2 to 3 doses and the animal is killed and blood collected at the end of 30-40 days. The serum collected after blood

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Aquacultural Biotechnology

Biotechnology has potential to affect aquaculture and can provide at least a partial solution to the problem of feeding the world's growing population because without dramatic increases in production this cannot be achieved. Exploiting more resources such as more water, fish for meal and oil, and heavy use of chemicals for aquacultural use is environmentally unsustainable. Modern biotechnology has also opened up opportunities to increase production and enhance the quality of fresh and processed farmed species. In addition, farmed species are now being developed to resist disease, and this will reduce losses and allows increased production on same area, and therefore bring possible benefits torural areas. Finally biotechnology can contribute significantly to aquaculture industry, for example by helping to make more diversification in farmed species that will more attractive to consumers. Modern biotechnology will be a useful for the genetic improvement of aquacultured species and the protection and management of wild aquatic populations (Altunok Muhammet et al., 2013)

Biotechnology and Aquaculture in India Chromosome manipulation In the last few years, there has been a lot of progress in the area of producing sterile fish in order to prevent overcrowding and to improve flesh quality. The sterile fish continue to grow through the period in which the diploids mature and cease to grow. The methods to produce sterile fish are:1) induction of gonadal autoimmunity, 2) surgical removal of gonads, 3) irradiation of embryos or fry and 4) triploid production through chromosomal manipulation. Of these, the most effective and easily practicable is the last method. In several fish species, thermal, chemical or pressure shocks are known to produce triploidy. It is not known whether they are produced due to the inhibition of the second meiotic division or due to the retention of the second polar body. However, to achieve triploidy, one has to precisely fix the time duration as well as the desired temperature to effect cold or heat shock. These characteristics vary from species to species (Pandian, 1989 and 1990). By applying chromosome manipulation techniques described elsewhere singly or in combination, it has been possible for us to produce haploids, triploids, hybrid triploids (O.mossambicus X O. mossambicus-O. niloticus), gynogens and supermales of O. mossambicus. Of these, viable haploids have been produced for the first time.

Conclusion

Aquaculture biotechnology and other technological innovations are showing a positive impact on aquaculture diversification success, investment potential, and international technology exchange. The development of biotechnology in aquaculture should provide a means of producing healthy and fast growing animals, through environmentally friendly means. However, this development will largely depends on the desire and willingness of the producers to work hand in- hand with scientists and the international donor community to assist developing counties in related research, capacity building and infrastructure development. Improved exchange of information and discussion between scientists, researchers, and producers from different regions on their problems and achievements will undoubtedly help this important sector to further develop with the view to increasing sustainable aquatic animal production globally

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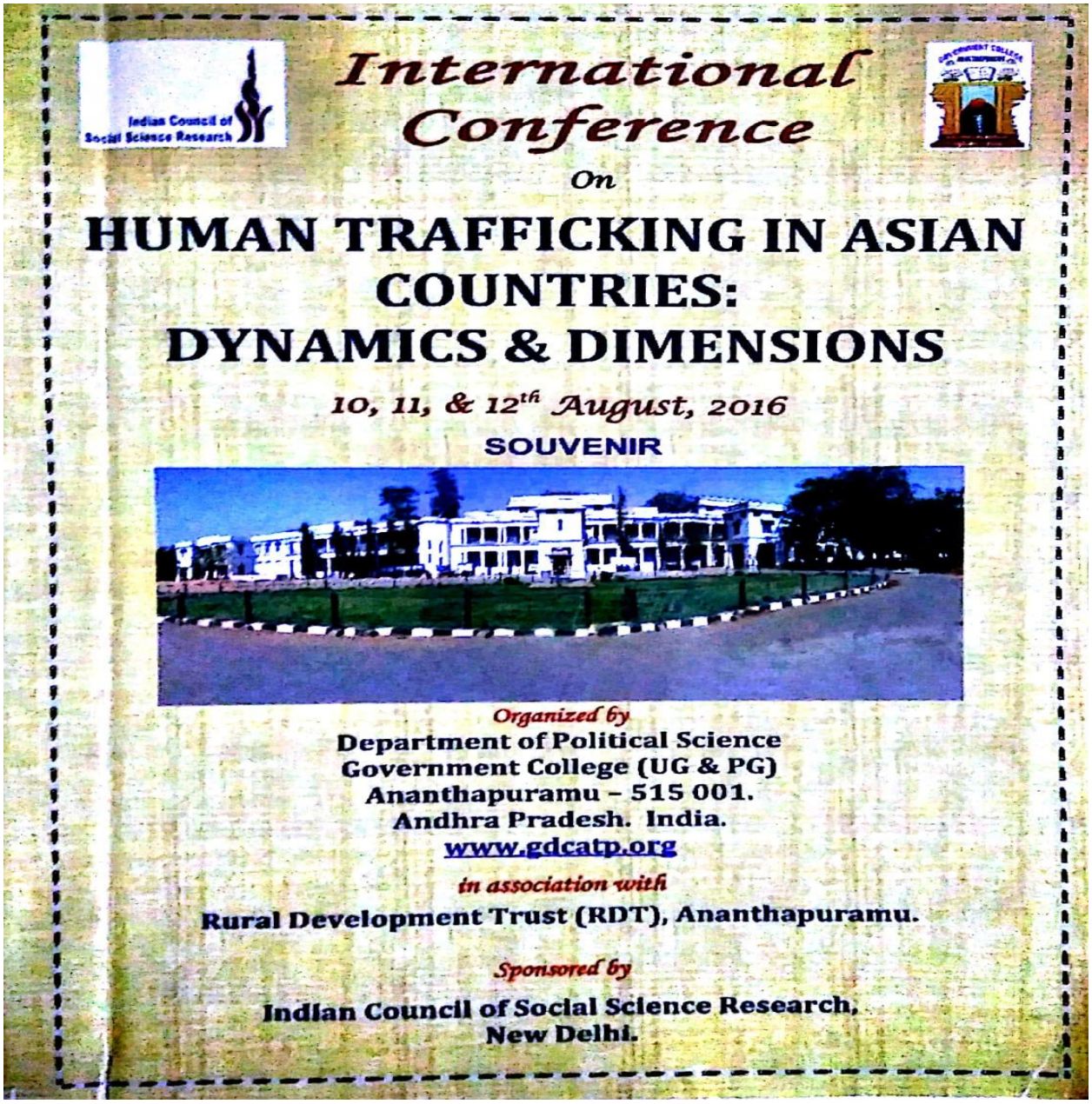
DEPARTMENT OF HOMESCIENCE

47. Ms. P. Hemalatha attended ***International conference*** on "**Human Trafficking in Asian Countries: Dynamics&Dimensions"** & presented a paper entitled "UJJAWALA- A Ray of Hope India's initiative for Trafficking "organized by Dept of Political Science Government College, Ananthapuram in Association with Rural Development Trust Ananthapuram from 10th to 12th August, 2016 Sponsored by Indian Council of Social Science Research New Delhi and published in the Souvenir ,pg 145-146.



UJJAWALA-A RAY OF HOPE - INDIA'S INITIATIVE FOR TRAFFICKED VICTIMS

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"Trafficking in persons" and "human trafficking" have been used as umbrella terms for the act of recruiting, harboring, transporting, providing, or obtaining a person for compelled labor or commercial sex acts through the use of force, fraud, or coercion. Human trafficking is a diverse and hidden crime. It is a low risk high reward activity.

The 2014 Global Slavery Index (GSI) found that there are nearly 36 million victims of human trafficking worldwide. Of that, 36 million, nearly two-thirds, are from Asia. Without serious attention from the U.S. and Asian governments, millions of adults and children will continue to be forced into bonded labor, sex trafficking, slave-like conditions, and child soldiering in Asia. According to the GSI, India, China, Pakistan, Indonesia, Bangladesh, and Thailand are in the top 10 countries with the highest number of trafficking victims in the world. India tops the list with 14 million victims of trafficking. In many countries either the necessary laws are not in place or they are not properly enforced but the victims are treated as criminals.

In the wake of globalization and the resultant marginalization and alienation of large sections of humanity, sex trafficking has become a matter of urgent concern today worldwide. In India alone, over 200 thousand women and children are inducted into the flesh trade every year. The state of Andhra Pradesh is one of the largest suppliers of women and children for the purposes of commercial sexual exploitation. Economic hardships coupled with the prevailing status of women in society, and changing public attitudes towards sex and morality creates the context for the flourishing of this modern-day form of slavery.

3P paradigm of prosecution, protection, and prevention are the key issues in the process of combating trafficking in any country. New prevention measures and methods will emerge and evolve as Government's and anti trafficking stake holders apply experience and share lessons learned. Prevention efforts can become more sophisticated, scalable and effective if supported by sufficient funds and political will. Increasing public awareness about the risks and signs of human trafficking is an important piece of any anti trafficking prevention strategy. India has taken many initiatives to prevent and fight against human trafficking which includes Khoya-paya, a portal for finding missing kids, National Tracking System for missing and vulnerable children etc. Ujjawala is one among them.

The Ujjawala scheme is a valuable step in the direction of protecting two vulnerable sections of society- women and children from exploitations. The scheme aims to empower such victims of trafficking and help them become financially independent, thus improving their standard of leaving, health and social status. this scheme works with five components i.e.., prevention, rescue, rehabilitation, reintegration and repatriation. As a holistic multi-dimensional approach is needed to address the complex nature of this issue, it is imperative that civil society, non-government organizations and pressure groups also play a vital role. This paper throws light on in depth study of a Ujjawla home run by an NGO to explore various issues related to administrative aspects psycho social issues of victims, financial viability of the program rehabilitative measures taken and overall functioning of the scheme.

DEPARTMENT OF HISTORY

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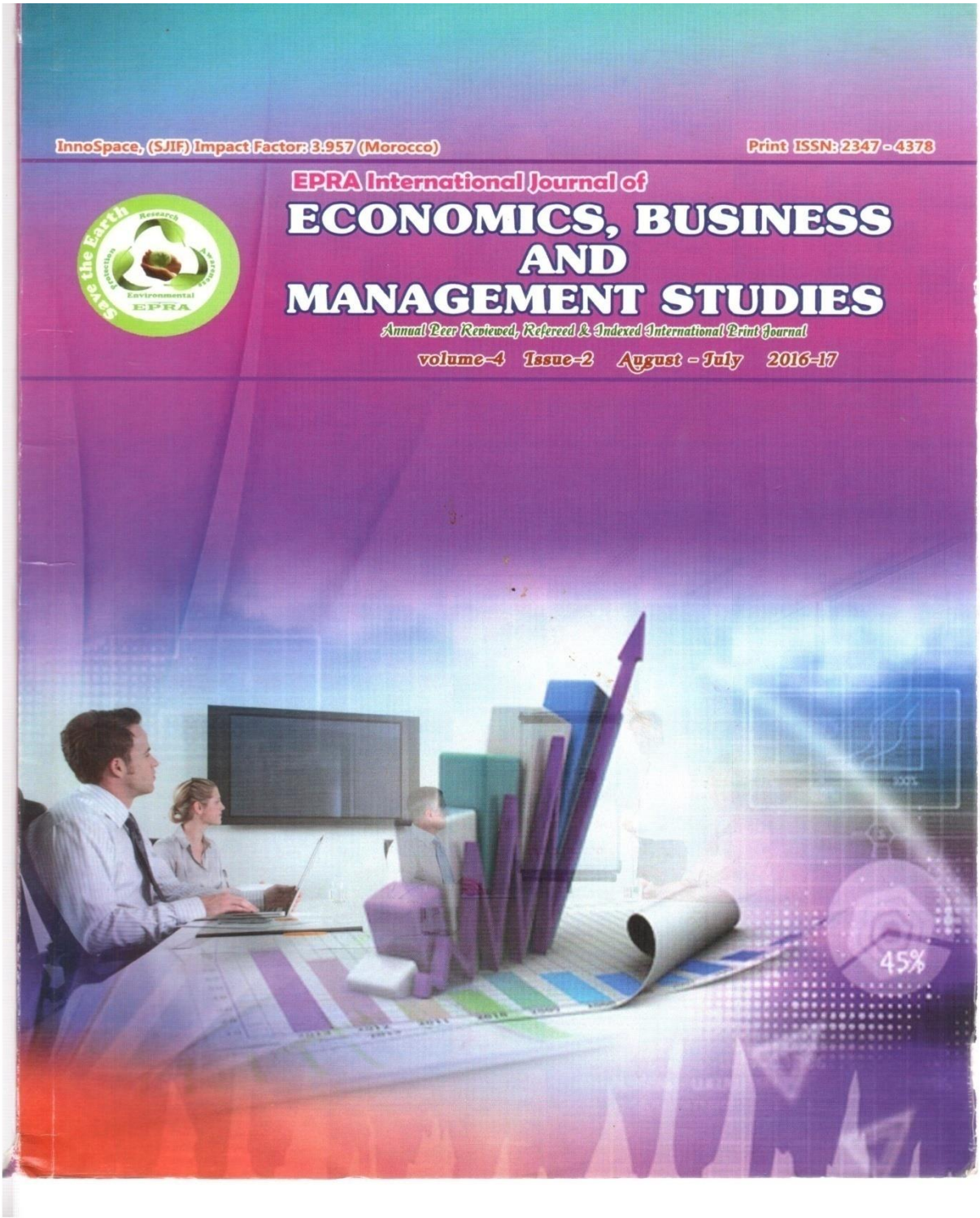

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TOURIST IMPORTANCE OF BUDDHIST SIGHTS IN GUNTUR DISTRICT-A STUDY

P.Jannamma[1]

ABSTRACT

Buddhism was first introduced to the world in the 6th century BCE by Siddhartha Gautama. It first spread outside the ancient kingdom of Magadha. At the time India already had an established reputation for being a land of pioneers in spiritual and intellectual innovation. The Indian demographic at the time, however, had reached a point where it could be divided into two broad sects: the self centered aristocracy, and the ritualistic masses. Eventually, resentment towards the injustices suffered by the lower classes, and the overwhelming powers of the priestly class prompted the development of alternative teachings and philosophies. Today the town is a popular tourist destination because of attractions like the famous Amaravathi Stupa and the archaeological museum. The banks of river Krishna serve as popular picnic spots among the locals and draw numerous tourists. Guntur is a very important part of the state of Andhra Pradesh as it is considered the cradle of learning and administration. It is regarded as one of the most developed cities in the state because it has the maximum of learning institutes and administrative organizations. The language and literature, art and architecture, social norms and religious practices of that time were shaped by the enlightening stimulus of this great religion. The magnificent remains of many Buddhist Viharas and stupas in Guntur district give us a glorious glimpse of the ancient times when Buddhism flourished in the district. Guntur is an important tourist destination of Andhra Pradesh and is famous for Buddhist monuments. Find peace and tranquility as you make the circuit of the Buddhist sites.

KEY WORDS: *Tourism, Buddhism and Monuments Importance.*

INTRODUCTION

Buddhism had a glorious career in Andhra for about one thousand years (400 B.C-A.D 600). Both from the foreign and native literary accounts, it is learnt that Buddhism made its way into the Andhradesa even during the life time of the Buddha. The Chinese traveller Yuan Chwang recorded a tradition that the Buddha visited Andhrades and personally preaches the *dhamma*. The Buddhist literature contains references to Assaka and Mulaka as Janapadas in Andhraratta and to Andhra nagari on the river Thelivaha (Krishna).

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Buddhism in Andhradesa, though assigned to pre-Asokan times, the Mouryan emperor Asoka was responsible for the spread of Buddhism in this part of the country during the 3rd century B.C. when Andhradesa was part of his domain. Most of the Buddhist sites in Andhra Pradesh witnessed all the three phases of Buddhism viz. Theravada, Mahayana and Vajrayana. Buddhism became the household faith in the Telugu country and its impact can be seen on several Buddhist sites, where the images of the Buddha were worshipped.

Among the 150 Buddhist sites so far reported from Andhra Pradesh, more than 50 sites were excavated thoroughly and the structures laid bare were conserved and preserved for posterity. Among them, 20 prominent sites are identified spread over 12 districts for developing them into three Buddhist circuits viz. Hyderabad, Vijayawada and Visakhapatnam.

Historical background of the Buddhist site Amaravathi explains the phases of the evolution of Amaravathi stupa right from the pre-Asokan period to the medieval period and highlight the interesting features of Amaravathi as a place of tourist importance. It provides inputs on the additional tourist attractions of Amaravathi at present era. Chronologically Bhattiprolu is the earliest Buddhist site in Andhra and stupa is said to be the pre-Asokan. The history of Bhattiprolu site in Buddhist view point. It explains the construction of the stupa and the personalities, involved in its development. This site was re-discovery of the Buddhist monuments at Bhattiprolu by the colonial Archaeologists like Alexander Rea and other scholars. It provides the information regarding the modern amenities, provided by the department of tourism to the pilgrims visit the Buddhist site, Bhattiprolu.

PROFILE

The Indian state of Andhra Pradesh has nearly 150 Buddhist sites most of which date back to the 3rd century B.C. This indicates that Buddhism might have had its heyday in the past in Andhra Pradesh but unfortunately gradually faded out in the modern era. Guntur District is located in Andhra Pradesh along the east coast of Bay of Bengal. The district has a coastline of around 100 kilometers. Guntur City is the largest city in the district and administrative center of Guntur District. The district is a major center for learning. Telugu and Urdu are the main languages spoken in this district.

Guntur district covers an area of 11,391 Sq.km, and has a population of 4,465,144 of which 28.80% is urban as of 2001, AD. The Krishna River forms the northeastern and eastern boundary of the district, separating Guntur District from Krishna District. The district is bounded on the southeast by the Bay of Bengal, on the south by Prakasam District, on the west by Mahbubnagar District, and on the northwest by Nalgonda District. It is divided into 57 mandals.

HISTORY OF BUDDHISM

Buddhism has now been established across almost every continent. About 488 million Buddhists worldwide represent 7% of the world's total population, making Buddhism the 4th largest religion in the world. Buddhism is the practice of Buddha's teachings, also called 'Dharma', which means 'protection'. By practising Buddha's teachings, living beings are permanently protected from suffering. The founder of Buddhism is Buddha Shakyamuni, who showed the manner of accomplishing the ultimate goal of living beings, the attainment of enlightenment, at Bodh Gaya in India in 589 BC. At the request of the gods Indra and Brahma, Buddha then began to expound his profound teachings, or 'turned the Wheel of Dharma'. Buddha gave eighty-four thousand teachings, and from these precious teachings Buddhism developed in this world.

Buddhism is a religion to about 300 million people around the world. The word comes from 'budhi', 'to awaken'. It has its origins about 2,500 years ago when Siddhartha Gotama, known as the Buddha, was himself awakened (enlightened) at the age of 35. Buddhism goes beyond religion and is more of a philosophy or 'way of life'. It is a philosophy because philosophy 'means love of wisdom' and the Buddhist path can be summed up as 1 to lead a moral life, 2 to be mindful and aware of thoughts and actions, and 3 to develop wisdom and understanding. Buddhism explains a purpose to life, it explains apparent

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injustice and inequality around the world and it provides a code of practice or way of life that leads to true happiness.

The influence of Buddhism in India started waning around the late Gupta period and the Pala Empire, further accentuated by the invasions from Central India. So while a lot of the 'practiced heritage' today lies in South and Southeast Asia, parts of India still carry the heritage forward, and at many pilgrimage sites, the confluence of Buddhism and Hinduism has created a unique cultural and architectural landscape.

The State Government has identified two Buddhist circuits Lower Krishna Valley covering Nagarjuna Sagar, Amaravati and other adjoining locations, and North Coastal Circuit covering Buddhist sites around Visakhapatnam District. It has also been proposed to develop Buddhist sites, monuments and Buddhist clusters in Hyderabad, Vijayawada and Visakhapatnam.

It deals with the advent of Buddhism into Andhra region and its stages of evolution. It discusses the role of certain personalities like King Asoka for the rapid development and spread of Buddhist thought in Andhra. It also explains the contribution of Andhra rulers, royal ladies, merchants and artisan communities for strengthening Buddhism on the land of Andhra particularly in Guntur.

NAGARJUNAKONDA

Nagarjunakonda, known as Sriparvata in ancient times, was located in the Guntur district. Also called Vijaypuri, it was the capital city of the Ikshavakus. A prominent center of learning, Sriparvata rose to greatest glory during the Ikshavaku period in the 3rd Century A.D. Several monasteries were excavated here, particularly the Maha Chaitya, the bathing ghat and the amphitheater. While constructing the Nagarjuna Sagar Dam, the ruins of this ancient Buddhist University and chaityas were reconstructed brick by brick on the top of a hill which forms the island Nagarjunakonda and at Anupu. A stunning monolithic statue of the Buddha standing in the eternal posture of sublime peace is the chief attraction in the museum.

AMARAVATHI

Set out on the Buddhist quest and find the supreme satisfaction you have been searching for. Of all the' Buddhist sites in Andhra Pradesh, Amaravati is by far, the most magnificent and the most widely known. Formerly known as Dhanyakataka, it is located on the right bank of River Krishna, about 28 kms from Vijayawada. The stupa at Dhanyakataka was several times enlarged and embellished over the centuries. This mighty monument, once measuring 30 mts in height, covered with marble sculptures painted in colours, is perhaps the finest memorial of Buddhism in the world. It is also known as "dipaladinne' Mound of lamps. It might have been the largest marble surfaced dome in the world. It was considered as the most sacred pilgrim center of the Buddhists in India.

BHATTIPROLU

Located on the right Bank of River Krishna, in Guntur District, about 25 km from Repalle, and 50 km from Vijayawada, Bhattiprolu known as Prathipalapura in ancient times is perhaps the site with the oldest known stupa. This pre-Mauryan stupa enshrined a Buddhist relic. King Kubiraka, the merchants and elite of this land built a Maha Chaitya which measured 40 mts in diameter, with an impressive drum covered with panels, on which the events in the Lord's life were sculpted. Inscribed stone relic caskets, crystal caskets, relics of the Lord Buddha and jewels were excavated here.

BUDDHIST TOURISM ECONOMIC & SOCIO-CULTURAL DIMENSIONS

Buddhist pilgrimage is a significant perennial tourist activity in India, which brings in large volume of tourists as well as foreign exchange to our shores. Additionally, it is a culturally unifying factor, linking India to the rest of South and Southeast Asia. With a high policy impetus on boosting 'inclusion', coupled with recent global experiences in community based tourism that have highlighted positive livelihood generation and educational impacts, implementation strategies are increasingly moving towards community led enterprises for

sustainability of growth models. The concept of 'collaborative community' models aim to deliver sustainable socio-economic development by building the capacity of local communities to realize the potential value of their natural and cultural heritage to create tourism enterprise opportunities through a co-operative destination management organization model, which not only supplements income, but act as an incentive to preserve local art and culture, and maintain traditional practices like architecture, cuisine and handicrafts etc.

The creation of co-operative models encompasses all the aspects of tourism under the ambit of a unified on-ground institution, which not only controls the structure and volume of tourist activity, but also ensures that the entire destination is promoted holistically rather than by fragmented independent products or sites. It is imperative for the communities to have Direct Cash Flow in their day-to-day economy, and ensuring that the community retains the administrative aspects of the business is key to ensuring equitable growth. The figure below highlights some of the macro societal concerns that the model offers.

CONCLUSION

Tourism in a green economy refers to tourism activities that can be maintained, or sustained, indefinitely in their social, economic, cultural, and environmental contexts "sustainable tourism". Sustainable tourism is not a special form of tourism; rather, all forms of tourism may strive to be more sustainable. Interest in unique cultures by tourists can result in adverse impacts and severe disruption for communities. Tourism destinations are occasionally built by outsiders in areas that indigenous or traditional communities consider to be theirs, and where the development was neither desired nor locally validated. Over thelast two decades, with the growth in ecotourism and alternative travel, tourism impacts on vulnerable cultures has begun to be taken seriously by the tourism industry, governments, non-governmental organizations and the cultural groups involved. Tourism growth, environmental conservation, and social wellbeing can be mutually reinforcing. All forms of tourism can contribute towards a green economy transition through investments leading to energy and water efficiency, climate-change mitigation, waste reduction, biodiversity and cultural heritage conservation, and the strengthening of linkages with local communities. Making tourism businesses more sustainable will foster the industry's growth, create more and better jobs, consolidate higher investment returns, benefit local development and contribute to poverty reduction, while raising awareness and support for the sustainable use of natural resources.

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Cultural heritage of buddhist monuments and its importance to develop piligrimage in andhra pradesh.

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Abstract

Tourism in India has emerged as one of the major segment of the economy. India, with its rich cultural heritage, ancient monuments, world famous temples, architecture masterpieces, wild animal's sanctuaries, country holds a great attraction for the overseas as well as domestic tourists. Tourism is inherently the fore runner of economic development with the entire cultural heritage at its foundations. However, it is also a form of development even if restricted or limited by economic realities, and is, nonetheless, a means by which individuals and societies can access to and gain insight of one another's places of interest and events of the past. Through experience, education and enjoyment. Tourism can be a liberating vehicle for gaining and exchanging knowledge and understanding in an intellectual, emotional and spiritual sense. Mahatma Gandhi eloquently expressed that "I do not want my house to be surrounded by walls or all sides of my windows to be barricaded. I want all the world's cultures to be free to blow around my house but I don't want to be carried away by any one of them". The State Government after considering the tourism potential of at least 22 Buddhist sites out of 150 discovered, identified for developing 3 Buddhist circuits, operational from Hyderabad, Vijayawada and Visakhapatnam. Nagarjunakonda in Hyderabad circuit, Amaravati in Vijayawada circuit and Thotlakonda, Bavikonda, Sankaram and Salihundam in Visakhapatnam circuit are developed with whole lot of tourist amenities. Though, the number of tourists visiting these sites for domestic sector, Government of Andhra Pradesh aims at drawing large number of tourists from Far East Countries. Now Andhra Pradesh State is included in the Buddhist circuits of India. This paper will give detailed status of cultural heritage of Buddhist monuments in Andhra Pradesh.

Keywords: Culture, Heritage, Buddhist, Monuments and Tourism

I. Introduction

Visiting historic, Buddhist and cultural sites is one of the most popular tourist activities today. As a result, nations are paying attention to one of the fastest growing niche market segments in the travel industry called heritage tourism. The National Trust for Historic Preservation defines heritage tourism as "traveling to experience the places, artifacts and activities that authentically represent the stories and people of the past and present".

The inscriptions of the Andhra Ikshvaku period record either the construction of the Buddhist monuments or the gifts made to them. All the donors and builders of the Viharas were the female members of the Ikshvaku royal family. Although Santamula I is reported to have performed the Vedic sacrifices, nothing is known about the religious leanings of his successors. This was the period during which Nagarjunakonda became a flourishing centre of Buddhism and a place of pilgrimage for the Buddhists. The donors were ladies from the royal household, the merchants and artisans and the people at large.

The great stupas of Jaggayyapeta, Nagarjunakonda and Ramireddipalle were built, repaired or extended during their reign. Buddhist pilgrims and scholars visited the Buddhist centre at Nagarjunakonda. The attraction for this Buddhist centre can be accounted for from the sea trade which was carried on between Lanka and the Ikshvakus though the ports situated on the mouths of the Krishna and the Godavari.

Buddhist Culture and tourism have a mutually beneficial relationship which therefore strengthened the attractiveness and competitiveness of regions and countries. Culture therefore is increasingly an important element of the tourism product. It also creates distinctiveness in a crowded global marketplace. At the same time, tourism provides an important means of enhancing cultural exchange creating income which in turn can support and strengthen cultural heritage, cultural production and encourage creativity. Creating a strong relationship between tourism and culture can therefore help destinations to become more attractive and competitive locations to live, visit, work and invest in.

II. Profile

The state of Andhra Pradesh extends between 12.40 and 19.50 Latitudes and 76.45 to 84.50 longitudes and occupies the 5th place in India covering approximately 2,75,000 square kilometers in area. It is the 4th most populous. Drained by such mighty and perennial rivers as Vamsadhara, Godavary, Krishna, Pennar, and Swarnamukhi, etc. and possessing important geological rock and mineral formations, covered by alluvial soils, Andhra Pradesh was most congenial for the survival and sustenance of mankind from the pre-historic times.

According to F.R. Allchin, the most numerous foreign visitors, particularly from Europe and America, visit India, Andhra Pradesh which we may broadly call cultural historical interests. In view of India's rich and varied monuments and the fact that they offer much that is unique, this class of tourism has clearly a great potential for development and in our view can be exploited to a far greater extent than at the present time. These tourists may further be broken down into those with general interest wishing to see a small selection only of the most important monuments; and those with more limited regional or thematic objectives. The monumental heritage may in broadest terms be divided into four principal sub-groups: monuments of Buddhism, starting with the sites associated with Buddha himself; Hindu monuments, ranging in time from the early centuries of the Christian era to the present day; and enormously varied in styles: the Indo-Islamic monuments; and, the monuments of European and British association with India .Each one of these four deserves to be exploited for purpose of Cultural tourism.

III. Heritage tourism centers on history and culture

While the term usually refers to cultural heritage embodied in historical and archaeological sites, arts, festivals, and pilgrimages some observers include natural heritage as well, particularly where it is linked to a way of life. Heritage Tourism schemes do not exclusively involve the Diasporas. The United Nations Economic, Social and Cultural Organization (UNESCO) designated outstanding landmarks as World Heritage Sites and by doing so, attract many international tourists. Such sites serve as a significant development resource for poor countries since they attract international funds for their restoration and preservation as well as tourism revenue.

Heritage tourism strategies in various countries have in common development which make them major growth areas. They can be used to boost local culture, aid the seasonal and geographic spread of tourism, because of people's inclination to seek out novelty, including that of observing traditional cultures. Heritage tourism has become a major "new" area of tourism demand, which almost all policy makers are aware of and anxious to develop.

IV. Economical development

All types of tourism in Andhra Pradesh have registered phenomenal growth in the last 12 years (2000-2011) ever since the Andhra Pradesh government decided to boost revenues from the tourism sector by projecting Andhra Pradesh as the ultimate tourist destiny. The reason why Andhra Pradesh has

been doing well in all types of tourism is that the people of have always been known for their hospitality, affability and polite behavior that has been attracting foreign travelers to Andhra Pradesh in hordes. Andhra Pradesh Government, in order to boost tourism of various kinds in Andhra Pradesh has set up a separate Ministry of Tourism and Culture. This ministry recently launched a campaign called "Take Andhra Pradesh to the World and, Bring the World to Andhra Pradesh" in order to encourage different types of tourism in Andhra Pradesh.

In the year 2009 foreign tourists spent around US $ 15.4 billion on their travel in Andhra Pradesh. Being a state with tremendous diversity, Andhra Pradesh has a lot to offer in terms of tourism and related activities. The diversity that Andhra Pradesh is famous for ensures that there is something prominent for all tourists, no matter what their interests are in Andhra Pradesh. Varieties of Tourism forms are available. The Andhra Pradesh Government, in order to boost tourism of various kinds is taking special steps to promote Pilgrimage Tourism, Spiritual Tourism, Heritage Tourism, Cultural Tourism, Eco-Tourism,. Wild life Tourism, Beach Tourism, Leisure Tourism, Tribal Tourism, Rural Tourism, Business Tourism, Adventure Tourism, Health Tourism, Medical Tourism, Endogenous Plants-Tourism. The State has deliberately adopted; Culture tourism as the principal instrument to help and transform the area (region); and, culture as the authentic representation of human skills and means of preserving its cultural heritage.

V. Buddhist monuments

The State Government after considering the tourism potential of at least 22 Buddhist sites out of 150 discovered, selected for developing 3 Buddhist circuits, operational from Hyderabad, Vijayawada and Visakhapatnam. Nagarjunakonda in Hyderabad circuit, Amaravati in Vijayawada circuit and Thotlakonda, Bavikonda, Sankaram (Plates 2, 3) and Salihundam in Visakhapatnam circuit are provided with whole lot of tourist amenities. Though, the number of tourists visiting these sites for domestic sector, Government of Andhra Pradesh aims at drawing large number of visitors from Far East Countries. Now Andhra Pradesh State is included in the Buddhist circuits of India.

As the Satavahanas and the Ikshvakus patronized Buddhism, this area has several Buddhist monuments. They were divided into three types, namely, the Stupas, Chaityas and Viharas. Originally these structures were devoid of images but they were gradually included in them. The legends of Buddhism and the mythology of Hinduism provided inexhaustible material to the artists. The Buddhist erected many Stupas from Salihundam near Srikakulam to Nellore, and among them, the Stupa at Amaravati (Plate 4) in Guntur district was the biggest and the most famous monument. The Stupa at Bhattiprolu is a wheel-shaped Sariraka Stupa. It is the first example of this model and the later Stupas constructed on the lines of later Satavahana period. The ruins of such Stupas came to light at Chandavaram, Ghantasala, Gudivada,28 Jaggayyapeta, Goli and Nagarjunakonda (Plate 5). Some Chaityas were also in view at Kondapur in Medak district, Vihara is found at Sankaram near Vishakhapatnam, but it is rock hewn. Kondapur, Ramathirtham, Simhachalam, Bhattiprolu, and Guntupalli are accessible from Vijayawada, while Panigiri and Dhulikatta are close to the State capital-Hyderabad. The massive monolith of Buddha standing 17 meters high on the 'Rock of Gibraltar' in the Hussain Sagar Lake. The installation of the statue is a story by itself. The monolith weighing over 320 tones was literally carted all the way from Raigiri in neighboring Nalgonda District, a distance of 60 km.

The village Nanduru lies about 16 kms to the North of Bapatla in Guntur District. In the year 1930, while digging at the site Mahachaitya was unearthed along with a reliquary. It is very interesting to note that according to some scholars, the Buddhist scholar Aryadeva, the disciple of Acharya Nagarjuna was born at Nanduru. The structures resemble those of Bavikonda, another Buddhist site at Visakhapatnam. The village Pedavegi lies 12 kms North of Eluru town in West Godavari District. In ancient times it is known as Vengipura capital of Salankayanas. Few Brahmi label inscriptions were reported from the excavated mound locally known as Dhanamdibba. There are museums at places like Nagarjuna konda, Guntur, Amaravati and Hyderabad that display various Buddhist antiquities and

relics gathered during the course of excavations at the various sites. Andhra Pradesh is emerging as a repository of enlightenment as far as Gautama the Buddha is concerned.

VI. Conclusion

Andhra Pradesh Cultural tourism in view of its glorious heritage in the form of magnificent cultural monuments and antiquities are overflowing with rich art and architecture. The music, folklore and dance during Jataras at temples provide a cultured and sophisticated entertainment to the tourists. Andhra Pradesh Tourism authorities have good strategies to cater the needs and expectations of National and International tourists. Since the responsibility of the development of tourism lies under the State Government, one of the major impediments in the proper developments of tourism which includes the maintenance of the monuments, protection of their architectural, historical and cultural value, is inadequacy of funds. The Central Govt. therefore, has to take up the responsibility of augmenting the developmental activities initiated by the State Government, with allocation of adequate funds at proper time, so that the pilgrimage tourism may be developed not only in the study region but throughout the country.

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ST. JOSEPH'S COLLEGE OF EDUCATION FOR WOMEN

(Autonomous, NAAC 'A') Guntur.

Affiliated to Acharya Nagarjuna University

LOVE, TRUTH, BEAUTY, AND GOODNESS AS VALUES

Mrs. T. Arogyamma,
H.O.D. Department of Economics,

M. Esther Sobha,
Librarian

JMJ College for Women, Tenali

Abstract:

" Humans love truth and rejoice in ceremonies that honor those qualities. For that sentiment we should indeed thank God." June Jordan

"No matter what upheavals may attend the social and economic growth of civilization, religion is genuine and worthwhile if it fosters in the individual an experience in which the sovereignty of truth, beauty, and goodness prevails, for such is the true spiritual concept of supreme reality. And through love and worship this becomes meaningful as fellowship with man and son with God.

TRUTH, BEAUTY, AND GOODNESS-DISCERNING GOD IN MIND, MATTER AND SPIRIT.

"Throughout this glorious age the chief pursuit of the ever-advancing mortals is the quest for a better understanding and a fuller realization of the comprehensible elements of Deity—truth, beauty, and goodness. This represents man's effort to discern God in mind, matter, and spirit. And as the mortal pursues this quest, he finds himself increasingly absorbed in the experiential study of philosophy, cosmology, and divinity.

"All truth—material, philosophic, or spiritual—is both beautiful and good. All real beauty—material art or spiritual symmetry—is both true and good. All genuine goodness—whether personal morality, social equity, or divine ministry—is equally true and beautiful. Health, sanity, and happiness are integrations of truth, beauty, and goodness as they are blended in human experience. Such levels of efficient living come about through the unification of energy systems, idea systems, and spirit systems.

"Truth is coherent, beauty is attractive and goodness is stabilizing. And when these values of that which is real are co-ordinated in personality experience, the result is a high order of love conditioned by wisdom and qualified by loyalty. The real purpose of all universe education is to effect the better co-ordination of the isolated child of the worlds with the larger realities of his expanding experience. Reality is finite on the human level, infinite and eternal on the higher and divine levels."

The value of three values would be discussed in full paper with few illustratins.

DEPARTMENT OF COMMERCE

51.

SERVICE QUALITY AND CUSTOMER RELATIONSHIP MANAGEMENT IN 21st CENTURY: EMERGING ISSUES AND CHALLENGES

Editor
Prof.M.Venkateswarlu

SERVICE QUALITY AND CUSTOMER SATISFACTION IN BANKING SECTOR IN INDIA

Dr. R. Naga Jyothi,Lecturer in Commerce, JMJ College for Women, Tenali-522201

The banking industry has been passing through a phase of transition which was initiated with the liberalisation of financial policies that lead to disintermediation, diversification and deregulation of the financial system. But the increased competition coupled with interventionist policies has jeopardised the cost benefit of funds. This has given way to non-conventional banking in place of traditional banking so as to capture the increased interest sensivity of depositors. "Manage the Change" has become the stepping stone for the success of the banks.

The important management objectives of banks are:

- To organise the structure to meet the challenges of changing environment;
- To improve customer services;
- To introduce new schemes;
- To improve housekeeping;
- To improve technology in banks;
- To modernise bank equipment;
- To train employees on an ongoing basis;
- To improve work ethics;
- To improve the quality of banking service;
- To improve the health of the banking organisation;
- To imbibe value system;
- To improve productivity through participative managemennt;
- To improve inspection and social audit;
- To follow instructions and stick to rules and guidelines;
- To rise above and serve the community;
- To utilise human resources for improving quality of life;
- To develop leadership and entrepreneurial spirit among cadre;
- To motivate employees to work efficiently, productively and profitably;
- To evolve a unique monitoring and controlling system; and
- To improve the image and strengthen the confidence of the people in the system.

To improve the quality of banking service and to improve the image and strengthen the confidence of the people in the system, in the current information age customer service has become a challenging issue in any service industry as there are many intangibles that define a customers satisfaction or otherwise with a paticular product or process.

When it comes to banking industry the task is even more challenging as banks are required to deliver improved and efficient custmor service to match the incresing expections of existing as well as new custmors both throughthe brick and mortar structure and the virtul world. The decision of the custmor to choose a particular bank is based on

various factors, however if the reasonsare to be categorised they can be divided in to two broad groups i.e tangible and intangible factors.The tangible factors may be hard performance, quality,reliability, cost of services and convenience. The intangible factors may be reputation, sense of caring, courtesy,willingness to help, problem soling ability of staff etc.

Last decade the banking industry witnessed that information technology and communications networking have revolutionised the working of banks.Unfortunately,with a significiant workforce, the first generation banks have not been able to harness the beneficial effect of computerisation. Having information technology not been properly implimented,led to a rise in the number of complaints. The rise of customer dissatisfaction can be attributed to the fact that information technology is viewed more as a panacea for reconciliation in the back office or substitute of hard-bound-ledger in the front office in banks.

Advent of Banking Ombudsman Scheme in India on June14,1995 to provide an expeditious and inexpensive forum to bank customers for resolution of their complaints relating to deficiency in banking services provided by commercial banks,regional ruralbanks and scheduled primary co-operative banks is one of the initiatives undertaken by the RBI, over the years,to ensure fair treatment to customers. Even though, there exists a tired mechanism for customer grivance redressal in the banks, its efficacy in terms of attending to customercomplaints is far from satisfactory.

WHAT IS CUSTOMER SATISFACTION?

Customer satisfaction is an emotional reaction to the difference between what customers anticipate and what they receive regarding the fullfillment of some need, goal or desire. There exists an interaction between the desired results and customer satisfaction, customer loyalty and custmer retention.

CUSTOMER 'S SEGMENTATION AND THEIR CONTRIBUTION

Customers play the most significant part in banking business. In fact it is said that only customer is the profit centre or else is overhead. Customer is the one who uses the products and services and judges the quality of those products and services. Hence its important for any bank to impress customers with superior services who in turn become ambassadors in the market. To manage customers, banks may follow some sort of approaches like segmentation or division of customers into groups becauseeach customer has to be considered valuable and profitable. Normally, following types of customers contribute to the profit at different parts of the business cycle.

- **New Customers**: Acquiring new customers is the lifeblood of any bank. To keep eye on new customer acquisition trends is essential to have fingers on the pulse of operating market. It's the most expensive part of marketing investement and banks that can creatively reduce the cost to acquire new customers while generating increasingly more new customers will be the winners. It has been proved time and

again that customers that are properly inducted will stay with the bank longer and spend more moneythan other customers.

- **Existing Customers**: Existing customers can be further classified in three categories i.e. loyal, silent attrition and dissatisfied.

a) **Loyal customers**: These types of customers are less in numbers but promote more business and profit as compared to other customers as these are the ones which are completely satisfied. These customers revisit the bank overtimes hence it is crucial to interact and revisit and keep in touch with them on a regular basis and invest much time and effort with them. Loyal customers want individual attention and that demands polite and respectful responses from service provider.

b) **Customers in silent attrition**: Customers in silent attrition are those that have reduced or stopped using a product but where the account is still open eg dormant savings bank account with little or no balance. For these customers banks must determine why they are no longer using product simultaneously should create initiatives to change their behaviour.

c) **Dissatisfied customers**: Dissatisfied customers are, unfortunately, a hard fact of business life. The dissatisfaction generally stems from three sources: *charges-* misunderstood, unexplained, poorly explained, too step, etc; *perceived errors*; and *poor service*. The Harvard Business Review reported that a 5 % increase in customer loyalty could boost 25-85 % ' Addressing the challenges of customer retention profitability'.

- **Exiting customers**: Customers that are exiting are those that have started the process of moving their relationship to other banks or are in the process of considering that move. These customers may still use product but they are looking for the exit and actively seeking alternatives. Given time, they will leave. Intial challenge for the banks is to identify those exiting customers.
- **Exited customers**: Putting it simply, these are no longer customers. They have left. Strategies that are aimed at recapturing customers that have left the banks are generally called Winback strategies. Winback strategies are the most expensive and lowest return on investment place to endeavor to implement customer retention strategies. Since customers have already moved to another bank and it takes a fat allurempt to bring them back.

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A customer who banks with someone, he remembers ' how well he was treated', 'how the people who served the bank treated him', and 'how well the bank fullfilled his needs or wishes.' This is very vital fact of customer experience should be embedded in the minds of all employees. Banks as well as its employees has to be truly committed to customers to relish the opportunity to serve customers by

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Increased customer satisfaction results in higher customer retention enhancing the reputation of a bank. Improving staff morale and productivity are two sides of the same coin. If the staff is properly trained, nurtured, motivated and rewarded, profitability through improved customer service is automatically ensured. Bringing about continuous improvement in the operations of banks is , therefore, central to quality customer care. Economic turbulence coupled with fierce cut-throat compettition is forcing us to revisit and assimilate values was taught by our Father of the Nation with greater conviction:

'A customer is the most important visitor on our premises. He is not dependent on us. We are dependent on him. HE is not an interruption of our work. He is the purpose of it. He is not an outsiderof our business. He is part of it. We are not doing him a favour by giving us the opportunity to do so.'

-Mahatma Gandhi in a speech in South Africa in 1890.

Conclusion:

If the banks have excellent operational efficiency and technology both are not sufficient to ensure the customer satisfaction . The outstanding relationship and human touching services are also equally important to the customers over and above cost and speed considerations.

52.

IMPACT OF SERVICE QUALITY ON CUSTOMER SATISFACTION IN PUBLIC SECTOR AND PRIVATE SECTOR BANKS

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Research Scholar, Department of Commerce, SVU, Tirupati

Abstract:

Service Quality in banking sector is the most important criteria and asset for evaluating and satisfying customers and thereby increases the customer loyalty and average retention rate of customers. Among the service quality determinants, reliability, assurance and empathy have always played a pivotal role. Prior research suggests that customer perceptions and expectations are more likely to be different across service sectors. Hence, this paper examines the effect of service quality determinants on the degree of customer satisfaction in public and private banks in India. By realizing the gap between the perceived and actual service quality, customer satisfaction can be extremely improved.

Keywords : Banking sector, customer, Service Quality, Customer Satisfaction.

INTRODUCTION

The Indian service sector also regarded as the tertiary sector of Indian economy today constitutes a wide spectrum of sectors combined such as banking, education, hotels and restaurants, insurance, wholesale and retail trade, railways, public administration, telecom and other services. One of the key contributors to our nation's GDP, the service sector has grabbed the global attention owing to the reformation in the form of privatization, removal of regulation restrictions and many more during the past decade. Thus when the expected level of service to be provided to the customers are greater than the actual level of service provided by any organization, then the service quality offered is considered as low and vice versa. This model was developed initially to measure customer perception of service quality for the banking and financial services but later refined to sectors such as hospitality, telecommunications and healthcare. Despite some arguments on this service quality model, the determinants accounted for measuring service quality are found to be reliable and could be used in various situations and been practiced by many researchers. As this model incorporates all five determinants as service quality signals, it is feasible to investigate these questions explicitly.

CUSTOMER SATISFACTION

This topic contains six constructs namely reliability, assurance, tangibility, empathy, responsiveness and customer satisfaction. The measurement scale is developed with reference to ERVQUAL model . In this proposed model of service quality measurement, gap analysis is used to find the difference between customers' expected service performance and actual service performance. Reliability indicates whether the service is provided accurately as promised to its customers. Assurance signals knowledge

and courtesy of employees in bringing trust and confidence. Tangibility shows all physical facilities, equipments, personnel and communication materials primarily visible in an organization. Empathy suggests whether the organization shows care, individualized attention and providing the required service by understanding its customers' needs. Responsiveness indicates whether the organization is willing to help its customers readily. All the items of construct are measured with the Likert 5-point scale. The research employs convenience sampling method for data collection. Primary research Survey was carried out by means of a structured questionnaire.

The respondents were those who are having accounts in various banks in Hyderabad. The respondents group comprises of various categories like Working Professional, Businessman, Housewife, Senior Citizen, Student etc. 150 respondents were interviewed. ANALYSIS Reliability and Validity Test Cronbach's α was used to measure the consistency of each item under the same construct. All scales have greater than the suggested value of 0.70. All the constructs assurance, tangibility, empathy, responsiveness and customer satisfaction have the sufficient standard reliability values. Despite the slightly lowered value of 0.64, reliability is also taken into account for the purpose of research because the composite reliability values are higher than 0.70 for all constructs taken in the research including Reliability. The AVE values for all constructs are greater than 0.50 as per the standard AVE rule and also the Composite Reliability values for all constructs are greater than AVE in all cases.

Thus the reliability scale is proved to be higher in this research indicating the effectiveness of the study. The alpha value for each construct demonstrates adequate internal consistency. The results indicate that the determinant, Assurance has the highest impact on customer satisfaction than any other determinants of service quality of banking services provided in Hyderabad. If assurance increases by 0.383 will have increased customer satisfaction in banking sector. Similarly, the customer satisfaction in banks in Hyderabad is also strongly influenced by the tangibility where an increase in tangibility by 0.279 will cause a direct increase in the customer satisfaction in Hyderabad banks. Also, the customer satisfaction in Hyderabad banking services will be directly affected by empathy where an increase in empathy 0.2 will have a respective increase in the customer satisfaction within banks in Hyderabad. However, the lowest impact of the reliability and responsiveness on customer satisfaction, where an increase in them by 0.146 and 0.056 respectively will cause an increase in the customer satisfaction in banking services provided by banks in Hyderabad.

The customer satisfaction level is very high in private banks than the public banks in the city by considering the above mean values. The public banks or the government banks have to strive for attaining increased customer satisfaction by decreasing the gap exists in all dimensions of service quality. But by taking the overall gap score into account, the highest gap scores are realized under Reliability and Empathy. The banks need to take steps and devise strategies to mitigate the gap occurred in the above

dimensions. Consistent service, timely delivery and response, attention in handling concerns etc will improve the satisfaction level in the desired areas. Also, the banks should frame unique and customized strategies and policies to address the customer queries. Though, the dimension Tangibility got lesser gap score than others, it has no impact on influencing customer satisfaction in banking services provided in the city and it is of less or no significance to customers regarding the services provided. Among the key factors influencing the customer satisfaction in the city, Assurance has the least gap score than Reliability and Empathy. Thus all the banks operating in the city have been providing their respective services as promised or assured to the customers.

DISCUSSION OF EMPIRICAL RESULTS

According to above analytic results, this study examined the perception of service quality of banking services provided to customers in Hyderabad and the relative differences attached with the various determinants of service quality using the SERVQUAL model. The findings of the research suggest that customer satisfaction towards banking services in the city of Hyderabad is significantly influenced by Assurance, Tangibility, Empathy, Reliability and Responsiveness. It is found out that Assurance has the most significant impact on customer satisfaction towards banking services provided in Hyderabad and Responsiveness has the least significant impact on customer satisfaction towards banks in . From this findings, it is clear that the customer expectation exceeds well in assurance provided by the banks in Hyderabad in terms of giving importance to customers' suggestions and views, secured transactions, sufficient knowledge base management, accurate record maintenance, meeting customers regularly etc.

MANAGERIAL IMPLICATIONS

It is important that the bank management should have a better understanding of what their customer needs are and what the customers expect from the services provided by the banks in terms of service quality. The bank managers should identify the gap prevails between the perceived service quality and actual service quality of banking services provided to customers and find effective ways to enhance customer satisfaction with respect to important service quality features. Because there is a stiff competition in banking sector in India, customer service by exceeding the required needs of customers is the most vital component for each bank and bank managers need to emphasize on ways to improve customer satisfaction regarding improved service quality. Also, the bank managers can use the results of this study to increase their understanding of which service quality dimensions has the strongest association with overall customer satisfaction. When providing banking services, observations on the level of fulfillment of customer needs and the degree of customer satisfaction with the respective bank periodically need to be done and it will help the banks to decrease the gap in matching the perceived service and the rendered service so that customers' loyalty will increase thereby they will recommend their banks to others. From the gap analysis table, the maximum gap score is found under the

dimension, empathy. It is the responsibility of the bank management irrespective of whether the bank is private, public or foreign to put serious efforts to enhance the skill of the employee, new training methods implementation to increase the caring and concerning attitude towards customers in order to satisfy the customers. Further, the banks have to maintain the momentum by providing the guaranteed services as promised to deliver in the city. Empathy is one main aspect where the banks need to work on and can be enhanced by improving certain existing conditions prevailed like lack of attention in serving customer queries or complaints, lack of time spent in paying individual attention to senior citizens, physically challenged etc.

CONCLUSION

The Indian banks have been competing with same kind of products to the consumers and hence service quality is considered as the key differentiator among the banks providing better service to the customers. Consistency in providing the required service quality is the key to differentiate one another. Since the competition in this industry is intense, the competition prevails among not only banks but also with other financial institutions operating either locally or globally. However, the paradigm of understanding the principal factors that influence customer satisfaction in the banking sector in India which will likely to help the banks' management and the financial institutions to enhance the quality of service provided to the customers at least in the context of the city.

The term service quality has two core elements, customer expectation and customer perception. Customers will consider the service quality as low when the desired performance of services provided by their banks fails to meet up their expectation and alternatively, will consider the service quality as high when the bank's desired performance matches or exceeds their expectations. This study examined the perception of service quality of banking services provided to customers in Hyderabad and the relative differences attached with the various determinants of service quality using the SERVQUAL model. It is found out that Assurance has the most significant impact on customer satisfaction towards banking services provided in Hyderabad and Responsiveness has the least significant impact on customer satisfaction towards banks in Hyderabad. From the findings, it is clear that the customer expectation exceeds well in assurance provided by the banks in Hyderabad in terms of giving importance to customers' suggestions and views, secured transactions, sufficient knowledge base management, accurate record maintenance, meeting customers regularly etc. The banks deliver the best service to the customers what they assured for. Obviously, the banks in Hyderabad fail to meet the expected customer service in the dimension of responsiveness. The banks are not helping the customers at times when the customers need them the most and the customer requests and other queries remains unanswered or unattended at most times. Problem handling is also one important aspect where the banks in Hyderabad fail miserably. Thus, the customer perceptions regarding responsiveness in quality of service provided to them

falls short with high margin and responses to this study suggest that responsiveness has positive correlation and no significant effect on customer satisfaction. It is evident that both private banks and public banks operating in Hyderabad have not shown interests in responding to problems experienced by customers.

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53.

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Dr. R. Naga Jyothi,Lecturer in Commerce, JMJ College for Women, Tenali-522201

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Conclusion:

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DEPARTMENT OF COMPUTERS

54.

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A review on Field Extraction and User Session Identification through Web Server Log

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Abstract:
In the web servers, log repositories plays a key role as it keeps record of user pattern for different users and it is great source of knowledge. Web Usage Pattern is process of getting the web user browsing patterns by analyzing their navigational behavior. A modern process of identifying a web user session is the average time spent by user on pages. This paper introduces concepts of feature selection for classification and clustering, groups and with different algorithms with a categorizing framework based on search strategies, and provides guidelines in feature selection. This speaks about Stages of Web usage Mining, data cleaning, field extraction, User/IP Address and Session identification, Pattern discovery and analysis and Clustering.With the categorizing framework, we continue our efforts toward building an integrated system for intelligent feature selection. An added advantage of doing so is to help a user employ a suitable algorithm without Knowing details of each algorithm. Some real-world applications are included to demonstrate the use of feature selection in data mining.

Keywords: Web usage, Mining, data cleaning, field extraction,

Introduction

As computer and database technologies advance rapidly, data accumulates in a speed unmatchable by human's capacity of data processing. Data mining as a multidisciplinary joint effort from databases, machine learning, and statistics, is championing in turning mountains of data into nuggets. Researchers and practitioners realize that in order to use data mining tools effectively, data preprocessing is essential to successful data mining . Feature selection is one of the important and frequently used techniques in data preprocessing for data mining. It reduces the number of features, removes irrelevant, redundant, or noisy data, and brings the immediate effects for applications: speeding up a data mining algorithm, improving mining performance such as predictive accuracy and result comprehensibility. Feature selection has been a fertile field of research and development since 1970's in statistical pattern recognition machine Learning and data mining and widely applied to many fields such as text categorization image retrieval customer relationship management intrusion detection and genomic analysis.

Feature selection is a process that selects a subset of original features. The optimality of a feature subset is measured by an evaluation criterion. As the dimensionality of a domain expands, the number of features N increases. Finding an optimal feature subset is usually intractable and many problems related to feature selection have been shown to be **NP**-hard. A typical feature selection process consists of four basic steps. They are

1. Subset generation
2. Subset evaluation
3. Stopping criterion
4. Result validation.

WEB USAGE MINING Web usage mining is the application of data mining techniques on large web log repositories in order to extract useful knowledge about user's behavioral patterns. The primary data source in case of web usage mining is a web server log (or web access log). A Web server log is a textual file, independent of server platform, in which a Web server enters a record whenever a user requests for a resource. Analyzing the web access logs of different web sites can help understand the user behavior and the web structure, thereby improving the design of this colossal collection of resources.

Stages of Web Usage Mining

There are four stages of web usage mining

1. **Data Collection:** During this phase data is collected from various log files stored in various locations.
2. **Preprocessing:** This is the most important phase; it takes 80% of the effort of entire web usage mining process. During this phase data is extracted from logs files collected is cleaned and then users are identified and then sessions are made from users identified.
3. **Pattern Discovery:** This phase discovers various patterns followed by the user.
4. **Pattern analysis:** After patterns are discovered from web logs analysis is done using various query mechanism such as SQL to perform various OLAP operations.

Preprocessing Stage of Web Usage Mining

Whenever loading a particular web page, the browser also requests for all the objects embedded in the page, such as .gif or .jpg graphics files. These requests for gif and jpeg files are also logged in log files. These requests have to be cleaned before any further analysis of user patterns. Thus click stream data stored in log files requires substantial preprocessing before user behavior can be analyzed. Preprocessing is second phase after data collection and most essential step before discovery and analysis. Input to preprocessing phase is log file. It is large in size and contains number of raw and irrelevant entries and therefore cannot be directly used in Web usage mining process. Preprocessing of log fie is a very complex and painstaking job and it takes 80% of the total time of web usage mining process as whole.

A. Log File:

Log file is a plain text file which records information about each user which includes name, IP address, date, time, and bytes transferred, access request. Web server writes information in log file each time a user requests a resource from that particular site. When user submits request to a web server that activity is recorded in web log file. Log file size ranges from 1KB to 100MB. Log files give us information about pages requested in website, bytes sent from server to user and type of error occurred.

B. Location of Log Files: Log files are located in three different locations given below.

1. **Server:** These log files record usage of data of web server. These log file do not record cached pages visited. Data of these log files contains sensitive and personal information so web server keeps them closed.
2. **Proxy server:** Web proxy server is intermediary between user and web

server, it takes HTTP requests from user, gives them to web server, then result is passed from web server and returned to user. Client send request to web server via proxy server.

3. **Client browser:** These log files reside in client's browser window itself. This information can be recorded only if cookies are enabled. Cookies are pieces of information generated by a web server and stored in user's computer

C. **Log File formats:** Data in log files exists in three different formats:
   1. W3C Extended log file format
   2. NCSA (National Center for Supercomputing Application) common log file format
   3. IIS log file format

The main motivation behind performing web usage mining is that the information stored in World Wide Web is increasing day by day and so is the user's demand to get right data. For getting right data user's navigational patterns have to be studied. For this various mining techniques have to be used which will help us to extract meaningful patterns and relationship from large data. In the field of web usage mining researchers have done considerable research but rapid development of internet makes these studies lag behind.

Software has been created to perform Data Cleaning and User Identification using algorithms proposed by for data cleaning, Field extraction and for user identification using Java and data extracted is stored in SQL server.

Data cleaning:

Data cleaning is second stage after the storage of log file in table. This stage is performed to remove the unnecessary content which includes requests for images, styles and scripts or other files. This stage is the most simplest of all stages as it consists of only filtration of the data. During this stage all URLS with jpeg, gif and .css extensions are removed using algorithm.

Field Extraction:

During the stage fields are extracted from log file and is stored in excel file. Records extracted in MS Excel are then stored in SQL server to perform data cleaning and user identification. Fields extracted from excel file are URL name and IP address. It also includes SNO field to find out number of records extracted.

User/IP Address identification:

During this stage unique users having same IP address are identified using algorithm. Logic used is "If IP address is same but browser version or operating system is different then it represents different user."

Session identification:

Web log mining covers a long time periods, therefore users may access the site more than once. Session identification is in order to divide the access records into several accessing sequences, in which the pages are requested at the same time. Traditional session identification algorithm is based on a uniform and fixed timeout. While the interval between two sequential requests exceeds the timeout, new session is determined.

A user session can be defined as a set of pages visited by the same user within the duration of one particular visit to a web site. A user may have a single or multiple sessions during a period. Once a user was identified, the click stream of each user is portioned into logical clusters. The method of portioning into sessions is called as Sessionization.

Pattern Discovery and Analysis: Once user transactions have been identified, a variety of data mining techniques are performed for pattern discovery in web usage mining. These methods represent the approaches that often appear in the data mining literature such as discovery of association rules and sequential patterns and clustering and classification etc., Classification is a supervised learning process, because learning is driven by the assignment of instances to the classes in the training data. Mapping a data item into one of several predefined classes is done.

Clustering: Clustering is a technique to group users exhibiting similar browsing patterns. Such knowledge is especially useful for inferring user demographics in order to perform market segmentation in Ecommerce applications or provide personalized web content to pages. Sequential Patterns are used to find inter-session patterns such that the presence of a set of items followed by another item in a time-ordered set of sessions. By using this approach, web marketers can predict future visit patterns which will be helpful in placing advertisements aimed at certain user groups. Pattern Analysis is the last stage of web usage mining. Mined patterns are not suitable for interpretations and judgments. So it is important to filter out uninteresting rules or patterns from the set found in the pattern discovery phase. In this stage tools are provided to facilitate the transformation of information into knowledge. The exact analysis methodology is usually governed by the application for which Web mining is done. Knowledge query mechanism such as SQL is the most common method of pattern analysis. Another method is to load usage data into a data cube in order to perform OLAP operations.

WEB Usage Mining Applications:

Users' behavior is used in different applications such as Personalization, e-commerce, to improve the system and to improve the system design as per their interest etc., Web personalization offers many functions such as simple user salutation to more complicate such as content delivery as per users interests. Content delivery is very important since nonexpert users are overwhelmed by the quantity of information available online. It is possible to anticipate the user behavior by analyzing the current navigation patterns with patterns which were extracted from past web log.

Conclusion:

Web sites are one of the most important tools for advertisements in international area for universities and other foundation. The quality of a website can be evaluated by analyzing user accesses of the website. To know the quality of a web site user accesses are to be evaluated by web usage mining. The results of mining can be used to improve the website design and increase satisfaction which helps in various applications. Log files are the best source to know user behavior. But the raw log files contains unnecessary details like image access, failed entries etc., which will affect the accuracy of pattern discovery and analysis. So preprocessing stage is an important work in mining to make efficient pattern analysis. To get accurate mining results user's session details are to be known. The survey was performed on a selection of web usage methodologies in preprocessing. More concentration is done on preprocessing stages like field extraction, User/IP Address identification, and session identification. In future we can create more efficient session reconstructions through graphs

and mining the sessions using graph mining as quality sessions gives more accurate patterns for analysis of users.

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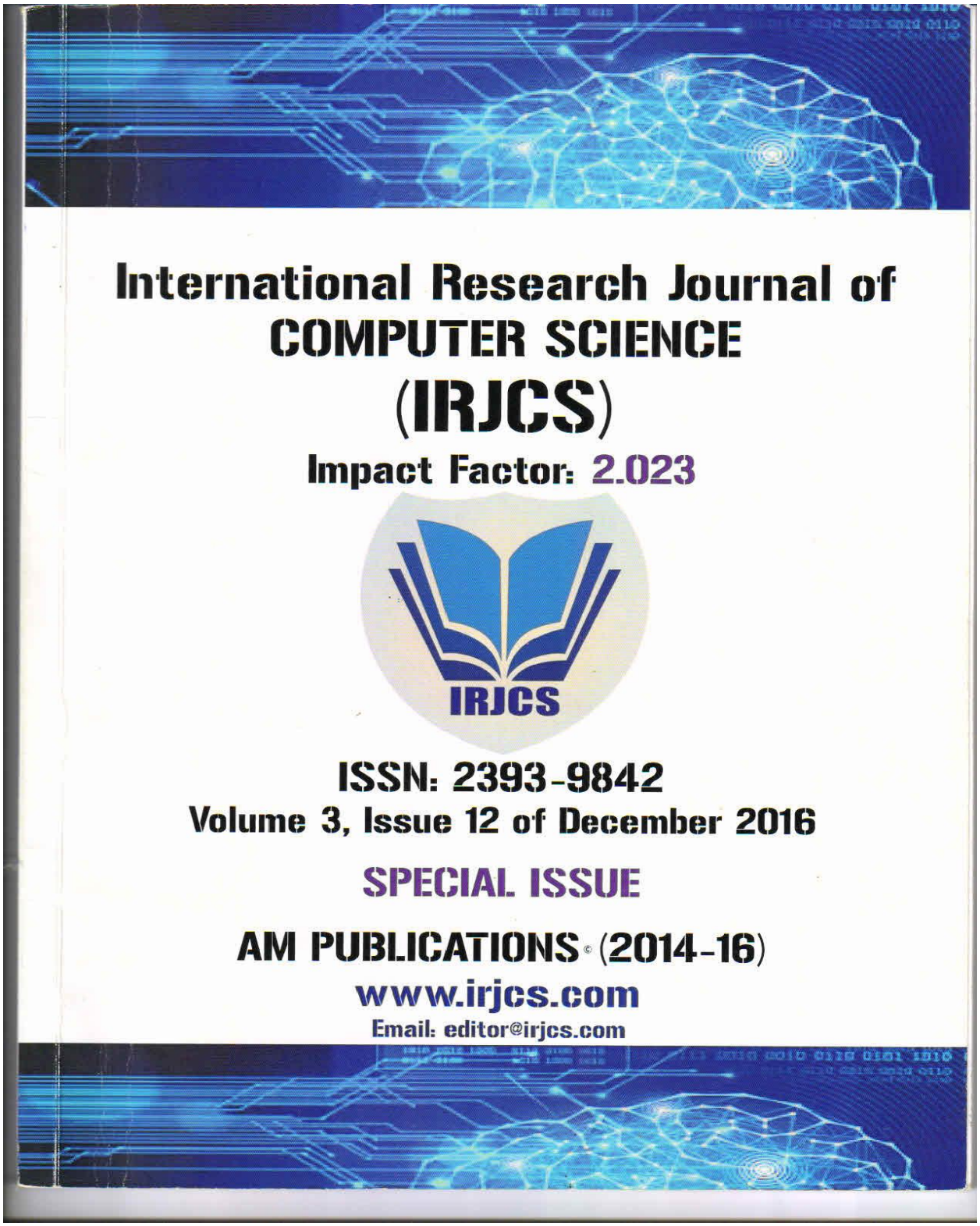
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SOCIAL MEDIA AND CYBER WELLNESS

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Abstract: ***Social media uses web-based and mobile technologies on smart phones and tablet computers to create highly interactive platforms through which individuals, communities and organizations can share, co-create, discuss, and modify user-generated content or pre-made content posted online. They introduce substantial and pervasive changes to communication between businesses, organizations, communities and individuals. Social media changes the way individuals and large organizations communicate. These changes are the focus of the emerging field of technoself studies. Social media differs from paper-based or traditional electronic media such as TV broadcasting in many ways, including quality, reach, frequency, usability, immediacy, and permanence. Social media operates in a dialogic transmission system. Cyber wellness is a major concern in today's hyper connected society. The emergence of internet related crimes such as rape, theft and piracy have made our youth in particular a very vulnerable demographic. Many educators and parents are unaware of the approaches they can take in educating and protecting their students and children from these threats. Educational psychology and technological methods are included to help teachers deliver these lessons, be they in classrooms or via e-learning platforms. This paper presents about features of social media, social networking websites, how social media differs from other media, the advantages and disadvantages of social media. Also describe about the meaning of Cyber Wellness (CW), and how to handle the media within the limits by practicing some of the principles.***

Keywords: ***Technoself, Social Networking Sites, Cyber Wellness.***

INTRODUCTION:

The development of social media started off with simple platforms such as sixdegrees.com. Unlike instant messaging clients such as ICQ and AOL's AIM, or chat clients like IRC, iChat or Chat Television, sixdegrees.com was the first online business that was created for real people, using their real names. However, the first social networks were short-lived because their users lost interest. The Social Network Revolution has led to the rise of the networking sites. Research shows that the audience spends 22 percent of their time on social networking sites, thus proving how popular social media platforms have become. This increase is because of the smart phones that are now in the daily lives of most humans. Social media can help to improve individuals' sense of connectedness with real and/or online communities and social media can be an effective communications (or marketing) tool for corporations, entrepreneurs, non-profit organizations, including advocacy groups and political parties and governments. According to Nielsen, Internet users continue to spend more time on social media sites than on any other type of site. At the same time, the total time spent on social media sites in the U.S. across PCs as well as on mobile devices increased by 99 percent to 121 billion minutes in July 2012 compared to 66 billion minutes in July 2011

DEFINITION:

Social media are Computer-mediated technologies that allow the creating and sharing of information, ideas, career interests and other forms of expression via communities and networks.

FEATURES OF SOCIAL MEDIA:

1. *Social Media is interactive Internet based applications.*
2. *Simple User Interface.*
3. *Prominent Search Functionality.*
4. *Personalized User Profile and Experience.*
5. *Notifications and Real time updates*
6. *The lifeblood of the social media orgasm is user-generated content such as text posts or comments, digital photos or videos and data generated through online interactions.*
7. *Users create service-specific profiles for the website or app.*
8. *Social media facilitates the development of online social networks by connecting a user's profile with the individuals and/or groups.*

SOCIAL NETWORKING SITES ARE:

1. **Face book:** Face book is an online social networking site that allows users to create their personal profiles, share photos and videos, and communicate with other users.
2. **Twitter:** Twitter an internet service that allows users to post "tweets" for their followers to see updates in real-time.
3. **LinkedIn:** LinkedIn is a networking website for the business community that allows users to create professional profiles, post resumes, and communicate with other professionals and job-seekers.
4. **Pinterest:** Pinterest is an online community that allows users to display photos of items found on the web by "pinning" them and sharing ideas with others.
5. **Snapchat:** Snapchat is an app on mobile devices that allows users to send and share photos of themselves and their daily activities.
6. **Google+:** Google+ is a Google social project. The Google+ design team sought to replicate the way people interact offline more closely than is the case in other social networking services, such as Face book and Twitter. The project's slogan is "Real-life sharing rethought for the web."
7. **WhatsApp:** WhatsApps is a proprietary, cross-platform, encrypted instant client for smart phones. It uses the Internet to make voice calls, video calls; send text messages, documents, PDF files, images, GIF, videos, user location, audio files, phone contacts and voice notes to other users using standard cellular mobile.
8. **Facebook Messenger:** Facebook Messenger is an instant messaging service and software application which provides text and voice communication. Integrated with Facebook's web-based Chat feature and built on the open MQTT protocol, Messenger lets Facebook users chat with friends both on mobile and on the main website. On October 3, 2016, Facebook launched Facebook Messenger Lite to attract more users, particularly, that running Android operating system on 2G network. It skips notification sounds, voice calling and other features that increase the loading time.
9. **WeChat:**We Chat is a platform instant service developed by Tencent in China, first released in January 2011. It is one of the largest standalone messaging apps by monthly active users.
10. **Tumblr:** Tumblr is a micro blogging and networking website founded by David Karp in 2007, and owned by Yahoo! since 2013. The service allows users to post multimedia and other content to a short-form blog. Users can follow other users' blogs. Bloggers can also make their blogs private. For bloggers, many of the website's features are accessed from a "dashboard" interface.
11. **Skype:**Skypeis an application that provides video chat and voice call services. Users may exchange such digital documents as images, text, video and any others, and may transmit both text and video messages. Skype allows the creation of video conference calls. Skype is available for Microsoft Windows, Macintosh, or Linux, as well as Android, Blackberry, Apple and Windows smart phones and tablets. First released in August 2003, Skype was created by the Swede Niklas Zennström and the Dane Janus Friis.
12. **Viber:**Viber is a cross-platform instant messaging and Voice over IP (VoIP) app that was popularized by the Israeli company Viber Media. In addition to instant messaging, users can exchange images, video and audio media messages.
13. **Line:** Line is a proprietary application for instant communications on electronic devices such as smart phones, tablet computers and personal computers. Line users exchange texts, images, video and audio, and conduct free VoIP conversations and video conferences. Line was first launched in Japan in 201. Line became Japan's largest social network in 2013.
14. **Instagram:** Instagram is an online mobile photo, video-sharing, and social networking service that enables its users to take pictures and videos, and share them either publicly or privately on the app.
15. **QQ:Tencent QQ**, popularly known as **QQ**, is an messaging software developed by a Chinese company named Tencent Holdings Limited. QQ also offers a variety of services, including online social games, music, shopping, micro blogging, movies, and group and voice chat. The logo and mascot is a small penguin wearing a red scarf.
16. **QZone:Qzone**is a social networking website which was created by Tencent in 2005. It allows users to write blogs, keep diaries, send photos, listen to music, and watch videos. Users can set their Qzone background and select accessories based on their preferences.
17. **Reddit**: Reddit is a social news website and forum where stories are socially curated and promoted by site members. The site name is a play on the words "I read it".
18. **Wikipedia:** Wikipedia is a free, open content online encyclopaedia created through the collaborative effort of a community of users known as *Wikipedia's*. Anyone registered on the site can create an article for publication; registration is not required to edit articles. Jimmy Wales and Larry Sanger co-founded Wikipedia project in January 2001.

PROPERTIES THAT HELP TO DESCRIBE THE DIFFERENCES BETWEEN SOCIAL AND INDUSTRIAL MEDIA ARE:

1. **Quality:** In industrial (traditional) publishing—mediated by a publisher—the typical range of quality is substantially narrower than in niche, unmediated markets.

2. The main challenge posed by content in social media sites is the fact that the distribution of quality has high variance: from very high-quality items to low-quality, sometimes abusive content.
3. **Reach:** Both industrial and social media technologies provide scale and are capable of reaching a global audience. Industrial media, however, typically use a centralized framework for organization, production, and dissemination, whereas social media are by their very nature more decentralized, less hierarchical, and distinguished by multiple points of production and utility.
4. **Frequency:** The number of times an advertisement is displayed on social media platforms.
5. **Accessibility:** The means of production for industrial media are typically government and/or corporate (privately owned); social media tools are generally available to the public at little or no cost.
6. **Usability:** Industrial media production typically requires specialized skills and training. Conversely, most social media production requires only modest reinterpretation of existing skills; in theory, anyone with access can operate the means of social media production.
7. **Immediacy:** The time lag between communications produced by industrial media can be long (days, weeks, or even months) compared to social media (which can be capable of virtually instantaneous responses).
8. **Permanence:** Industrial media, once created, cannot be altered (once a magazine article is printed and distributed, changes cannot be made to that same article) whereas social media can be altered almost instantaneously by comments or editing.
9. **Recency:**The time lag between communications produced by industrial media is relatively long (days, weeks, or even months) compared to social media (which can be capable of virtually instantaneous responses.
10. **Two-way conversation:** Two-way communication involves feedback from the receiver to the sender. This allows the sender to know the message was received accurately by the receiver.
11. **Open system:** An open system is a system that has external interactions. Such interactions can take the form of information, energy, or material transfers into or out of the system boundary, depending on the discipline which defines the concept. Open system is a process that exchanges material, energy, people, capital and information with its environment.

ADVANTAGES OF SOCIAL MEDIA:

1. **Connectivity:** People from anywhere can connect with anyone. Regardless of the location and religion. The beauty of social media is that you can connect with anyone to learn and share your thoughts.
2. **Education:** Social media has a lot of benefits for the students and teachers. It is very easy to educate from others who are experts and professionals via the social media and enhance your knowledge about any field. Regardless of your location and education background you can educate yourself, without paying for it.
3. **Help:** You can share your issues with the community to get help and guidance. Whether it is helping in term of money or in term of advice, you can get it from the community you are connected with.
4. **Information and Updates:** You update yourself from the latest happenings around in the world. Most of the time, Television and print media these days are biased and does not convey the true message. With the help of social media you can get the facts and true information by doing some research.
5. **Promotion:** The business people can promote the business online to the largest audience.The whole world is open to all. This makes the businesses profitable and less expensive.
6. **Noble Cause:** Social media can also be used for the noble causes. People are using social media for donation for needy people and it can be a quick way to help such people.
7. **Awareness:** Social media also create awareness and innovate the way people live. Social media has helped people to discover new and innovative stuffs that can enhance personal lives. From farmers to teachers, students to lawyers every individual of the society can benefit from the social media.
8. **Helps Government and Agencies to Fight Crime:** Social media helps Governments and Security Agencies to spy and find out the criminals.
9. **Improves Business Reputation:** Positive comments and sharing about a company can help them with sales and goodwill. Since people are free to share whatever they want on the social media, it can impact positively when good words are shared.
10. **Helps in Building Communities:** Since our world has different religions and beliefs. Social media helps in building and participating in the community of own religion and believes to discuss and learn about it. Similarly, people of different communities can connect to discuss and share related stuffs.

DISADVANTAGS OF SOCIAL MEDIA:

1. **Cyber bullying:** Many children have become victims of the cyber bullying over the past. Since anyone can create a fake account and do anything without being traced, it has become quite easy for anyone to bully on the Internet.
2. **Hacking:** Personal data and privacy can be easily hacked and shared on the Internet. This makes financial losses and loss to personal life. Similarly, identity theft is another issue that can give financial losses to anyone by hacking their personal accounts.

3. **Addiction:** Addiction to social media disturbs personal life. The teenagers are the most affected people by the addiction of the social media. They get involved very extensively and are eventually cut off from the society. Due to this, a lot of time is wasted, which could be utilized for productive tasks and activities.
4. **Fraud and Scams:** Several examples are available where individuals have scammed and commit fraud through the social media.
5. **Security Issues:** Now a day's security agencies have access to people personal accounts. You never know when you are visited by any investigation officer regarding any issue that you mistakenly or unknowingly discussed over the internet.
6. **Reputation:** Social media can easily ruin someone's reputation just by creating a false story and spreading across the social media. Similarly businesses can also suffer losses due to bad reputation being conveyed over the social media.
7. **Cheating and Relationship Issues:** Most of the people have used the social media platform to marriage proposal. However, after some time turn to be wrong in their decision. Similarly, couples have cheated each other by showing the fake feelings and incorrect information.
8. **Health Issues:** The excess usage of social media can also have a negative impact on the health. Since exercise is the key to lose weight. most of the people get lazy, that results in bringing disorder in the routine life. Use of all the social media, affects the eyes and brain due more concentration and focus on to the monitor/screen.
9. **Social Media causes death:** Not just by using it, but by following the stunts and other crazy stuffs that are shared on the internet. For example bikers are doing the unnecessary stunts, people doing the jump over the trains and other life threatening stuffs.
10. **Glamorizes Drugs and Alcohol:** People start to follow others who are wealthy or drug addicted and share their views and videos on the web. This inspires others to follow the same and get addicted to the drugs and alcohol.

CYBER WELLNESS:

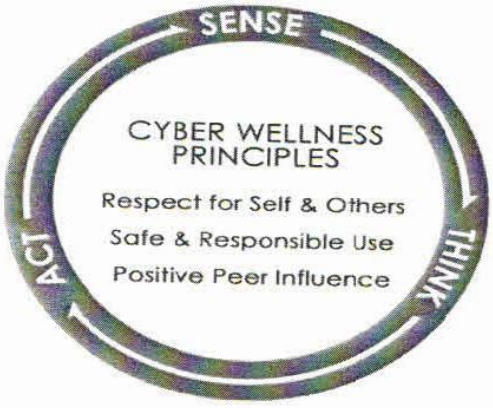
Cyber Wellness (CW) refers to the positive well-being of Internet users. It involves an understanding of online behaviour and awareness of how to protect oneself in cyberspace. The focus of Cyber wellness is about helping people to become responsible digital learners. When navigating cyberspace, people should demonstrate respect for self and others and practice safe and responsible use. The users also should be a positive peer influence by harnessing technology for collaboration, learning and productivity, as well as advocating positive use of technology for the good of the community.

Cyber Wellness Principles:

Some of the principles should be practiced while handling the social media. The three principles are

1. Respect for Self and Others
2. Safe and Responsible Use
3. Positive Peer Influence

When the principles are adhered to, will anchor to the people's well-being in cyberspace and will be a help to make careful and well-considered decisions.



Sense – Think – Act Process

Sense: Identify the possible risks of harmful behaviours online and learn how to protect oneself

Think: Analyse, evaluate and reflect on the online situation based on the three CW principles

Act: Translate understanding into actions so as to be safe and have a positive presence online

Respect for self and others:

- ✓ Uphold the dignity of people when online. That is, share appropriate content and participate in only legal online activities.
- ✓ respect other people online (e.g. put themselves in others' shoes, accept diverse views and opinions, give credit when using other people's work and seek permission where necessary, avoid sharing hurtful materials).

Safe and responsible use of social media:

- Have an understanding about harmful and illegal online behaviours.
- Take steps to protect themselves.
- Keep their personal information private.
- Verify the reliability of information using various sources.
- Take steps to avoid dangers they may encounter online.
- Maintain a healthy balance of their online and offline activities

Positive peer influence:

- Be a positive role model in online.
- Stand up for your peers online
- Share healthy and positive content.
- Harness the affordances of technology to do good for society

CONCLUSION:

Social media is the latest and fastest growing medium in India. Social media is a tool, which is amazing and powerful. Social media with advanced technology is changing people's lives more convenient and faster. Internet users will increase in future, because, it would be much cheaper and accessible. Also media is positive inspite of some negative things. Due to lack of trained persons for handling social media in India, misuse of social media is a challenge for the government. Ironically, the bigger social networking is, in people's lives, the more traditional values are important such as trust and transparency. According to me, we can have a healthy life including physical, psychological, social and moral values, when we embrace social media for learning purpose and getting knowledge.

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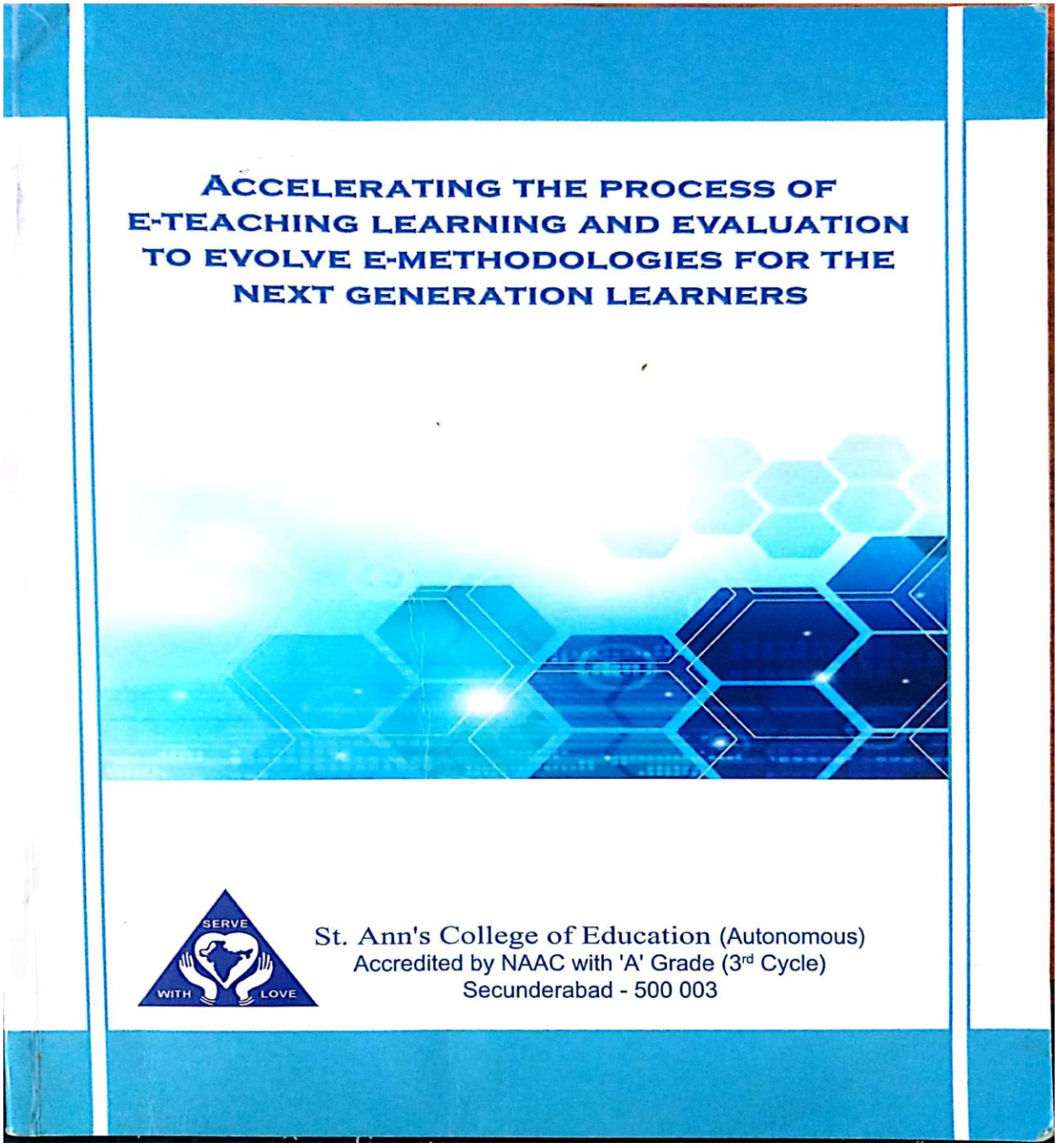
DEPARTMENT OF PHYSICAL EDUCATION

56. Published a paper titled *"ROLE OF RECREATIONAL GAMES FOR STUDENTS "* in the National Seminar Book titled Accelerating the process of E-Teaching Learning and Evalution to Evolve E-Methodologies for the Next Generation Leaders



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2.	Dr. Shiny K.P.	Use of ICT in enhancing the Quality of teaching and learning
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19.	Ms. Chaitanya Mekala	Best Practices in Technology: ICT portal for teachers

ROLE OF RECREATIONAL GAMES FOR STUDENTS

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Abstract

In the modern world, man is enjoying lots of luxuries provided by the developments in advanced technology. Simultaneously, man is also facing lots of physical, mental, emotional and social disturbances in everyday living. Undoubtedly the latest technological developments have provided all kinds of comforts in all walks of life, at home as well as the work places, in agriculture or industries and so on. They have also reduced dependence of persons on each other, has resulted in increased social, and physiological problems. It has also reduced physical work but introduced the shift system at work places. People working in day and night shift have reduced the family members to strangers. This is causing emotional upheavals. Collectively all these factors affect family life, society and nation adversely in the long run. Further, the technological advancements in every spheres of life have created lots of free, or leisure time after the working hours. Side by side easy availability of recreational gadgets like T.V, cable T.V, Video CD games, computer games have made the human child least interested in physical activity. As a result, in so many physical, mental and emotional problems have cropped up. To counteract these .i.e. to utility the free or leisure time in a constructive way and to make people physically active thereby allowing their growth and development, active recreation activities, other than the passive ones, are a must.

Introduction

Recreation carries different meaning to different individuals and it is applied to a great variety of activities. Sometimes this term means the activities of young people and the adults only in order to differentiate them from the play activities of the young children. Because of this diversity in the use of this word it is necessary to understand clearly what it stands for to avoid confusion. In common usage, the word, 'recreation' has a more comprehensive meaning and is not restricted to any particular age group or activity. Instead as the experts say the word 'recreation' is broad enough to include 'play' in its every expression like music, drama, any free activity, especially the creative activities that enrich life. (Brar, 2005)

Recreational Games

"Any form of leisure time experience or activity in which an individual engages from choice because of the enjoyment and satisfaction which it brings directly to him".(G.D.Butler, 1984)

"Any activity voluntarily engaged in during leisure time and primarily motivated by the satisfaction of pleasure derived from it". (Meyer and Brightbill, 1997)

Essential Characteristics of Recreation

Education is advocating that the recreation must have the following characteristics to benefit the participant to the fullest. (Brar, 2005)

Leisure Time for recreation, whatever activity is undertaken it must be done during one's free time. Since one cannot leave the workplace during the working hours, hence it cannot be called recreation by any stretch of imagination. Enjoyable the activity engaged in must be enjoyable not boring one. Each and every recreational game should bring joy to a child who by his/her very nature wants to involve himself / herself in the recreational games. Satisfaction the activity engaged in must bring immediate and direct satisfaction to the individual. Voluntary an individual must choose his/her own recreation activity which he/she likes. There must not be even an iota of compulsion. Soever what a child takes up must be respected. Constructive every recreational activity has to be constructive and has not to be harmful to other participants physically, mentally, emotionally, socially, or in any other way. It should help every participant to become a better integrated individual. Socially acceptable every recreational activity has got to be socially acceptable and individually beneficial to the participants. Each disabled child is interconnected with society. He loves to be an intimate part of it. Therefore, the society should not only accept him / her but respect the choices he/she makes for himself affectionately or warmly. Non-Survival eating and sleeping are not recreational activities by themselves. One may join a picnic in which a dinner or lunch is served, but other parts of the outing like games that participants play are the most important elements of this recreational activity. Group games and gatherings are important elements of any recreational activity, without which they cannot be called as such.

Aim of recreation

Recreational education is aimed at teaching people to utilize their free time in a constructive manner.

Objectives of Recreation

The recreational education has many worth-while objectives. The USA based American associations of health, Physical education and recreation (AAHPER) states that this special field contributes to the satisfaction of basic human needs for creative self-expression. It helps to promote total physical, mental, emotional and social health. Additionally, it serves as an antidote to the strains and tensions of life thereby providing an avenue for abundant personal and family living. Lastly, it helps to in calculate and develops effective citizenship and vitalizes democracy.

Some of the best statements of objectives have been enunciated by the above organization on the goals of recreation. They are as follows

Personal Fulfillment

Recreation recognizes the need of the people to become whatever they are capable of becoming and help them to attain that Recreation which they want to.

Democratic human relations:

Recreation recognizes that its goals must contribute to the individual's growth as well as for a democratic society whose integral part they are.

Leisure Skills and Interest

Recreation aims at the fulfillment of the interests of people in developing their skills so as to provide necessary incentives, motivations and mediums for spending their free time in a constructive and worthwhile manner.

Health and Fitness

Recreation can lead the reduction in mental illness, stress and tension. As the physical activity and make a man healthy and fit, so would the recreation activity.

Creative Expression and Aesthetic Appreciation

Recreation helps to provide the environment, leadership, material and motivation to the participants. It is in such environs that creativity, personal expression and esthetic appreciation of the participants surface and grow.

Environment for living in a leisure society:

Recreation plays an important role in encouraging such things as preservation of natural resources, construction of play grounds and recreation centers and awakening the population to an appreciation of aesthetic and cultural values.

Need and importance recreation in the Modern Society

According to Ajmer Singh, a well-known sports writer, there are certain fundamental human needs of an individual which must be satisfied for leading a healthy life. For instance, there are objectives of education that need to be achieved; there are obligations of democratic society that need to be fulfilled; there is the price of the technological advancement relished by the modern society that has to be paid for. There are other factors that have given rise to the wide spread recognition of the need and importance of recreation in the modern life. (Ajmir Singh, 2005).

Recreation - A Fundamental Human Need

Among all the people and in all stages of history, man has found outlets for self expression and personal development by evolving various forms of recreation that do have a striking similarity. In fact, Recreation is the common heritage of all people, although its expression

takes different outlets or forms. For instance, play is the chief field of voluntary activity all over the world among young children during their waking hours. Through play the child attains growth and experience. It is the nature's way of providing outlets to meet this great biological urge for activity and the means of acquiring skills needed in later life. As the child grows older, other forms of activity make increasing demands on his time, energy and attention. In adult life the duties and responsibilities of earning a living, caring for the family and maintaining a place in human society tend to reduce the quantum of recreation in life. Yet the urge for recreation is so fundamental and universal that it cannot be suppressed easily.

Recreation Contributes to Human Happiness

Happiness was recognized by our forefathers as a fundamental and worthy right for every individual. Without it, as well as recreation, life would be incomplete and drab. An expert on recreation Austin Fox Riggs, says that "The function of play is to balance life in relation to work, to afford a refreshing contrast to responsibility and routine, to keep alive the spirit of adventure and that sense of proportion which prevents taking oneself and one's job too seriously and thus to prevent the death of youth, and not infrequently the premature death of the man himself".

Recreation and Health

Any type of Recreation which is vigours, which is carried on in the open air, and which makes use of the fundamental muscles is the best known means of developing and maintaining healthy organs. However certain forms of recreation cause increased circulation of blood, greater respiratory activity, better elimination of wastes and improved digestion in the body. These activities do contribute to emotional stability of the participants by affording them rest, relaxation and better digestion. Further recreational activities contribute to greater emotional stability of individuals by stimulating creative activity. On top, they tones up the body through healthy stimulation of the nerve centers.

Recreation and Character Development

Recreation has been characterized as a force of tremendous consequence for the development of personal character and national culture. Yet character development is not an objective specifically sought by the persons engaging in recreational activities. It comes into being as a natural by-product of participation in team games, drama, and music which require cooperation, loyalty and team play.

Recreation and Crime Prevention

Participation in some recreation helps in building character. It also acts as a safety valve for the prevention of crime and delinquency among the participants. Because recreation activities have a stronger pull for the children and youth, delinquency is less likely to flourish in communities where opportunities for healthy recreation are abundant and attractive.

Recreation and Community Solidarity

Many forces in society tend to segregate people into distinct and often hostile group, based on differences in their economic status, social position, race, creed, nationality, education or cultural background. This, it breeds suspicion, distrust, and dislike of our fellow folks, creates distrust in neighborliness and discourages unity of interest.

Recreation and Morale

In periods of insecurity, depression and unusual strain man is more than ever in need of activity which can bring satisfaction and sense of accomplishment. In different parts of the world people are facing earthquakes, floods, military invasions, and other large scale disasters which often lead to mental breakdowns. During such times the value of recreation as means of building and restraining morale is a welcome relief.

Recreation and Safety

Adequate attention to the recreation paraphernalia especially in the form of play grounds, swimming pools under the supervision of efficient leadership contribute greatly to the reduction of accidents. Recreation areas that are properly designed and carefully operated are remarkably safe.

Recreation and Democracy

Democracy and recreation are alike in spirit, and each tends to promote and strengthen the other. This is because Democracy is committed to giving each individual an opportunity to grow fully, express himself freely and achieve an abundant life. In many respects the objectives, methods, and programmes of education and recreation are similar, but they are not identical. The fullest development of the individual is sought by both; but recreation affords immediate satisfaction, whereas education aims at a more distant goal.

Recreation and Economy

Leaders in business and industry have long realized that the way their employees spend their leisure hours influences their effectiveness on the job. In the welfare nation's of the world lots of money is being spend per year to take care of just one delinquent, whereas a playground, which may prevent children from becoming delinquents, can be operated at an annual cost of only a pittance of that cost per child.

Types of Recreation Activities

- Games & Sports
- Social activities
- Musical activities
- Arts & Crafts activities
- Drama activities

- Dance activities
- Nature & Outdoor activities
- Literacy and Language activities
- Collection activities
- Social Service activities

Games & Sports include

a) Low organized games (Bull in the Ring, Cat and Mouse, Hide and Seek, Snow Games Tag Games etc..,)

b) Individual and Dual Games and activities (Badminton, Athletic Events, Hopscotch, Golf Ring Tennis etc..,)

c) Gymnastics and stunts (Apparatus work, Calisthenics, gymnastics marching, pyramid building, Rope Jumping, Tumbling etc..,)

d) Group or team games (Basketball, Volleyball, Dodge ball, Kick-ball, Tug of war, Netball Touch football, water polo etc.)

e) Sports (Archery, Boating, Fencing, Diving, Jumping, Kite flying, Motor cycling, Pistol or rifle shooting, swimming, track events etc.)

Social activities

Card games, socializing, club meetings, entertaining, birthday parties, Christmas celebrations, New year celebrations, Valentine Day celebrations, pencil and paper games table tennis, caroms, chess, treasure hunts etc.

Musical activities

Vocal and instrumental items. It also includes music festivals, television concerts, musical competitions, band concerts, composing music, music listening groups etc.

Arts & Crafts activities

Block printing, book binding, dying and coloring, fabric decoration, finger painting furniture refinishing, pot making, knitting, leather craft, modeling, paper craft, home decoration, paper folding and cutting, plastic crafts, toy making etc.

Drama activities

Fashion shows, mask making, fairs, carnivals, doll fashion shows, mock trails, musical dramas and comedies, one act play, theatre play, story, play, stage lighting etc.

Dance activities

Folk, Classic, Modern, Social, Acrobatics etc.

Nature & Outdoor activities

Bee culture, Astronomy, Bird watching, Camping, Caring for pets, Excursion, Fishing, Museums, Parks, Art Galleries, Mountain climbing, Hiking, Hunting, Nature study, Collection and Identification, Snow tracking, Visiting zoo, etc..,

Literacy and language activities

Debates, discussion clubs, book clubs, creative writing, lectures, poetry groups, public speaking, puzzles, mental games, reading, study groups, writing letters, story telling, foreign language groups.

Collection activities

Antiques, autographs, butterflies, buttons, firearms, lamps, music instruments, paintings, pictures, post cards, stamps, tapestries, toys, wood cuts etc.

Social service activities

Helping for the conduct of a hobby, craft or nature project, teaching students free of cost, transporting the aged or persons with intellectual disability to recreation centres, assisting with the recreation programmes at hospitals or homes for the aged, helping orphan homes. Though the above given list of recreation activities is far from complete, yet it indicates the wide variety of activities that give direct satisfaction to the participants by fulfilling their basic and fundamental needs.

Advantages of recreation games for children

Recreation games are not only for simple entertainment or fun: but it teaches lots of important lessons to any human being. Children, who like to play recreation games, are more sociable and physically than others. The physical and mental agility of a child improves top a large extent through playing games. The children learn to be more matured when they play in a regular basis. Some of the advantages of playing games are given below. Indoor or outdoor recreation games both are quite useful for the child all-round development. Indoor games are related to the growth of brain and mental ability and the outdoor games are responsible for building the physical strength and power. Recreation games also improve the muscle flexibility and strengthen the sense organs to enhance their performance. A flexible child can perform much better in life in every situation than someone who does not play in regular basis. Recreation games have also been useful for normal development of the children having development problems. By playing games, the children learn to interact with each other and thus to become more social. Even the quiet and shy children change themselves to become more smart and friendly while playing together. During playing, as children interact among themselves, they eventually learn to react and express their feeling. Recreation games also teach the quality of self-control to children. Winning and loosing are the two sides of any game. Recreation games teach the child to accept failure as well as his success by controlling the emotion. Children can confidently handle their disappointment after

getting defeated in a game. They come back with new enthusiasm when they play next. This lesson helps in the future life to fight in any kind of situation. Recreation games are normally set by a group of rules and restrictions. The children have to follow these rules for playing the games in the right way. It means following a discipline and discipline is one of the main factors for being successful. Recreation games are perceived as exciting, funny and challenging by the teachers as well as the students, according to Leicha Bragg, education professor at Deakin University in Victoria, Australia.

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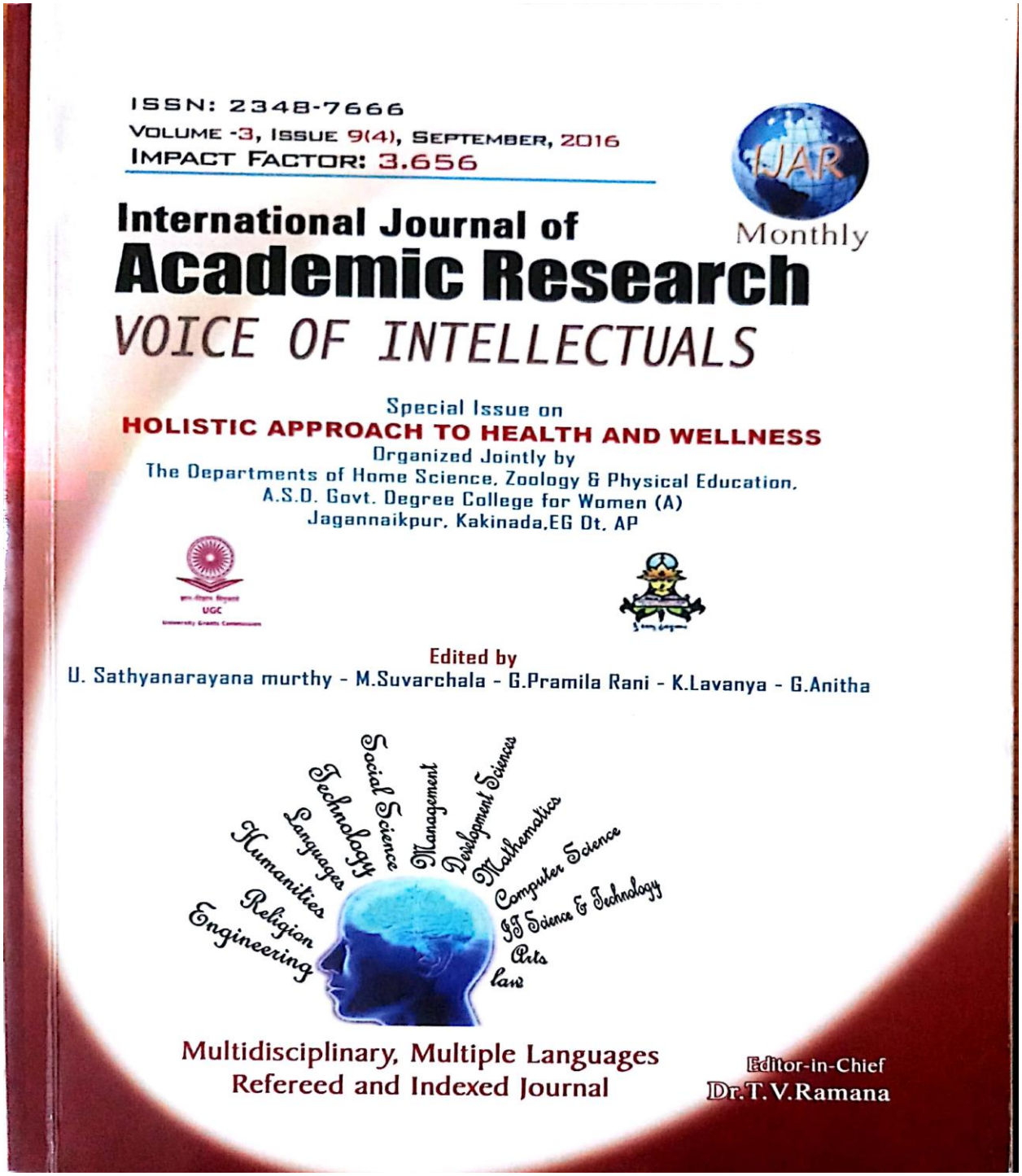

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Effect of specific training on selected physical fitness variables among college level women volleyball players

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Abstract: *The present study is to find out the effect of specific training on the selected physical fitness variables among college levelwomen volleyball players. 30 women Volleyball players who have represented the college were selected from J.M.J College for Women, Tenali. The subjects were between 17 and 21 years. They were divided into two groups of fifteen in each. One group was acted as the experimental group and another group was acted as control group. The experimental group underwent the specific training for 6 weeks 3 days per week. Each training session was for one hour in the evening from 5.00 PM to 6.00 PM. To achieve the result, the collected data on following criterion measures namely physical fitness variables that is shoulder strength, agility. The standardized tests will be taken before and after the specific training. Shoulder strength was tested using modified pushups , agility was tested using 4x10 shuttle run. The paired 't' test was applied to analyzed the collected data and in all cases the criteria for the statistical significance was set at 0.05 level of confidence.*

Key Words: *World War, Volleyball, championship*

Interdiction

Canada was the first country after U.S.A. to play volleyball [1900] and Cuba introduced the game in 1905. The game spread from one country to another, mainly through the efforts of Y.C.M.A., which is a world. Wide organization where ever the Y.C.M.A. Physical Director went, volleyball went with them. Volleyball was one of the popular army sports during the First World War and the American Soldiers carried the game to many parts of the world. Volleyball has now spread for and men and women throughout the world play wide and it. It is estimated that the game is popular in more than thirty-five countries.

Volleyball is today an international game. The first step towards achieving international status was taken when the representatives of several countries interested in volleyball met at Berlin during the Olympic Games in 1936. The International Volley ball Association was formed in the year 1947 with it'shead quarters in Paris. More than twenty countries are now members of this association. The first world Volleyball championship was held in 1949 at Prague, Czechoslovakia, when twelve countries were represented. Reports go to say that the championship was held at winter stadium with thousands of people witnessing the matches each day. Russia easily became the champions defeating Czechoslovakia in the finals. It is interesting to note that soviets put on the field, their second team in most of the matches. The second world championship was held in 1952 at the famous Dynamo stadium in Moscow, U.S.S.R. Teams from

11 countries competed for the world title. Forty to fifty thousand spectators watched the great thrills of International Volleyball. Russia annexed the championship without losing a single set throughout the tournament.

Statement of the Problem

The purpose of this study is to find out the effect of specific training on selected physical fitness variables among college level women volleyball players.

Delimitation

1) The subjects were restricted to women volleyball players.
2) As per their College records their age was 17 to 21 years.
3) On a random sampling 30 students were selected from J.M.J College for Women, Tenali (AP)
4) The training schedule is a period of six weeks only.
5) The study is confined only to the selected specific training.

Limitation

1) The previous experience of the subjects in the field of sports and games which influence the training is not considered.
2) Health habits and food habits are not taken into consideration.
3) The weather condition such as atmosphere temperature and humidity during test period are also not considered.

Hypothesis

1) It was hypothesized that there may be significant difference due to specific training on selected physical fitness variables namelyShoulder Strengthandagility among college level women volleyball players.

Significance of the Study

1) This study will help to identify the suitable training method increase the performance on selected physical fitness variables.
2) This study also helpful for physical education teacher and coaches to adapt this training programmed to improve the physical fitness variables among college level women volleyball players.
3) The result of this study may be help to the physical educationist to plan suitable programmed for college level women volleyball players.

Methodology

Selection of Subjects

The purpose of this study was to find out the effect of specific training on selected physical fitness variables among college level women volleyball players. Thirty volleyball players were selected from J.M.J College for Women, Tenali (AP). The subject's age ranged from 17 and 21 years. Thirty subjects were selected at random and subjects were divided into two equal groups designed one experimental group and another Control Group. Thus each group consisted of 15 subjects.

Selection of Variables

The Investigator reviewed the available scientific literature and on the basis of discussion with experts, feasibility, criteria, availability of instruments, equipment's and the relevance of the variables to the present study. The

following variables were selected for the present study.

Independent Variables: Specific Training
Dependent Variables:
Physical Variables

1) Agility
2) Shoulder Strength

Experimental Design

The selected subjects (N=30) were divided into two groups each consisting of fifteen. The experimental group underwent the specific training for three days in a week for one hour from 5.00 pm to 6.00 pm for six weeks in total and the control group was not involved in any specific training but were of the investigator in engaged in their usual activities.

Statistical Technique

The following statistical procedures were follows to estimate the effect of specific training on selected physical fitness variables among college level women volleyball players the't' ratio was calculated to find out the significance of the difference between the mean of the initial and final test of the Clarke and state that, the't' ratio is the ratio of the difference between means and standard error of the difference.**Table I**

Analysis of 't'-Ratio on Pre and Post-test for Control and Experimental Group on agility

Variables	Group Name	Mean		Sd		Sd Error	df	't' ratio
		Pre	Post	Pre	Post			
Agility	Control	17.96	17.92	0.45	0.48	0.093	14	1.59
	Experimental	17.99	17.61	0.57	0.55	0.06		5.57*

**Significance of .05 level of confidence*

Figure II: The Mean Values of Pre and Post Tests of Experimental and Control Group on Agility

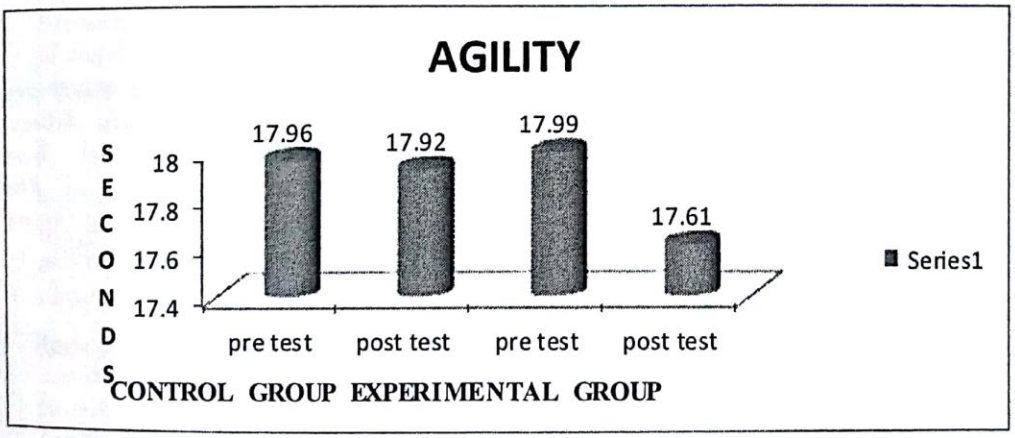


Table II

Analysis of't'-Ratio for the data Pre Post-test for

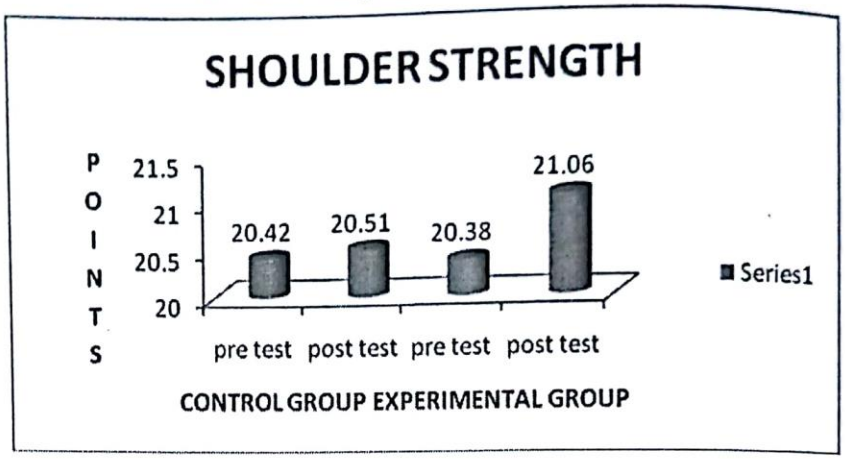
Control and Experimental Group on Shoulder Strength

Variables	Group Name	Mean		Sd		Sd Error	df	't' ratio
		Pre	Post	Pre	Post			
Shoulder Strength	Control	20.42	20.51	1.83	1.63	0.37	14	1.80
	Experimental	20.38	21.06	1.71	1.85	0.21		3.16*

*Significance of .05 level of confidence

Figure II

The Mean Values of Pre and Post Tests of Experimental and Control Group on Shoulder Strength



Discussions on Findings

The result of this investigation showed a significant improvement in the subjects of the experimental Group regular practice of specific training.

The results of this study with the hypothesis of the investigation. Interest on the part of the subject used in this study to improve their specific training might also account for the result and this inference is supported by the further fact that all previous studies of similar nature were conducted on specific training. The six week period for the experimental seen to be produce valid result.

The results of the study reveal that there was a significant difference found among College level Women volleyball players on physical fitness variables also when comparing the mean values of physical fitness variables.

CONCLUSIONS

Within the limitations of study the following were made.

The results of the study showed that there were significant improvements in physical fitness variables Agility and Shoulder Strength after six weeks of game specific training among volleyball players.

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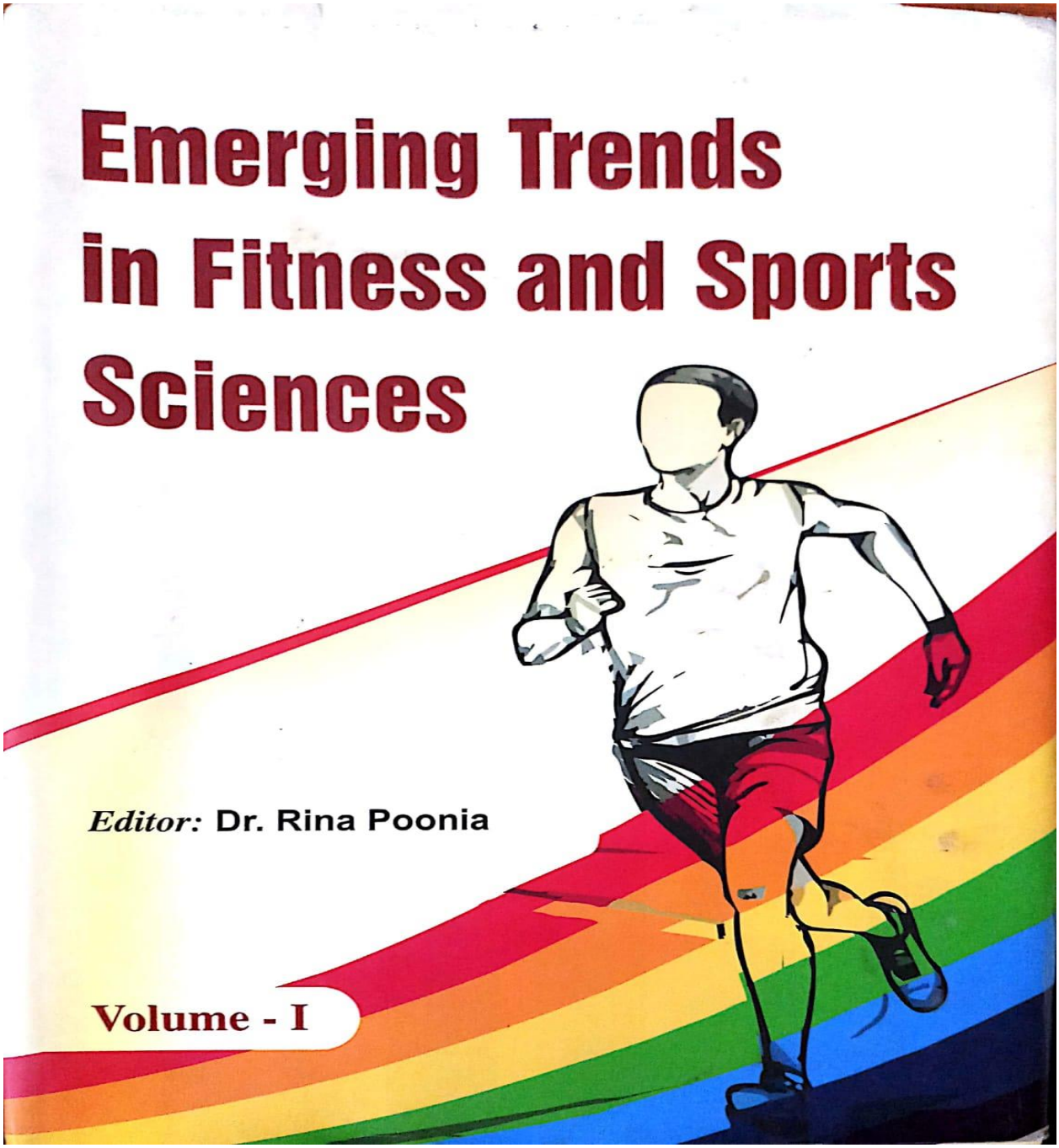

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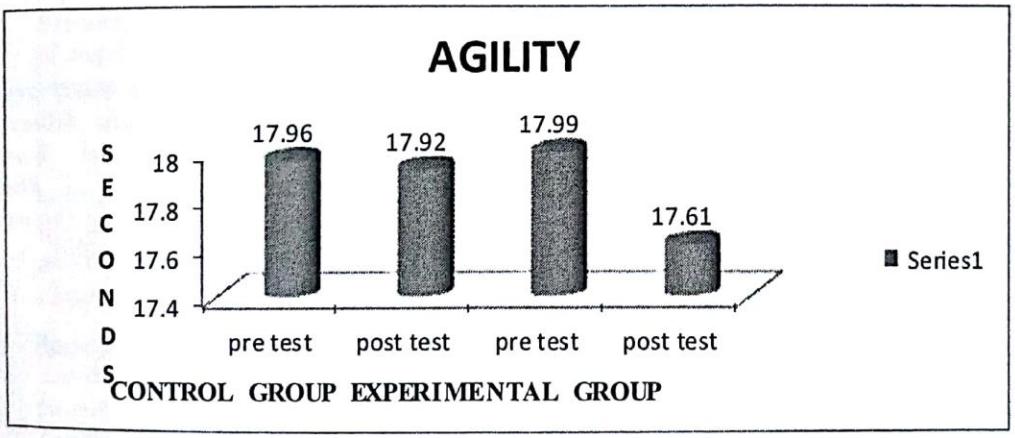

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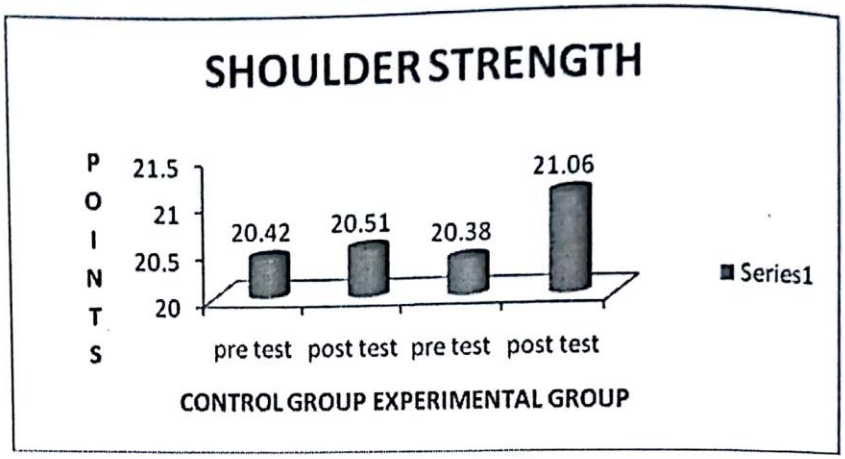

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The results of the study reveal that there was a significant difference found among College level Women volleyball players on physical fitness variables also when comparing the mean values of physical fitness variables.

CONCLUSIONS

Within the limitations of study the following were made.

The results of the study showed that there were significant improvements in physical fitness variables Agility and Shoulder Strength after six weeks of game specific training among volleyball players.

physical fitness among college level women kho-kho players. For this purpose, 30 students were selected as subjects from J.M.J College for women tenali (A.P) by applying random sampling method. The age of the subjects ranged from 18 to 22 years.

Selection of Variables

Based on the relevant literature that are viewed and in accordance with the views of the professional physical education personalities, the importance of variables at the high level performance, feasibility aspect of testing, the following variables were selected for this study namely physical fitness. They are speed, agility and endurance. A specially prepared group of exercises was used for training and is considered as independent variable in this study.

Independent Variable

Specific group of exercises

Dependent Variables

- **Physical Fitness Variables**
  1. Speed
  2. Agility
  3. Endurance

Table -1: Selection of Tests and Unit of Measurements

Variables	Name of the Test	Unit of Measurements
Speed	50 yard run	seconds
Agility	5 X10 Meters Shuttle run	seconds
Endurance	800 Meters run	Minutes and seconds

Experimental Design

The selected subjects (N=30) were divided into two groups each consisting of fifteen. The experimental group underwent the specific training for three days in a week for one hour from 5.00 pm to 6.00 pm for six weeks in total and the control group was not involved in any specific training but were of the investigator in engaged in their usual activities.

Statistical Techniques

The following statistical procedures were employed to estimate the effect of specific training on the selected physical fitness variables among college level women kho-kho players. 't' ratio was calculated to find out the significance difference between the mean of pre and post test of the group

Formulae

$$\text{Mean} = \frac{\Sigma X}{N} \qquad \text{'t'} = \frac{DM}{\sigma DM}$$

DM – difference between the mean

σDM – standard error of the difference between means

Table-2: Table Showing Mean Difference Standard Deviation and 't' Value of Experimental and Control Groups in Speed

Group	Mean	Md	Std. deviation	Std. error of the mean	't'	Table value
Experimental pre-test	7.93	0.50	0.57	0.14	18.11*	2.14
Experimental post test	7.43		0.61	0.15		
Control pre test	8.02	0.02	0.49	0.12	1.74	2.14
Control post test	8.00		0.48	0.13		

Significant at 0.05 level

Figure-1: Bar Diagram showing Pre and Post Test Mean Value of Experimental Group and Control Group in Speed

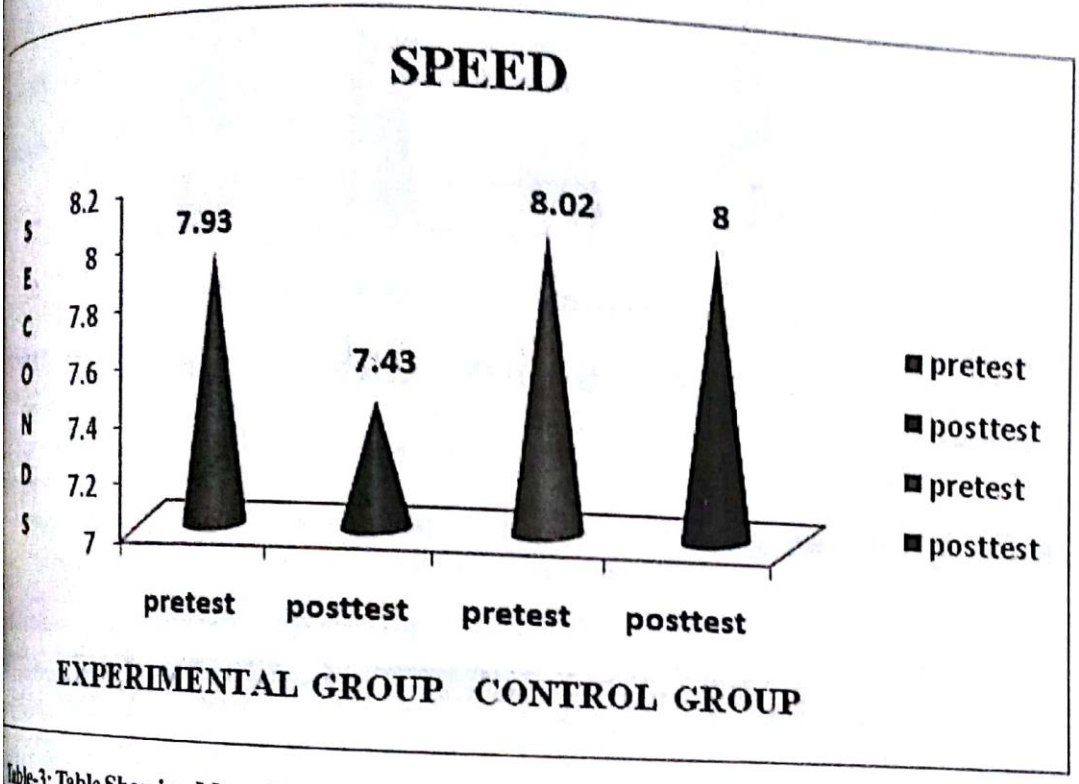


Table-3: Table Showing Mean Difference Standard Deviation and 't' Value of Experimental and Control Groups in Agility

Group	Mean	Md	Std. deviation	Std. error of the mean	't'	Table value
perimental pre-test	15.29	0.61	1.03	0.26	15.80*	2.14
perimental post test	14.68		1.07	0.27		
Control pre test	15.48	0.02	0.83	0.21	1.88	2.14
Control post test	15.46		0.85	0.22		

nificant at 0.05 level

Figure-2: Bar Diagram Showing Pre and Post Test Mean Value of Experimental Group and Control Group in Agility

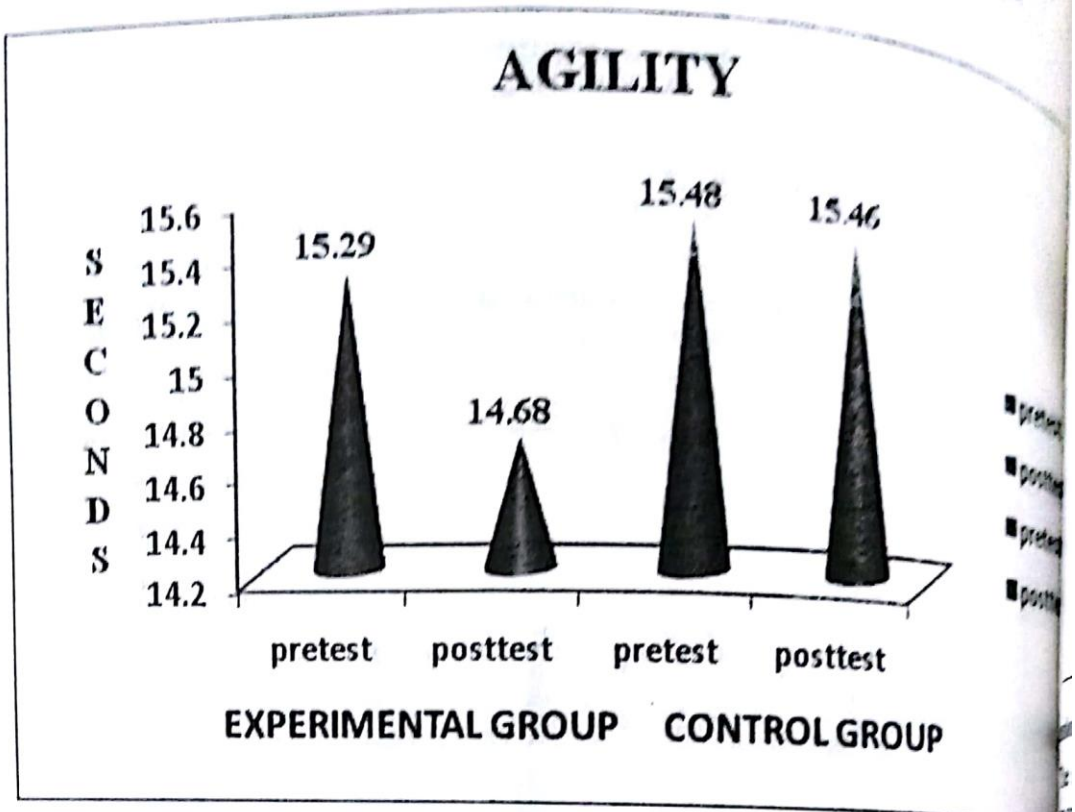
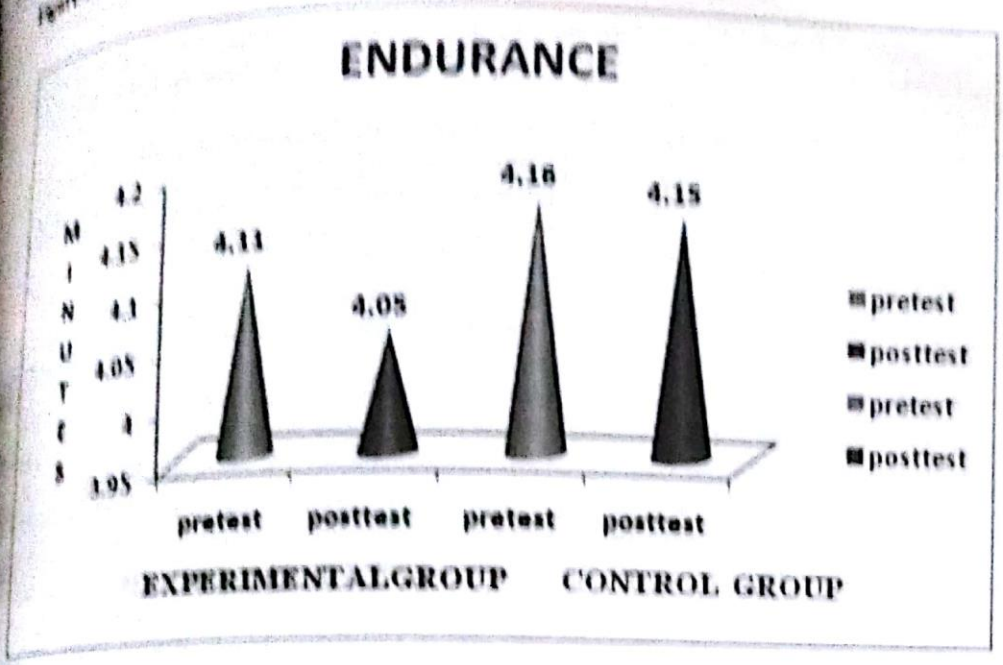


Table-4: Table showing Mean Difference Standard Deviation and 't' Value of Experimental and Control Groups in Endurance

Group	Mean	Md	Std. deviation	Std. error of the mean	't'	Table value
Experimental pre-test	4.11	0.06	0.10	0.02	20.57*	2.14
Experimental post test	4.05		0.11	0.03		
Control pre test	4.16	0.01	0.07	0.01	1.74	2.14
Control post test	4.15		0.08	0.02		

* *Significant at 0.05 level*

Figure-4: Bar Diagram Showing Pre and Post Test Mean Value of Experimental Group and Control Group in Endurance



...ussion on Findings

The result of the study shows that the experimental group that had undergone specific ...ing and improved physical fitness variables namely speed, agility and endurance. This may ...e to the effect of specific training.

From the result of the present study, it is concluded that the experimental group improved in ...cal fitness variables.

...clusions

Based on the statistical analysis and the limitation of the study, and results the following ...clusions are drawn.

- It was concluded that experimental group significantly improved on physical fitness variables namely speed, agility and endurance.
- Further it was concluded that the control group shows insignificant improvement on physical fitness variables.

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