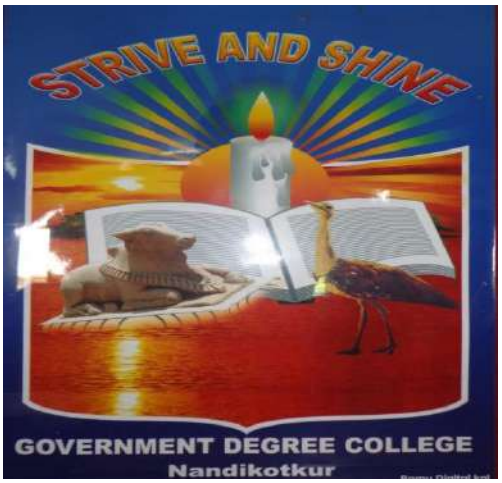
Government Degree College, Nandikotkur



3.3.1 Number of research papers published per teacher in the Journals notified on UGC website during the last five years

3.3.1 Number of research papers published per teacher in the Journals notified on UGC website during the last five years									
Sno	**Title of paper**	**Name of the author/s**	**Department of the teacher**	**Name of journal**	**Year of publication**	**ISSN number**	**Link to the recognition in UGC enlistment of the Journal /Digital Object Identifier (doi) number**		
							Link to website of the Journal	**Link to article / paper / abstract of the article**	**Is it listed in UGC Care list**
1	Some Properties Of Simple Ternary Semigroups	T.Sunitha	Mathematics	International Journal of Mathematics Trends and Technology	2019	ISSN 2231-5373	https://scholar.google.co.in/scholar?q=international+journal+of+mathematics+trends+and+technology+ISSN+2231-5373&hl=en&as_sdt=0&as_vis=1&oi=scholart	https://ijmttjournal.org/public/assets/volume-65/issue-6/IJMTT-V65I6P516.pdf	UGC CARE JOURNAL
2	Sita Puni Boli Upanyas Mein Sita Ke Mansik bhav tarangon ki abhivyathi	M.Parvathi	Hindi	An International Journal Bilingual Peer referred research journal, Shodh Saritha Volume-6	2019	ISSN 2348-2397	http://seresearchfoundation.in/	https://drive.google.com/file/d/1-Go06Mn5cpOm4Em051JJfaI2gcFIM82U/view?usp=drive_link	UGC CARE JOURNAL
3	Effect of Heavy Metals on plant growth & development	G.V. Ranga Reddy	Botony	International Journal of Research	2019	ISSN 2236-6124	https://ijrpublisher.com/	https://drive.google.com/file/d/1Emy84z0cUo8eUPBxD9oDjqpHpeOAOwgo/view?usp=drive_link	UGC CARE JOURNAL
4	Challenges of climate in conservation of biodiversity	G.V. Ranga Reddy	Botony	International Journal of scientific research & Review	2019	ISSN :2279-543X	https://www.ijsrr.org/	https://drive.google.com/file/d/18MHET7Qk3BrmjjNhQhwwhV8fzyew7CV5/view?usp=drive_link	UGC CARE JOURNAL

6	Garwaas ' upnyas mein pratipadit samakalinsamasyavonka simhavalokam	M.Parvathi	Hindi	An International Journal Bilingual Peer referred research journal, Shodh /sanchar Bulletein Volume-6	2020	2229-3620	https://shodhsanchar.in/	https://drive.google.com/file/d/1kfh-Dt9HJAKGf8-RMe4iht317aPrZwBe/view?usp=drive_link	UGC CARE JOURNAL
7	Phytomorphological and Medicinal Peoperties of Boswellia serrata & B.Ovalifoliolata	G.V Ranga Reddy	Botany	Research Journal of Life Sciencs , Bioinformatics, Pharmaceutical and Chemical Sciences	2020	2454-6348	http://rjlbpcs.com/	https://drive.google.com/file/d/1p9_uTcGy6PeMVt0SI4q4YMUHNJAoop6t/view?usp=drive_link	UGC CARE JOURNAL
8	Ancient Two Temples in Kurnool Dist	A. Venkataswamy	History	Ancient Two Temples in Kurnool Dist	2020	2348-1269	https://www.ijrar.org/	https://www.ijrar.org/papers/IJRAR2002048.pdf	UGC CARE JOURNAL
10	Analysis of Chat based artificial intelligence (AI) marketing	Dr.S.Mohana Murali	Commerce	International Journal of Natural Science	2022	0976-0997	https://tnsroindia.org.in/journals.html	https://www.researchgate.net/publication/363249181_Analysis_of_Chat_bots_based_Artificial_Intelligence_AI_Marketing	UGC CARE JOURNAL
13	A Study of Phytosociogical attributes of Shrub Plant Resources In Nallam	Dr. T.Shalisaheb	Botany	Int.J.of Phytology Research	Feb. 2023	EISSN 2583-0635	International Journal of Phytology Research (dzarc.com)	https://dzarc.com/phytology/article/view/293	UGC CARE JOURNAL

	alais								
14	Effect of Fire on Plant Distribution & Germination	Dr. T. shalisaheb	Botany	Int.J. of ScientificDevelopment & Research	March. 2023	ISSN 2455-2631	https://www.ijsdr.org/	https://www.researchgate.net/publication/330497223_Study_of_medicinal_climbers_of_Nallamalais_Andhra_Pradesh	UGC CARE JOURNAL
15	Phytosiological attributed of Climber species in Nallamalais India	Dr. T.Shalisaheb	Botany	Int.J. Of Scientific Development & Research	June. 2023	ISSN 2455-2631	https://www.ijsdr.org/	https://www.ijsdr.org/viewpaperforall.php?paper=IJSDR2303182	UGC CARE JOURNAL
18	Thermocoustic Parameters of some liquid muxtures of O-chloroaniline with F, NMF and N, N-DMF	Dr. T.Kalimulla	Physics	I.J.of Multidisciplinary research	March-april. 2023	EISSN 2582-2160	https://www.ijfmr.com/	https://www.ijfmr.com/papers/2023/2/1848.pdf	UGC CARE JOURNAL

Effect of Heavy Metals on Growth and Development of Plants

G. V. Ranga Reddy, Lecturer in Botany, Dept. of Botany
Government Degree College, Nandikotkur, Kurnool dist., Andhra Pradesh, India

ABSTRACT:

Heavy metals have strong influence on nutritional values and therefore, plants grown on metal-contaminated soil were nutrient deficient and consumption of such vegetables may lead to nutritional deficiency in the population particularly living in developing countries which are already facing the malnutrition problems. Heavy metal contamination is a globally recognized environmental issue, threatening human life very seriously. Increasing population and high demand for food resulted in release of various contaminants into environment that finally contaminate the food chain. Edible plants are the major source of diet, and their contamination with toxic metals may result in catastrophic health hazards. Heavy metals affect the human health directly and/or indirectly and one of the indirect effects is the change in plant nutritional values [1]. This paper discuss about the effect of heavy metals on growth and development of plants.

Keywords: ***Heavy metals, Plants grown, Nutritional deficiency, Population, Health hazards, Environmental issue***

INTRODUCTION:

Heavy metal is one of the serious environmental pollutions for now days as impact of industrial development in several countries. Heavy metals give toxic effects on human health and cause several serious diseases. Several techniques have been using for removing heavy metal contaminants from the environmental but these techniques have limitations such as high cost, long time, logistical problems and mechanical complexity[2].

Environmental pollution has become a serious public health concern because it becomes a major source of health risk and causes several serious diseases throughout the world [3]. One of the serious environmental pollutions is heavy metals. Although the health effects of heavy metals have been known for a long time, exposure to heavy metals continues and is even increasing in some areas. The effects of heavy metals on human health can even lead to death [4].

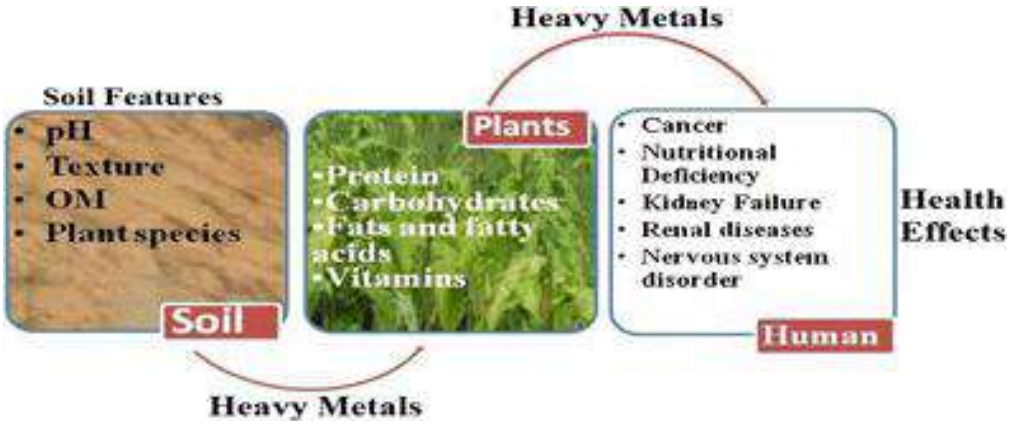


Fig.1. Heavy Metals [source: Google images]

Heavy metals become a primary concern than other environmental pollutions because heavy metals can't be destroyed by degradation. The remediation process of contaminated soils, groundwater, and surface water by heavy metals needs some methods to remove the metals from contaminated areas [5]. Soils that are contaminated with heavy metals can be treated by acid leaching, soil washing, physical or mechanical separation of the contaminant, electro-chemical treatment, electro kinetics, chemical treatment, thermal or pyrometalurgical separation and biochemical processes [6,7,8,9]. Bioremediation is an innovative and promising technology available for removal of heavy metals and recovery of the heavy metals in polluted water and lands [10].

Phytoremediation is one of bioremediation techniques can be used as an alternative solution for heavy metal remediation process. The phytoremediation of metals is a cost-effective, efficient, environment- and eco-friendly 'green' technology based on the use of metal-accumulating plants to remove toxic metals, including radionuclide's as well as organic pollutants from contaminated soils and water [11,12].

SOURCE OF HEAVY METALS IN THE ENVIRONMENT:

Elements with metallic properties and an atomic number >20 is the conventionally definition of heavy metals. Naturally, metals are normal components in soils. However, in high levels, metals can be toxic for plants, animal and microbes. The most common and important heavy metals as contaminant in the environment are As, Sr, Cs, U, Cd, Cr, Cu, Hg, Pb and Zn [13]. Some of these metals are micronutrients necessary for plant growth and development, such as Zn, Cu, Mn, Ni, and Co, while others have unknown biological function, such as Cd, Pb, and Hg [14].

Heavy metals in the environment come from natural and human intervention sources. Minerals weathering, erosion and volcanic activity are the most significant natural sources while for anthropogenic sources are mining, smelting, electroplating, use of pesticides and fertilizers as well as bio-solids in agriculture, sludge dumping, industrial discharge, atmospheric deposition, etc. [10,12].

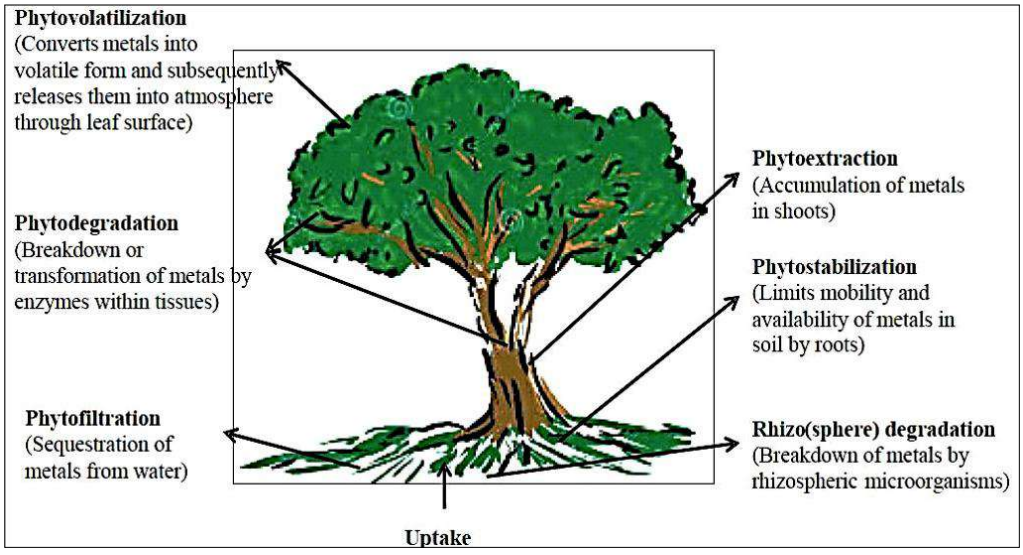


Fig.2. Various mechanisms involved in the phytoremediation of heavy metals [16]

The most important factor affecting the rate of metal removal in phytoremediation is plant selection to be used as accumulator has given described for the selection of remediating plants [13]:

- The plant biomass, the metal removal rate depends on the plant biomass harvested and metal consentration in harvested biomass.
- Ecosystem protection, native species are preferred to exotic plants, which can be invasive and endanger the harmony of the ecosystem. To avoid propagation of weedy species, crops are in general preferred, although some crops may be too palatable and pose a risk to grazing animals.
- Physical characteristics of soil contamination, for the remediation of surface-contaminated soils, shallow rooted species would be appropriate to use, whereas deep-rooted plants would be the choice for more profound contamination.

EFFECT OF HEAVY METAL ON PLANT GROWTH:

The effect of heavy metal toxicity on the growth of plants varies according to the particular heavy metal involved in the process. For metals such as Pb, Cd, Hg, and As which do not play any beneficial role in plant growth, adverse effects have been recorded at very low concentrations of these metals in the growth medium. Kibra recorded significant reduction in height of rice plants growing on a soil contaminated with 1 mgHg/kg. Reduced tiller and panicle formation also occurred at this concentration of Hg in the soil [15]. For Cd, reduction in shoot and root growth in wheat plants occurred when Cd in the soil solution was as low as 5 mg/L [16]. Most of the reduction in growth parameters of plants growing on polluted soils can be attributed to reduced photosynthetic activities, plant mineral nutrition, and reduced activity of some enzymes [17].

CONCLUSION:

Phytoremediation is a remediation technology to clean up the contaminants from environment by using green plants. Phytoremediation can be an alternative solution as a green technology to treat heavy metal contaminated areas. Plants growing on these soils show a reduction in growth, performance, and yield. Plants growing on heavy metal polluted soils show a reduction in growth due to changes in their physiological and biochemical activities. This is especially true when the heavy metal involved does not play any beneficial role towards the growth and development of plants. Bioremediation is an effective method of treating heavy metal polluted soils and it is suitable for the establishment/reestablishment of crops on treated soils.

REFERENCES:

1. https://link.springer.com/article/10.1007/s11356-015-4881-0
2. http://umj.academia.edu/Departments/Agroteknologi/Documents
3. Briggs D 2003 Environmental pollution and the global burden disease British Medical Bulletin 68 1-24
4. Jarup L 2003 Hazards of heavy metal contamination British Medical Bulletin 68 167-82
5. Henry J R 2000 An Overview of the Phytoremediation of Lead and Mercury (Washington : US Environmental Protection Agency)
6. Cunningham S D. Berti W R and Huang J W 1995 Phytoremediation of contaminated soils TIBTECH 13 393-97

7. Mulligan C N, Yong R N and Gibbs B F 2001 Remediation technologies for metalcontaminated soils and groundwater: an evaluation Engineering Geology 60 193-207
8. Hashim M A, Mukhopadhyay S, Sahu J N and Sengupta B 2011 Remediation technologies for heavy metal contaminated groundwater Journal of Environmental Management 92 2355-88
9. Tangahu B V, Abdullah S R S, Basri H, Idris M, Anuar N and Mukhlisin M 2011 A review on heavy metals (As, Pb, and Hg) uptake by plants through phytoremediation. International Journal of Chemical Enineering 939161(2011)31
10. Dixit R, Wasiulah, Malaviya D, Pandiyan K, Singh U B, Sahu A, Shukla R, Singh B P, Rai J P, Sharma P K, Lade H and Paul D 2015 Bioremediation of heavy metals from soil and aquatic environment: An overview of principles and criteria of fundamental processes Sustainability 7 2189-212
11. Raskin I, Smith R D and Salt D E 1997 Phytoremediation of metals: using plants to remove pollutants from the environment Current Opinion in Biotechnology 8 221-228
12. Ali H, Khan E and Sajad M A 2013 Phytoremediation of heavy metals – concepts and applications Chemosphere 91 869-81
13. Lasat M M 2000 Phytoextraction of metals from contaminated soil: a review of plant/soil/metal interaction and assessment of pertinent agronomic issues J. Hazardous Substance Res. 21-25
14. Gaur A and Adholeya A 2004 Prosfects of arbusclar mycorrhizal fungi in phytoremediation of heavy metal contaminated soils Current Science 86(4) 528-34
15. M. G. Kibra, “Effects of mercury on some growth parameters of rice (Oryza sativa L.),” Soil & Environment, vol. 27, no. 1, pp. 23–28, 2008. View at Google Scholar
16. I. Ahmad, M. J. Akhtar, Z. A. Zahir, and A. Jamil, “Effect of cadmium on seed germination and seedling growth of four wheat (Triticum aestivum L.) cultivars,” Pakistan Journal of Botany, vol. 44, no. 5, pp. 1569–1574, 2012. View at Google Scholar · View at Scopus
17. A. Kabata-Pendias, Trace Elements in Soils and Plants, CRC Press, Boca Raton, Fla, USA, 3rd edition, 2001.

Challenges of Climatic Changes in Conservation of Biodiversity

G. V. Ranga Reddy, *Lecturer in Botany, Dept. of Botany*
Government Degree College, Nandikotkur, Kurnool dist., Andhra Pradesh, India

ABSTRACT:

Healthy ecosystems and rich biodiversity are fundamental to life on our planet. Climate change is affecting the habitats of several species, which must either adapt or migrate to areas with more favourable conditions. Changing temperature and precipitation regimes will interact with existing drivers such as habitat loss to influence species distributions despite their protection within reserve boundaries. It is now widely recognized that climate change and biodiversity are interconnected. Biodiversity is affected by climate change, with negative consequences for human well-being, but biodiversity, through the ecosystem services it supports, also makes an important contribution to both climate-change mitigation and adaptation. Consequently, conserving and sustainably managing biodiversity is critical to addressing climate change. In the atmosphere, gases such as water vapour, carbon dioxide, ozone, and methane act like the glass roof of a greenhouse by trapping heat and warming the planet. These gases are called greenhouse gases. The natural levels of these gases are being supplemented by emissions resulting from human activities, such as the burning of fossil fuels, farming activities and land-use changes. As a result, the Earth's surface and lower atmosphere are warming, and this rise in temperature is accompanied by many other changes. This paper describes the climate change pose fundamental challenges for current approaches to biodiversity conservation.

Keywords: ***Ecosystems, Biodiversity, Planet, Climate change, Habitats, Greenhouse gases***

INTRODUCTION:

Habitat loss and fragmentation, overexploitation, pollution, the impact of invasive alien species and, increasingly, climate change all threaten global biodiversity. Global warming will affect all species and exacerbate the other environmental stresses already being experienced by ecosystems. Climate change may thus further accelerate both the ongoing impoverishment of global biodiversity, caused by unsustainable use of natural capital, and the degradation of land, freshwater, and marine systems. For example, the warming of coastal waters, coral die-off, and impacts on coastal fisheries caused by climate change are exacerbating the impacts on marine systems of overexploitation by industrial and artisanal fisheries, as well as pollution from ships' waste and land sources.

Climate change predictions are not encouraging; according to the IPCC WGI Fourth Assessment Report, a further increase in temperatures of 1.4°C to 5.8°C by 2100 is projected. Predicted impacts associated with such temperature increase include: a further rise in global mean sea level, changes in precipitation patterns, and more people at risk from dangerous "vector-borne diseases" such as malaria. The world is heating up. The increasing concentrations of greenhouse gases, such as CO_2, in the Earth's atmosphere are causing the planet's climate system to retain more energy. The average temperature of the Earth's surface increased by an estimated 0.7°C since the beginning of the 20th century and, according to the

most recent projections of the Intergovernmental Panel on Climate Change, could rise by 1.6–4.3°C compared to an 1850-1900 baseline by 2100.

CLIMATE CHANGE COMPONENTS:

- Temperature
- Rainfall
- Extreme events
- CO_2 concentr.
- Ocean dynamics

BIODIVERSITY COMPONENTS:

- Genetics
- Physiology
- Phenology
- Dynamics
- Distribution
- Interspecific relationships
- Community productivity
- Ecosystem Services
- Biome integrity

BIODIVERSITY AND CLIMATE CHANGE:

Climate change is already forcing biodiversity to adapt either through shifting habitat, changing life cycles, or the development of new physical traits. There is ample evidence that climate change affects biodiversity. According to the Millennium Ecosystem Assessment, climate change is likely to become one of the most significant drivers of biodiversity loss by the end of the century. Biodiversity can support efforts to reduce the negative effects of climate change. Conserved or restored habitats can remove carbon dioxide from the atmosphere, thus helping to address climate change by storing carbon, for example, reducing emissions from deforestation and forest degradation.

Conserving natural terrestrial, freshwater and marine ecosystems and restoring degraded ecosystems (including their genetic and species diversity) is essential for the overall goals of both the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change because ecosystems play a key role in the global carbon cycle and in adapting to climate change, while also providing a wide range of ecosystem services that are essential for human well-being and the achievement of the Millennium Development Goals.

SHIFTS IN CLIMATIC ENVELOPES:

To estimate the effect of climate change on species, scientists use what they call a climatic envelope (sometimes also referred to as a bioclimatic envelope), which is the range

of temperatures, rainfall and other climate-related parameters in which a species currently exists. As the climate warms, the geographic location of climatic envelopes will shift significantly, possibly even to the extent that species can no longer survive in their current locations. Such species will need to follow their climatic envelopes by migrating to cooler and moister environments, usually uphill or southwards in the southern hemisphere. Marine species will also need to adapt to warmer ocean temperatures. There are several well documented cases of climate-induced shifts in the distribution of plants and animals in the northern hemisphere, but less information is available for southern hemisphere species. The mountain pygmy possum is particularly vulnerable to a loss of habitat linked to climate change.

ECOSYSTEM-BASED ADAPTATION:

Conservation and management strategies that maintain and restore biodiversity can be expected to reduce some of the negative impacts from climate change. Ecosystem-based adaptation, which integrates the use of biodiversity and ecosystem services into an overall adaptation strategy, can be cost-effective and generate social, economic and cultural co-benefits and contribute to the conservation of biodiversity. However, there are rates and magnitude of climate change for which natural adaptation will become increasingly difficult. Options to increase the adaptive capacity of species and ecosystems in the face of accelerating climate change include:

- Reducing non-climatic stresses, such as pollution, over-exploitation, habitat loss and fragmentation and invasive alien species.
- Wider adoption of conservation and sustainable use practices including through the strengthening of protected area networks.
- Facilitating adaptive management through strengthening monitoring and evaluation systems.

Ecosystem-based adaptation uses biodiversity and ecosystem services in an overall adaptation strategy. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to the adverse effects of climate change. Examples of ecosystem-based adaptation activities include:

- Coastal defence through the maintenance and/or restoration of mangroves and other coastal wetlands to reduce coastal flooding and coastal erosion.
- Sustainable management of upland wetlands and floodplains for maintenance of water flow and quality.
- Conservation and restoration of forests to stabilize land slopes and regulate water flows.
- Establishment of diverse agro-forestry systems to cope with increased risk from changed climatic conditions.
- Conservation of agro-biodiversity to provide specific gene pools for crop and livestock adaptation to climate change.

MAJOR THREATS IN BIODIVERSITY:

- Degradation, destruction and fragmentation of natural habitats
- Decrease in the capacity of the agricultural areas to host wildlife

- Pollution of soils, air and water
- Invasions by alien species
- Epidemics affecting wildlife
- Climate change
- Desiccation of soils and wetlands
- Recreation and leisure
- Overfishing and decline of species
- Pollution and eutrophication
- Degradation and destruction of the sea floor
- Alien species introductions
- Leisure and tourism

CONCLUSION:

Climate change is a serious environmental challenge that could undermine the drive for sustainable development. Biodiversity ensures natural sustainability for all life on the planet, think more abundant crops and fresher air, for example. More than 3 billion people depend on marine and coastal biodiversity, while more than 1.6 billion people rely on forests for their livelihoods. The loss of biodiversity affects the lives of more than 1 billion people living in dry-lands. But rapid, manmade climate change speeds up the process, without affording ecosystems and species the time to adapt. For example, rising ocean temperatures and diminishing Arctic sea ice affects marine biodiversity and can shift vegetation zones, having global implications. Climate is a major factor in the distribution of species across the globe and climate change forces them to adjust. But many are not able to cope, causing them to die out.

REFERENCES:

1. https://www.science.org.au/curious/earth-environment/climate-change-and biodiversity
2. http://www.biomedsearch.com/nih/Climate-change-biodiversity-conservation-impacts/20948670.html
3. https://www.cbd.int/climate
4. https://mashable.com/2015/05/23/biodiversity-threats/
5. http://www.biodiv.be/biodiversity/threats
6. https://www.spaceandmotion.com/environmental/climate-change-global-warming.htm
7. http://siteresources.worldbank.org/INTBIODIVERSITY/Resources/Biodiversity_10-1-08_final.pdf
8. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2920684/

Life Science Informatics Publications

Research Journal of Life Sciences, Bioinformatics, Pharmaceutical and Chemical Sciences

Journal Home page http://www.rjlbpcs.com/

RJLBPCS

ISSN 2454-6348

Original Research Article **DOI: 10.26479/2019.0505.06**

PHYTOMORPHOLOGICAL AND MEDICINAL PROPERTIES OF *BOSWELLIA OVALIFOLIOLATA* BAL. & HENRY AND *BOSWELLIA SERRATA* ROXB. ex COLEBR

G.V. Ranga Reddy[1], D. Muralidhara Rao[2*]

1. Department of Botany, Rayalaseema University, Kurnool, A.P., India.

2. Department of Biotechnology, Sri Krishnadevaraya University, Anantapuramu, Andhra Pradesh, India.

ABSTRACT: Man's reliance on plants for edible and medicinal purpose is an important topic in the past, present and future. Though advanced technology developed in medicine, majority of the world's population still depends almost exclusively on medicinal plants. But only few medicinal plants of high economic value have been cultivated under field conditions. The majority of plants used for medicines are collected from the wild. In the present investigation, we examined the morphological and medicinal properties of the both *Boswellia ovalifoliolata* Balakr. & A.N. Henry, Endemic to Seshachalam hill ranges (Tirumala, Kadapa) of Eastern ghats.as IUCN Conservation status. *Boswellia serrata* Roxb. ex Colebr. is common in lower hill slopes of Tirumala and Talakona. Both the plants belongs to Burseraceae showed resemblances as well differences with respect to morphology and medicinal properties and Rare in open areas. Coimbatore, Dharmapuri, Salem, South Arcot, Central and North-West India. **Keywords:** Phytomorphology, medicinal properties, *B. ovalifoliolata*, *B.serrata*, IUCN Conserv Status.

Article History: Received: Feb 05, 2019; Revised: April 12, 2019; Accepted: July 26, 2019.

Corresponding Author: Dr. D. Muralidhara Rao Ph.D.

Assistant Professor, Department of Biotechnology, Sri Krishnadevaraya University, Anantapuramu, Andhra Pradesh, India.

1. INTRODUCTION

The World Health Organization (WHO) estimates that about 80% of people in developing countries still rely on plant derived drugs and the main reason being their low price (Ekor, 2014). Moreover utilization of medicinal plants has getting momentum recently due to plants contain some complex

© 2019 Life Science Informatics Publication All rights reserved

chemical compounds which may not be possible to synthesize in a laboratory and provides important clues for new medicines. Specifically in India, different species of plants have been reported to be used for medicinal purposes in the various systems of medicine and this country has been an important exporter of medicinal plants [1,8]. Long back it was estimated that the market potential for herbal drugs in the western portion of the world alone has increased to 47 billion [1,3]. Generally the medicinal plants have been subjected to rigorous chemical analysis to find bio-active components for particular disease [4,5,7]. Initially all the newly identified plants have been isolated, evaluated and later depend on the potential, increases the utility of that particular plant in large scale [11,17]. Moreover medicines are no longer sold only in the form of powders and also prepared in the form of crude extracts of roots, stems and leaves. So it is important that properly identified and certified planting material can be supplied to the growers for the preparation of medicine [1,12]. Several indigenous drug industries have been established in recently which supply readymade medicines. In this process, new drugs have been discovered and new uses have been found [8,6,2]. All this has necessitated the large scale collection of plants by collectors to supply raw material to industry leading to endangered and some are on the verge of extinction [9,10]. If efforts are made for systematic cultivation of medicinal plants either it may be tissue culture or other biotechnological methods for elite characters instead of collecting them from the wild, many of the problems mentioned above will be minimized [2,16]. Cultivation of plants can be planned to meet the needs of the industry in required quantities and at the required time [11,12]. *Boswellia ovalifoliolata* (Ln. Konda sambrani, Adavi sambrani, Guggilam) and *Boswellia serrata* (Ln.White Dammar,Dhupamu, Guggilam, Parangi)members of Burseraceae are important medicinal plants with potential benefits [13,15]. Both the plants were originated from India and *B. ovalifoliolata* was an endemic species to Seshachalam hill ranges of Palakonda region of Eastern Ghats of India [1,2,15]. Both the plants were medium-sized trees and differ morphologically from each other [2, 16]. The extracts of these plants were used for curing of osteoarthritis, rheumatoid arthritis, bronchial asthma, diabetes and showed antimicrobial activity for a range of species. Present study aims to know the morphological details of these two plants which belong to same family and also need to know the chemical properties specifically medicinal value [12,14].

2. MATERIALS AND METHODS

In the present investigation, two important medicinal taxa i.e *Boswellia ovalifoliolata* and *Boswellia serrata* of Burseraceae, were collected from wild in different places of Tirumala hills, Chittoor district of Andhra Pradesh. The botanical identification of the taxa was carried out by using regional and local floras [5,9,12,13]. The herbarium was prepared according to the method of [2, 14] and deposited in the department of botany [16,18]. In our studies we have observed that most of the tribals used plant parts like stem bark, leaf, fruit and resin gum, for curing numerous diseases. The medicinal and ethnomedicinal field survey was made and the data on the medicinal uses were

© 2019 Life Science Informatics Publication All rights reserved

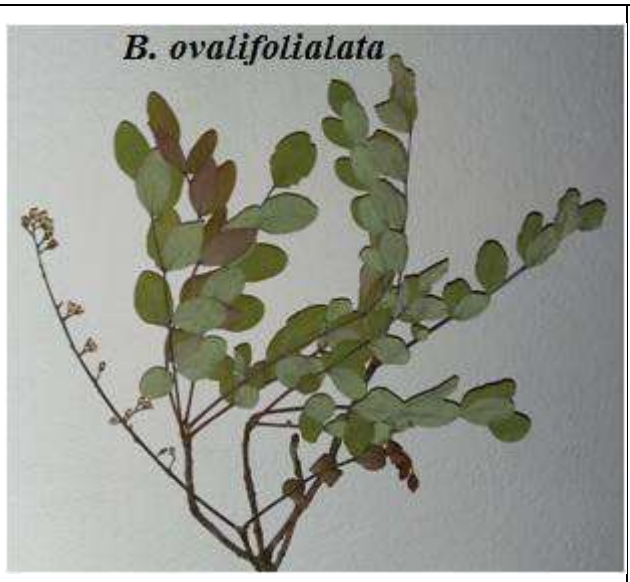
gathered from tribals, tribal physicians, local healers, age old persons, mid-wives, sadhus, wood cutters, herbal venders, forest officials and from present available literature [19,30]. The method of preparation, dosage, timing and mode of administration of each identified drug were recorded. The selected plant species are widely used in indigenous practices by traditional healers to cure numerous diseases and work has been under progress.

3. RESULTS AND DISCUSSION

In the present investigation, we observed the phytomorphological and functional similarities and differences between *B. ovalifoliolata* and *B. serrata* and all the results were documented below (Table-1). *B. ovalifoliolata* is a medium size deciduous tree with 7-10 m tall and branchlets were thick with red in colour and glabrous. Bark was appeared with thick green and contains 0.5-1.5 cm thickness and in peeling off conditions appeared with brown or yellow thin papery sheets or flakes. The bark of *B. ovalifoliolata* gives fragrant, red, yellow and white resin gum. Leaves were 9-25 cm long, alternate, crowded at the ends of branches, young foliage reddish, compound, imparipinnate and exstipulate [20,21]. Leaflets were opposite or alternate, basal and upper leaves smaller than middle one. Sometime upper leaves were larger and lower one's are very smaller, sessile, 9-13 pairs, coriaceous 1.7-7.5 x 1.0-5.3 cm ovate-oblong, sub orbicular and rounded at base, margin entire, tip obtuse and retuse, glabrous and glaucous beneath (Fig. 1). Secondary veins were 8-10 pairs, venation reticulate, leaf rachis and veins appear in thick reddish color. Flowers appears pale rose-pink or greenish white, 5 mm across, in large axillary much branched panicles. Panicles were longer than leaves with 5-35 cm long and pedicles were 4-6 mm long and both peduncles and pedicles were glabrous. Calyx 5-toothed, lobes short, broadly triangular, glabrous, persistent with 1x 2 mm. Petals were 5, smaller, distinct, imbricate, glabrous, narrowed at the base, obovate- oblong, 4-5 mm long, 2.5-3.0 mm wide and deciduous. Disc was annular, crenate, fleshy, adnate to the calyx tube. Stamens were 10, alternating long and short and inserted outside under the disc. Filaments subulate, base board, 1 mm long and papillose. Anthers were dithecous, versatile, longitudinally dehiscing and wall tuberculate. Ovary sessile, tricarpellary syncarpous, trilocular, ovules 1 or 2 in each locule, collateral, pendulous and style short, 2.5 mm long with four vertical groves and stigma capitate. Fruit was drupe, green or greenish yellow, trigonous containing 3-pyrenes, 1.0-1.5 cm long, 0.5-0.8 cm wide and valves septicidal. Pyrenes was ovate or elliptic, bony, one or two seeded, finally separating from the trigonous axis. Seeds were cordate, winged, compressed, pendulous; testa membranous. The season for flowering and fruiting seeds was March-June every year [9,15]. (Fig-1a). *B. serrata* is a medium size deciduous tree with10-15 m tall and branchlets green in color and young shoots are appeared with hairy. Bark green was 0.4-1.3 cm thickness and in peeling off, it appears light brown and brown or yellow thin papery flakes. Bark after chopping from the trunk the lower surface appears in whitish brown or light brown and after drying brown, aromatic smell and bitter taste [21,23]. Bark gives a fragrant thick red or white resin gum. Leaves were 12-42 cm long,

© 2019 Life Science Informatics Publication All rights reserved

alternate, crowded at the ends of branches, young foliage yellow or light brown, compound, impripinnate and exstipulate (Fig. 2). Leaflets were opposite or subopposite, basal pair much smaller than others, sometimes very variable in size, sessile, 17-27 pairs, thin-coriaceous, 0.5-7.2 X 0.5-2.1 cm, oblong-lanceolate, obtuse at base, margin entire or crenate or wavy, tip obtuse or subacute, pubescent on veins or nerves and greenish beneath. Secondary veins more than 16 pairs, venation reticulate and only mid vein light reddish [27,29]. Flowers were pinkish white in color, 4-5 mm across, in little branched axillary racemes and panicles were shorter than leaves, 3-20 cm long and pedicles were 2-4 mm long, both peduncles and pedicles pubescent. Calyx 5-thoothed, short, triangular, puberulous outside, persistent and 0.5x1.5 mm. Petals 5, distinct, larger, imbricate, puberulous outside, obovate-oblong, 6-8 mm long, 3.0-3.5 mm wide and deciduous(23,28). Disc was annular, fleshy and adnate to the calyx lobes. Stamens were 10 and inserted below disc. Filaments were free, 1.1 mm long and anthers dithecous and dehiscing longitudinally(24,26). Ovary was sessile, tricarpellary syncarpous, trilocular, ovules one in each locule and pendulous. Style was simple short, 2.1 mm long and stigma undivided or lobed. Fruit was drupe, brown or green, trigonous with 3-pyrenes, 0.8-1.2 cm long, 0.3-0.5 cm wide, valves septicidal. Pyrnes were heart shaped, bony, 1-seeded, valves separating from the trigonous axis. Seeds were ovate-obovate of sub cordate winged, compressed, pendulous and testa membranous (Fig-1b).



1a. Boswellia ovalifoliolata

2b. Boswellia serrata

Figure-1a&1b: Phytomorphological variations of *B. ovalifoliolata* and *B. serrata*

© 2019 Life Science Informatics Publication All rights reserved

***2a.Bosewellia ovalifoliolata* -Tree Habit**

2b.Flowering Twig

2c.Lamina (Leaf) upper and lower surface

Figure-2 *a. Bosewellia ovalifoliolata* -Tree Habit - 2b.Flowering Twig – 2c. Lamina (Leaf) upper and lower surface

© 2019 Life Science Informatics Publication All rights reserved

***3a.Boswellia serrata* tree habit**

3b.Lamina (Leaf) upper and lower surface

3c.Flowering &Fruiting Twigs

Figure-33a.Boswellia serrata tree habit - 3b. Lamina (Leaf) upper and lower surface - 3c.Flowering &Fruiting Twigs

© 2019 Life Science Informatics Publication All rights reserved

Table 1: Phytomorphological differences between *Boswellia ovalifoliata* and *Boswellia serrata*

Boswellia ovalifoliata	*Boswellia serrata*
1. Desiduous tree, 7-10 m tall; branchlets thick reddish.	1. Desiduous tree, 10-15 m tall; branchlets green.
2. Bark thick green, peals off in brown or yellow papary sheets or flakes.	2. Bark green, peals off in light brown or yellow papary sheets or flakes.
3. Bark after chopping from the trunk lower surface brown, after drying thick brown.	3. Bark after chopping from the trunk lower surface whitish brown or light brown, after drying brown.
4. Bark gives a fragrant yellowish red or white resin gum.	4. Bark gives a fragrant thick red or white resin gum.
5. Young foliage reddish.	5. Young foliage yellow or light brown.
6. Leaves 9-25 cm long, glabrous above, glaucous beneath; leaflets 9-13 pairs.	6. Leaves 12-42 cm long, pubescent on veins, greenish beneath; leaflets 17-27 pairs.
7. Leaflets ovate-oblong, suborbicular, rounded at base, margin entire, tip obtuse and retuse.	7. Leaflets oblong-lanceolate, margin entire or crenate or wavy, tip obtuse or sub acute.
8. Secondary veins 8-10 pairs.	8. Secondary veins more than 16 pairs.
9. Leaf rachis and veins thick reddish.	9. Only leaf mid vein light reddish.
10. Panicles 5-35 cm long, longer than the leaves in much branched panicles; pedicles 4-6 mm long; both peduncles and pedicles glabrous.	10. Panicles 3-20 cm long, shorter than leaves in little branched racemes; pedicles 2-4 mm long; both peduncles and pedicles pubescent.
11. Flowers pale rose-pink or greenish white.	11. Flowers pinkish-white.
12. Sepals and petals completely glabrous; petals smaller, 4-5 mm long, 2.5-3.0 mm wide, obovate-oblong.	12. Sepals and petals puberulous outside; petals larger, 6-8 mm long, 3.0-3.5mm wide, ovate-oblong.
13. Stamens 10, inserted outside under the disc.	13. Stamens 10, inserted below the disc.
14. Anthers wall tuberculate.	14. Anthers wall not tuberculate.
15. Ovules 1or 2 in each carpel.	15. Ovules 1 in each carpel.
16. Style 2.5 mm long with four vertical groves.	16. Style 2.1mm long, vertical groves absent.
17. Drupe green or greenish yellow with 3 – pyrenes, each one is ovate or elliptic, 1or 2 seeded.	17. Drupe brown or greenish with 3- pyrenes, each one is heart shaped,1- seeded.
18. Seeds cordate.	18. Seeds ovate-obovate or subcordate.

The season for flowering and fruiting seeds were March-June every year. Several researchers worked on these plants and described taxonomical and chemical composition(4,9,12,13). Medicinal properties of both the plants were discussed in detail in the Table-2.

© 2019 Life Science Informatics Publication All rights reserved

Table 2: Medicinal properties of *B. ovalifoliolata* and *B. serrata*

S.No.	Name of the plant	Part used	Medicinal uses
1.	*Boswellia ovalifoliolata* (Ln. Konda sambrani, Adavi sambrani, Guggilam)	Leaf	Throat ulcers.
		Bark	Stomach ulcers, diabetes, abdominal pain.
		Fruit	Aphthae.
		Resin	Joint pains, arthritis, inflammations, amoebic dysentery, diarrhoea and perfumery products.
2.	*Boswellia serrata* (Ln.White Dammar,Dhupamu ,Guggilam, Parangi)	Bark	Dysentery, diarrhoea and antiseptic to wounds, cuts, burns, boils and fractured bones for early healing.
		Resin	Boils and wounds, incense, cordiac diseases, haemorrhage, cough, dysponea, polyuria, leucorrhoea, oligospermia skin diseases, urinary disorders, urethritis, piles, ulcers, burns, purgative, diabetes, diarrhoea, dysentery, pulmonary affections and cutaneous troubles.
		Leaf	Boils and wounds.

4. CONCLUSION

Present work may be explores the possibility of gaining knowledge about two medicinal plants in the Burseraceae family. Moreover this paper may be useful for public who is following and practioners of the traditional medicine.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No Animals/Humans were used for studies that are base of this research.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The authors confirm that the data supporting the findings of this research are available within the article.

ACKNOWLEDGEMENT

Authors are expressing their gratitude the Vice-Chancellor, Registrar and Head, Department of Botany, Rayalaseema University, Kurnool, for providing necessary logistics and encouragement to carryout research work.

© 2019 Life Science Informatics Publication All rights reserved

CONFLICT OF INTEREST

Authors have no conflict of interest.

REFERENCES

1. Ahmedullah and Nayar MP. Endemic plants of the Indian region. Botanical Survey of India, Howrah. 1986; Vol. 1, pp. 38-39.
2. Balakrishnan NP and Henry AN. A new species of Boswellia from south India. Bombay, 1961; Nat. Hist. Soc.58: 546.
3. Benjamin FJH and Murthy GVS. Flora of Sri Venkateswara National Park, Andhra Pradesh. Botanical Survey of India. St. Joesph's Press, Thiruvananthapuram, Kerala, India, 2013; 165-166.
4. Ekor M .The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. 2014; Front Pharmacol. 4-177.
5. Gamble JS. Flora of the Presidency of Madras. 1957; Vol1-3.B.S.I. Calcutta.
6. Khan AL, Mabood F, Akber F, Ali A, Shahzad R, Al-Harrasi A, Al-Rawahi A, Shinwari ZK, Lee IJ. Endogenous phytohormones of frankincense producing *Boswellia sacra* tree populations. 2018; PLos One 19:13:e0207910.
7. Khan IA and Khanum A. Role of Biotechnology in medicinal and aromatic plants - Retrospect and prospect : Introductory remarks In : Khan, I.A and Khanum, A. Role of biotechnology in medicinal and aromatic plants, 1998; vol.1. pp.1-12. Ukaaz Publications., Hyderabad.
8. Kirtikar KR and Basu BD. Indian Medicinal plants. Reprint edition. Lalith Mohan Basu publications, Allahabad, India, 1976;Vol.1&2.
9. Kumar V, Shriram V, Bhagat R, Khare T, Kapse S and Kadoo N. Phytochemical profile, anti-oxidant, anti-inflammatory and anti-proliferative activities of *Pogostemon deccanensis* essential oils. 3 Biotech. 2019; 9:31.
10. Madhava Chetty K, Sivaji K and Thulasi Rao K. Flowering Plants of Chittoor district, Andhra Pradesh, India. 5th edition. Students Offset Printers, Tirupati, 2015.
11. Narayana Rao K, Thamanna and Nagaraju N. Medicinal Plants of Tirumala Tirupati Devasthanams (TTD) Publications, Tirupati, Andhara Pradesh,1988.
12. Prasanna PV, Chandra Mohan Reddy M, Venkata Ramana M and Venu P. Trees of Hyderabad, a pictorial guide. Botanical Survey of India. St. Joesph's Press, Thiruvananthapuram, Kerala, India, 2012; 49-50.
13. Pullaiah T, Sri Ramamurthy K and Karuppusamy S. Flora of Eastern Ghats Hill Ranges of South East India, 2001; 3: 264.
14. Rangacharyulu D. The Flora of Chittoor district, Ph.D. Thesis, S.V. University, Tirupati, 1991.
15. Thammanna P, Rao KN and Madhava chetty K. Angiospermic Wealth of Tirumala, T.T.D. Press. Tirupati. 1994.

© 2019 Life Science Informatics Publication All rights reserved

16. Yadav SR and Sardesai MM. Flora of Kolhapur District. Shivaji University, Kolhapur, India: 2002. 103.
17. Yoganarasimhan SN. Medicinal Plants of India. Srinivasan and Kosal Ram of Cyber media, Banglore. 2000, Vol.2.
18. Chopra, R.N., S.L.Nayar & I.C.Chopra. Glossary of Indian Medicinal plants. CSIR, NewDelhi, 1956.
19. Chopra, I.C. Chopra, K.L. Handa & L.d. Kapoor. Chopra's Indigenous drugs of India. U.N. Dhur & Sons Pvt. Ltd., Calcutta, 1958.
20. Chopra, I.C. Chopra & B.S. Verma. Supplement to glossary of Indian medicinal plants. CSIR, New Delhi, 1969.
21. Conklin, H.C. Ethnobotanical problems in comparative study of folk taxonomy. Proc. Ninth Pacific Sci. Cong. Pacific Sci. Assocn. 4: 1962; (Botany), 299-301.
22. Dey, A.C. 1994. Indian Medicinal Plants and Ayurvedic Preparations. Bishen Singh Mahendra Pal Singh, Dehra Dun -248001 (India)
23. Gupta, S.P. Study of plants during ethnological research among the Tribals. (ed. S.K. Jain). A Manual of Ethnobotany 2ed. Scientific Publishers. Jodhpur. 1995.
24. Hemadri, K. Medicinal Plants from Andhra Pradesh. Telugu Akademy, Hyderabad, 1979.
25. Jain, S.K. (ed.). Glimpses of Indian Ethnobotany. Oxford & IBH. Pub. Co. New Delhi, 1981.
26. Kirtikar KR & Basu BD. Indian Medicinal Plants. Vol 3, pp. 1841. Allahabad. Lalit Mohan Publication, 1935.
27. Khan A.V. & Khan A.A. Herbal abortifacients used by folk people of some districts of Western Uttar Pradesh (India). Journal of Natural Remedies, 2003; 3(1), 41- 44.
28. Rama Rao, N. and A.N.Henry. The Ethnobotany of Eastern Ghats in Andhra Pradesh. India. 1996.pp.1-259. Botanical Survey of India, Calcutta.
29. Rao, P.S., K.Venkaiah and R. Padmaja Field Guide on Medicinal Plants. Research and Development Circle, Forest Department, Andhra Pradesh, 1999.
30. Sudarsanam, G. and N.S. Balaji Rao. Medicinal Plants used by the Yanadi tribe of Nellore district. Andhra Pradesh. India. Bull. Pure and Applied Sci. 1994; 13b : 65-70.
31. Vedavathy, S., V.Mrudula and A.Sudhakar. Tribal Medicine of Chittoor district in Andhra Pradesh. Pub. Herbal Folklore Research Centre. S.V.Arts & Science College, Tirupati, Andhra Pradesh, 1997.

© 2019 Life Science Informatics Publication All rights reserved
Peer review under responsibility of Life Science Informatics Publications

Ancient Two Temples in Kurnool, District, A.P.State.

A.Venkataswamy, Lecturer,in History,GDC,Nandikotkur.

Kurnool. District. A.P.

ABSTRACT:

1.SRI SURYANARAYANA TEMPLE(Sun God) :-

The sun god temple natively known as Sri Suryanarayana Temple is located in Nandikotkur, 28 K.M. from Kurnool (District). It is the only second temple in the State of Andhra Pradesh. The first temple is located in Arasavelli of Srikakulam district. The temple at Nandikotkur was built by Chalukya kings in 1080A.D. when they ruled Altamura. It was renovated in 1996 by Sri Mallikaaaarjuna Rao.

2.Sri Tharthur Ranganatha Swamy Temple:

Sri Ranganatha Swamy temple is located in Tharthur of Bunglow Mandal, Kurnool District, which is 40 K.M from Kurnool city. It has gained, A great importance in Andhra Pradesh state

Key words: Ancient temples in Kurnool district, Ap.

1.SRI SURYANARAYANA TEMPLE(Sun God) :-

The sun god temple natively known as Sri Suryanarayana Temple is located in Nandikotkur, 28 K.M. from Kurnool (District). It is the only second temple in the State of Andhra Pradesh. The first temple is located in Arasavelli of Srikakulam district. The temple at Nandikotkur was built by Chalukya kings in 1080A.D. when they ruled Altamura. It was renovated in 1996 by Sri Mallikaaaarjuna Rao.

History of the Temple:

In 13th century the Kakatiya Emperor Prathapa Rudra Deva gifted Nandikotkur region to Sirisingadeva who was the then army chief of Kakaatiya Empire. Then this region was call Navanandikotkur and later on it took the name of Nandikotkur during this time Siriasingadeva kept his relatives and friends as guardians to the place, Atmakur, parumanchala, Lingapuram ,Byrapuram and Beeravolu Later in course of time, The Idol of Suryanarayana God(Sun God) was little damaged. During this time, the elders of the village formed a committee to restructure (or) reshape the Idol. The then Ex M.L.A. Sri Byreddy Rajasekhara Reddy garu supported them and got the Idol well structure and shaped. On the walls of the Temple, we find inscriptions and writings sculpted by Chalukya and Kakatiyas.

Description of the Temple:

To the right side of Suryanarayana temple, we find goddess Sari Bramarambika and Lord Mallikarjuna Swamy temples. In this temple Idols of goddess Chayadeva and Ushadeva (wits), have been installed. These temples are constructed according to Kakatiya architecture with the consent of Sri Prathaparudradeva, the empire of kakathiya. Navananda stupas were installed, following the Shiva tradition. The area of the temple occupies 10 acres and huge wall are cnstructed for the protection of the Temple; The Idol shrine and in the centre, Koneru (A stone faced tank with steps for bathing) and exist way, give a pleasant look to the pilgrims.

Importance of the Temple:

People from different places of the country visit this for the blessings of Lord Suryanarayana; since 1950 the regular on and daily prayers about rituals are performed, till today. During Ratha sapthami, the rays of the Sun fall on the feet of Lord Suryanarayana Deva. Many People from the different parts of the Country flock at the temple to observe this great miracle. The Sun God here is also called as the God of Health.

2.Sri Tharthur Ranganatha Swamy Temple:

Sri Ranganatha Swamy temple is located in Tharthur of Bunglow Mandal, Kurnool District, which is 40 K.M from Kurnool city. It has gained, A great importance in Andhra Pradesh state.

History of the temple:

Nearly 700(Seven Hundred Years) back the girl of Sri Rangapuram, A village which is on the other banks of the River Krishna, came to her in-leas house with a tradition of carry Seer of rise in her saree which is called (**Odibeeyam Telugu Word).** When she came with Odibeeyam to Tharthur a miracle happened that there was a Idol of Sri Ranganatha is her Odibeeyam, t hat is in her embrace. So this was thought be a great miracle of god Sri Ranganatha, so she installed the same Idol of Sri Ranganatha Swamy at that village. This was revealed as per the local puranas and chalukya inscriptions. Later M.L.A. the temple was renovated by tie Local people and constructed a big temple; the donors were Ex M.L.A. Byreddy Rajasekhara Reddy, M.L.A. Smt. Gowru **Charitha** Reddy and Educationalist Sri.K. Janardhana Reddy.

Description of the Temple:

At the temple has a wide area of 15 acres. The temple is constructed a beautiful with 3 staired gopuram in front of the temple. The Idol of Lord Hanuman and Mandapam, Antaralapam and Garbhagudi temples. In this temple there are also Idols of Lord Ganapathi, Nandi and Navagrahas. Sri Ranganatha Swamy of tharthur is said to be the incarnation of Lord Maha Vishnu, all the

people of nearly 20 villages in and around Tharthur visits the temple regularly. Nearby this temple we find temples of Bata Sunkulamma, Poleramma.

Importance of the Temple:

Since 700 years in A.P (State), Tharthur has gained its importance and popularity for its Jathara in the Name of Sri Ranganatha Swamy. This Jathara is celebrate in the month of April. It begins on Sriramanavami date and continues for 20 days, many Pilgrims from Telangana, A.P.(State) visit this place. In this Jathara there is a great exhibition of farmers. T h is exhibition has become very popular in state. Many farmers and Local peoples participate in this. The Ratha of Sri Ranganatha Swami pulled by the public and many people celebrate this occasion happy. Paruveta, There Prabha is most importance of the celebrations.

Key words: Ancient Temples in Kurnool. District. Venkatswamy830@gmail.com

REFERENCE: 1. HISTORY OF KURNOOL HAND BOOK

ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/363249181

Analysis of Chat bots based Artificial Intelligence (AI) Marketing

Article *in* International Journal of Natural Sciences · September 2022

CITATION
1

READS
815

1 author:

S Mohana Murali

10 PUBLICATIONS **5** CITATIONS

SEE PROFILE

All content following this page was uploaded by S Mohana Murali on 03 September 2022.

The user has requested enhancement of the downloaded file.

Indian Journal of Natural Sciences *www.tnsroindia.org.in ©IJONS*

Vol.13 / Issue 73 / August / 2022 *International Bimonthly (Print)* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Analysis of Chat bots based Artificial Intelligence (AI) Marketing

S.Mohana Murali[1]*, C.Sandhya[2], Nitesh Behare[3], Ajitharani Unnikrishnan[4] and B.Rajasekaran[5]

[1]Lecturer in Commerce Govt. Degree College Srisailam project, Nandyal Dist, Andhra Pradesh, India
[2]Assistant Professor, Department of Management Science S.A.Engineering College, Chennai,Tamil Nadu, India
[3]Associate Professor, Department of Management Studies, Balaji Institute of International Business (BIIB), Sri Balaji University, Pune, India
[4]Assistant Professor, Department of Commerce and Management Studies, Sri. C Achutha Menon Govt. College, Thrissur , Kerala, India
[5]Associate Professor, Department of Electronics and Communication Engineering Vinayaka Mission's, Kirupananda Variyar Engineering College, Vinayaka Mission's Research Foundation (Deemed to be University), Salem, Tamil nadu, India

Received: 10 June 2022 Revised: 29 June 2022 Accepted: 16 July 2022

***Address for Correspondence**
S.Mohana Murali,
Lecturer in Commerce,
Govt. Degree College Srisailam project,
Nandyal Dist, Andhra Pradesh, India

This is an Open Access Journal / article distributed under the terms of the **Creative Commons Attribution License (**CC BY-NC-ND 3.0) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. All rights reserved.

ABSTRACT

Artificial intelligence (AI) is a platform that allows marketers to develop highly tailored client experiences, improve organisation response, and solve customer problems. In this study, the chatbot is examined as an artificial intelligence tool in marketing, as well as its current application and future potential in the sector. A survey of respondents' behaviours, habits, and expectations when utilising various communication channels was undertaken, with a focus on chatbots and their benefits and drawbacks in comparison to other communication channels, with a total of 60 survey respondents. The findings revealed that the greatest benefit of employing chatbots in marketing services was when offering simple, quick information, but they also revealed respondents' worry of chat bots supplying them with incorrect information. Chatbots should be considered by businesses, particularly if they face communication issues with clients, but also if they want to keep up with the changing lifestyles of their customers.

Keywords: Artificial Intelligence, Customer, Chat bots, Pattern recognition,

INTRODUCTION

Artificial intelligence is garnering greater attention from the scientific community and the general public as technology advances, resulting in the development of technical skills. A rising number of initiatives are attempting to integrate artificial intelligence into business processes in order to profit from the implementation described above. According to the author of this paper, marketing's purpose is to resell a product or service. A delighted client who receives added value from the product or service purchased and then returns to make another purchase is referred to as a continuous sale. Artificial intelligence's advent into the marketing sector opens up new possibilities. It will be feasible to offer customised products and services using a machine that can track client behaviour, document observed behaviour, and spot patterns, giving marketers significantly more options. The role and potential of artificial intelligence in marketing will be discussed in the following section, with a focus on chatbots. A survey was conducted to examine respondents' behaviour, habits, and expectations while using various communication channels, as well as the benefits and drawbacks of chat bots compared to other communication channels.

Marketing of Artificial Intelligence

Artificial intelligence has a number of different expert definitions. Artificial intelligence is defined as "the science of making smart machines," according to Demis Has ibis, co-founder and CEO of Google Deep Mind. In this case, smart computers refer to the degree to which they have succeeded in imitating human thought patterns [1-2]. Marketers may use artificial intelligence to offer highly personalised customer experiences at a lower cost than traditional marketing strategies. Any interaction a user has with a product or service is recorded and utilised to improve and customise it in the future. Artificial intelligence has evolved from a science-fiction concept to a technological reality in today's world.According to a PwC poll 72 percent of marketers believe that artificial intelligence can help them grow their business. Companies can get a competitive edge by using customer data to make their offer more relevant: 1. They can create items that are more consumer-oriented. 2. They can deliver services that are more focused on the customer. 3. They can pinpoint the target market with more accuracy, resulting in a higher conversion rate. 4 They are able to totally satisfy their clients' requirements. Data has evolved into a company's most important asset. The utility of data for artificial intelligence development through machine learning grows in tandem with the amount of data available. To construct, test, and prepare artificial intelligence, huge amounts of data are required.

When it comes to boosting industrial sectors, artificial intelligence has a lot of potential. Financial institutions, the automotive industry, law companies, and others have all employed it. For organisations trying to beat their competitors, owning data and analysing it using artificial intelligence has become important[3-4]. Artificial intelligence, as previously said, is not a recent invention. However, the capabilities of artificial intelligence and machine learning remained a mystery for a long time after their discovery because we were unable to collect huge amounts of data from various sources and across categories in order to cross them subsequently.Because enormous volumes of data were required to design and test artificial intelligence-based computers, no significant advances in artificial intelligence development were made at the time. With the passage of time, however, the situation has shifted. We now have the ability to not only gather and store vast volumes of data, but also to cross and analyse it in order to make conclusions and link it. The evolution of artificial intelligence and its tools is a result of changing and developing BDs.

Chatbots

Bots are software that conducts automated activities, and chatbots are bots that may be found on a variety of messaging sites. Because the purpose of chatbots is to have a discussion with humans, the major role of chatbots is to communicate with humans. It is desirable for individuals to have as simple access to information as possible, therefore messaging systems have been chosen as convenient platforms for people to utilise for daily communication. A. Market segmentation breakdown by type of chatbot The market for chatbots is classified into three segments.

• Market segmentation based on the type of chatbot o Rules-based chatbot o Artificial intelligence-based chatbot It's worth noting that rule-based chat bots are a subset of chat bots that use artificial intelligence. Rules-based chatbots are typically intended to serve as an interactive FAQ page. They've been trained to identify particular concepts and patterns, allowing them to respond with a set of predetermined responses. Artificial intelligence-based chatbots use complex algorithms to operate like an artificial brain. They understand not just the user's request, but also the context, intention, and emotion, and they continue to "learn" about the user through each individual discussion.
• Segmentation of the market based on the chatbot's user interface o Web-based chatbots o Application-based chatbots
• Chatbot end-user segmentation o News and media o E-commerce o Banking and insurance o Health care o Telecommunications o Gaming and entertainment B. Chatbots are judged based on the following criteria. Does the chatbot react with the requested and proper information? The emphasis is on quantitative outputs, with no consideration given to the quality of the user experience. Accuracy, precision, and reaction are the three measures used. Is the chatbot capable of natural and lengthier discussions due to language principles? It is necessary to have a court of non-numerical expert witnesses.

Is the chatbot engaging and interactive. Qualitative experience is quantified and based on task completion and customer satisfaction surveys, but determining these criteria can be complex and costly. Artificial Intelligence - Does a chatbot behave like a human, and how intelligent is it? Artificial intelligence's "humanity" is determined by observing logical and abstract thought processes.

Survey of chatbots communication in organizations

The data was gathered using a survey. Google's tool, Google Forms, was used to construct it and then evaluate it. The survey was shared with many Faculty of Organizational Sciences student groups on Facebook. The purpose of the survey is to look into respondents' interactions with organisation chatbots, such as their behaviour, expectations, and habits when using various communication channels, particularly the Internet, and then reflect on the benefits and drawbacks of chatbots in comparison to other communication channels, as well as assess how respondents view chatbots. Students, or the most active millennials, were chosen as the target demographic since they are the most frequent users of social media and the Internet in general (pewresearch.org, 2018). At the start of the poll, a few basic demographic questions were asked. The respondents' ages were initially looked at. Because the survey link was posted on the Faculty of Organizational Sciences' Student Groups, it was projected that 97 percent of the responders would be between the ages of 19 and 25. The gender of the responders was the next factor to consider. Females make up somewhat more than two-thirds of the responders, while males make up slightly less than a third. The respondents' occupation was the subject of the third question.

Students account for over 64 percent of responses, while employees account for 32.8 percent. When asked, "How have you communicated with organisations over the past 12 months. 77 percent of respondents said they communicated with them by phone, 56 percent by email, 55 percent via social media (not including chatbots), 43 percent live with some of their employees at their organisations, and 21 percent communicated with a chat bot. Despite the fact that chat bot contact is not particularly common, it is nevertheless more extensive than communication via the website or mobile app. When asked if they start a conversation with an online chat, 62 percent answered they do. The following questions are presented in a textual format. The following step was to select from a list of pre-defined internet difficulties that they had encountered in the previous month. The lack of functioning of the site search option, difficulty accessing important information on the site, and the organization's non-responsiveness to user requests are the most prevalent complaints respondents have with the internet. Users expect a chatbot to obtain a speedy answer (89 percent), reserve a table in a restaurant or café (65 percent), and provide product or service information when they are asked what they think a chatbot would do (58 percent). The next question was about when they would prefer not to speak with the chatbot if they required specific information.

When requested for information, the vast majority of respondents are concerned that the chatbot would provide incorrect information (almost 50 percent of respondents).With 47 percent of respondents, the second most common

response is that they would prefer to interact with a live person. The third most popular response (33 percent) is that they would be annoyed if the chat bot did not speak in a polite manner. Then they had to link the communication channels at the desired response time.

When it comes to instant communication, the chatbot is the most popular option, followed by the phone and mobile apps. When given a 24-hour time frame, however, around 40% of respondents expect a response by email, website, or social media. In terms of responding after more than 24 hours, 20% of respondents expect to respond to the email within that time frame, while 17% expect to answer via the website. After that, individuals had to choose which of the specified benefits they expected to receive while dealing with businesses. Respondents to chatbots demand a quick response to simple questions, availability 24 hours a day, seven days a week, and uncomplicated communication. When it comes to difficult questions and professional responses, a chat bot is not the ideal mode of contact.

Future of Machine Intelligence Techniques in the Financial Markets: A Systematic Analysis

Artificial intelligence is a wide and promising field that assists people in a variety of ways, including medicine, education, telecommunications, finance, and the economy. The financial market is an important component of any country's finances; understanding how it works can significantly enhance the country's economy and, as a result, people's lives. We propose in this paper to provide the most recent research on deep learning techniques applied to the financial market industry, which can assist investors in making informed decisions. This paper contains all recent studies on deep learning algorithms for financial market forecasting, including stock market, stock index, commodities forecasts, and Forex. The main purpose is to identify the most recent models used to solve the prediction issue using RNN, as well as its features and uniqueness. We'll go over every step of the forecasting process, from pre-processing to input features, deep learning approaches, and the metrics used for evaluation.

The practise of forecasting the financial market dates back to the beginning of the stock market's existence. The stock market fluctuates at random and is difficult to forecast. Financial analysts have never ceased looking for new ways to predict this chaotic and nonlinear domain. Analysts tried three different approaches to solve this challenge. Fundamental analysis was the first. The technical analysis, which is based on historical data and some indicators, was the second. Researchers have recently attempted to obtain more valuable features, such as sentiment index, by extracting the trend from historical data and using it in the input features. The third strategy, fundamental analysis and technical analysis [combines the two preceding techniques. The rate of employment, political statistics, and the firm's report are all used in fundamental analysis. Deep learning is challenging to apply directly due to the unstructured nature of the data. Because technical analysis is entirely based on historical data, it is easier to apply Artificial Intelligence (AI) in this arena. To estimate the movement of the market, various methodologies were used. Statistics, machine learning, pattern recognition, sentiment analysis, and hybrid are the five most well-known types

CONCLUSION

After going over the theoretical and practical aspects of marketing, artificial intelligence, and chatbots, as well as their impact on today's marketing practises, one gets the idea that the influence will continue to grow. Humans are already using chatbots, despite the fact that they are rule-based. Artificial intelligence will become more available and studied as technology advances, thus its practical use will expand, and at some point, a large portion of operational communication will be conducted using artificial intelligence-based robots. The results of the poll revealed that the greatest benefit of utilising chatbots in marketing is the providing of basic, quick information, but they also revealed respondents' worry of receiving incorrect information from chatbots, which has to be addressed in the future. Organizations should consider the benefits of artificial intelligence technology and its application to the realm of chatbots, especially in the face of challenges in communicating with customers, but also if they intend to keep up with the lifestyle of a growing consumer, given the aforementioned increase in the growth of artificial intelligence technology and its application to the realm of chatbots.

REFERENCES

1. V. Goel, A. K. Goyal, A. Sharma and M. Singh, "Analyze Performance and Market Share of Various Cryptocurrencies," *2022 International Mobile and Embedded Technology Conference (MECON)*, 2022, pp. 494-499, doi: 10.1109/MECON53876.2022.9752449.
2. M. Hirano, H. Sakaji and K. Izumi, "Concept and Practice of Artificial Market Data Mining Platform," *2022 IEEE Symposium on Computational Intelligence for Financial Engineering and Economics (CIFEr)*, 2022, pp. 1-10, doi: 10.1109/CIFEr52523.2022.9776095.
3. S. A. Rehman Khan, M. Umar, M. Tanveer, Z. Yu and L. R. Janjua, "Business Data Analytic and Digital Marketing: Business Strategies in the Era of COVID-19," *2022 7th International Conference on Data Science and Machine Learning Applications (CDMA)*, 2022, pp. 13-18, doi: 10.1109/CDMA54072.2022.00008.
4. X. Wu and A. J. Conejo, "Distribution Market Including Prosumers: An Equilibrium Analysis," in *IEEE Transactions on Smart Grid*, doi: 10.1109/TSG.2022.3151338.

View publication stats

Phytology

A study of phytosociological attributes of shrubs plant resources in nallamalais

T. Shalisaheb[1*] and M. Manjula[2]

[1] Associate Professor of Botany, Govt. Degree College, Affiliated to Rayalaseema University, Kurnool, Andhra Pradesh, India

[2] Ravindra Degree College for Women, Affiliated to Rayalaseema University, Kurnool, Andhra Pradesh, India

Correspondence Author: T. Shalisaheb

Received 5 Jan 2023; Accepted 13 Feb 2023; Published 22 Feb 2023

Abstract

Biodiversity is essential for human survival and economic wellbeing and for the ecosystem function and stability.forest in India are considered as a source of livelihood for forest department people, as repository of rich biodiversity and source of timber for industries. Nallamalla, the study area of the present work is one of the 234 Centres of Plant Diversity of the World. Heavy biotic interference primarily pertaining to over-exploitation of wild plant resources is leading to alarming loss of species population in the study area.The present study is based on ramdom sampling method by quadrates in different vegetation types of Nallamalais & documents the diversity of shrubs plant resources of the forest.The total number of individuals TNI of shrubs in the study site was 606. The total abundance value for all the 37 shrubs is 210.22 which are average of 5.68.

Keywords: biodiversitty, nallamalla, diversity, shrubs, TNI

Introduction

Biodiversity is essential for human survival and economic well-being and for the ecosystem function and stability. It has attracted world attention because of the growing awareness of its importance on the one hand, and the anticipated massive depletion on the other. In this regard natural forests are critically important for maintaining biological diversity as they not only contain half of the world's total biodiversity and also have the highest species diversity and endemism of any ecosystem type (CBD, 2012) [4].

Forests can release the stored carbon as CO_2 that form nearly 17-25% of the total greenhouse gas emissions, at the same time forest conservation, afforestation, reforestation and sustainable forest management can curb about 25% of emissions. Hence, forests besides being home to more than 50% of biodiversity on land also provides an opportunity to promote actions that simultaneously protect climate, biodiversity and provide sustainable livelihoods to forest dependent people. In this context, India has become one of the strong proponents for the idea of reducing emissions from tropical deforestation and degradation.

To integrate forests in to climate change activities by reduction in forest degradation, baseline information about the forest plant diversity, forest structure, carbon sequestration potential in above ground and below ground biomass will be of most useful. Degradation of the tropical forests and destruction of habitats due to anthropogenic disturbances are a major cause of decline biodiversity at global level (Reddy and Ugle, 2008) [33]. The dry tropical, subtropical and woodlands covered more than half of the world's tropics (Janzen 1988) [16] but have decreased considerably during the last decennia. A total of 52% of the forests are tropical in world and in India, approximately 86% are tropical (Singh and Singh 1988) [40]. These forests, however, are strongly impacted by anthropogenic activities (Champion and Seth 1968; Singh *et al.,* 1991) [5]. Because of high anthropogenic pressures in the past several decades, the dry deciduous forest cover in most parts of India is being converted into dry deciduous scrub, dry savannah and dry grasslands which are progressively species poor. This situation calls for in-depth study of dry deciduous forests with respect to species diversity, structure and regeneration. Nallamalais, the study area of the present work is one of the 234 Centres of Plant Diversity of the world (Davis *et al.,* 1995) [10] and they are rich with diversified habitats supporting a wide array of plant and animal life and provides livelihood for indigenous tribal communities as well other forest dwellers. The local chenchu tribe has rich traditional botanical knowledge and is using over 450 plant species for curing different ailments. Forest dwellers collect process and market different types of Non-Timber Forest Produce, worth to mention the fruits, herbaceous medicinal plants, gums and beedi leaf. Besides, large amounts of fuel wood, fodder harvested from the forested tracts form the basic livelihood of rural populations. Despite of the ecological and economic importance of forests of Nallamalais, these ecosystems have been subjected to great stress, and continue to face multiple threats. Deforestation and forest degradation in the Nallamalais continue unabated. Even the protected areas face tremendous pressures from local communities living inside and around the forests and other 'biosphere people'. Heavy biotic interference primarily pertaining to over-exploitation of wild plant resources is leading to alarming loss of species populations in the study area. Nallamalais of Telangana state are present above the river Krishna and is home for many wild animals especially Tiger, Panther, Bear, Sambar, Wild Boar, Deer and variety of birds, reptiles and insects.

Lack of complete and consolidated information on plant resource is a major stumbling block in the whole process of conservation and utilization of plant resources of Nallamalais

in Andhrapradesh State. It is important to have an assessment of the existing status of the natural strands of these resources, their geographic distribution and population structure to arrive at sustainable levels of harvesting and to develop working plans for the forest resources.

The present study is based by random sampling method by lying of nested quadrates in different vegetation types of Nallamalais documents the diversity of plants and structure of the forest. With this background, a holistic attempt has been made on plant diversity, distribution and the structure of Nallamalais to fulfil the following objectives:

Objectives

- Inventory of plant taxa encountered in the sampling units
- To know the structure of Northern Nallamala forests
- To determine the disturbance index of different forest sites in Nallamalais
- To know the threats to flora of Nallamalais and to propose effective strategies for its conservation.

Review of literature

The literature pertaining to the present work is presented below:

a) Floristic studies

According to Ellis (1987, 1990) [11, 12], studies on Nallamalais dates back to 1870's. R.H. Beddome during 1870-73 and 1881, Lushington in 1915; sporadic collections made by Hooker in 1883; J.S. Gamble during1883-87, C.A. Barber, in 1899, 1902 and 1906; Barber collections in Diguvametta and Gundlabrahmeswaram area during 1915-1920; Jacob 1917 and Fischer in 1921. Rangachari and personnel of the unit of Grass Survey of IARI also collected plants from Nallamalais. But no published data is available on any of these collections (Ellis, 1987) [11]. They made only random collections and kept in various herbaria in India as well as Royal Botanical Gardens, Kew, England (Raju & Pullaiah, 1995) [30].

The major studies on plant resources of Nallamalais in the past 25 years include Champion and Seth (1968) [5] recognized 6 major forest types in Nallamalis. Ellis (1987) [11] studied the flora of Nallamalais and reported 743 taxa. Raghava Rao (1989) studied the Flora of Mahabubnagar district collected most of the plants from Nallamalais. Shali Saheb (2008) [37] studied the medicinal plants of Nallamalais and reported 501 taxa. Murthy and Benjamin (2008) [27] made a critical study on floristic of Nagarjuna Sagar Tiger Reserve and reported 962 species. NRSA (2007) [28] using remote sensing and GIS has brought out an additional dimension to bio-resources management perspective. They recorded 252 economically important species from Eastern Ghats of Andhra Pradesh as a part of the Phase II biodiversity project including 123 trees. They also reported 261 medicinally important species and their indicative uses covering 93 tree species. Most of the above-mentioned works are done in Nallamalais of Andhra Pradesh except Raghava Rao.

b) Quantification studies

Vegetation mapping and monitoring is a primary requirement for management and planning activities at the local, modeling species distribution using environmental surrogates of known locations planning, when primary information is lacking (Anderson and Meyer, 2004) [1]. Association of a particular species with specific environmental conditions has been documented (Colding and Folke, 1997; Hubbell, 989) [6,], but quantitative analysis have been possible only recently (Cullen *et al.,* 2001) with advent of new tools, as well as availability of continuous spatial data on various environmental parameters (Keer and Ostrovsky, 2003).

Sampling inventories

Many quantitative ecological methods have been proposed to study plants of ethno botanical importance by Johns *et al.* (1990), Moerman (1991) [25] and Cotton (1997). Dallmeier (1992) opined that floristic inventories and studies on forest dynamics usually rely on sampling plots. He monitored various types of primary and secondary tropical forests through plotting method in biosphere reserves of Bolivia, Peru, Peurto Rico, US Virgin Islands and other sites. The effects of plot size and the influence of plot shape on the estimates of plant diversity were assessed by Kilburon (1966), Greg-Smith (1983) and Laurance *et al.,* (1998) respectively. Van Claster *et al.,* (2008) laid 255 plots of 10x10m for study the over storey and under storey. Zakaria *et al.,* (2009) analyses the plant communities from six study plots within the Penang Forest Reserves, Malaysia, through a sampling size of 20mx20m.

In India, quantitative inventory studies were initiated by Rai (1981) by studying all trees ≥10cm dbh in four plots of different sizes at Devimane, Malimane, Kodkami and Katleken areas of Western Ghats. Quantitative studies have been made through belt transect method in Chocopo tribe area in Northern Bolivia by Boom (1989) [3]. Most of the studies have followed the plot methods including square plots of 100mx100m (Gentry, 1988) [14]; 10mx10m (Shali Saheb, 2008) [37] to rectangular plots 10x1000m by Boom (1989) [3]. Kharkwal *et al.,* (2005) [20] examined the phytodiversity and growth form in relation to altitudinal gradient in the Central Himalayan (Kumaun) region of India. Supriya Devi and Yadava (2006) [41] studied the diversity index of shrubs and herbs were found to be higher than the tree species in Manipur. Mukesh Kumar *et al.,* (2008) [26] worked on sub-tropical Sal forest of Doon valley with 1x1m quadrates.

Sahu *et al.,* (2007) [35] made a study in the dry deciduous forests of Boudh district of Orissa in Northern Eastern Ghats. They used a nested quadrate of size 5x5m for quantifying the shrubs, climbers and also herbaceous flora.

Kadavul & Parthasarathy (1999) [19] suggested that the variation in species richness of various forest types is not only determined by edaphic factors but also by their proximity to village and the plot dimensions. NRSA (2007) [28] sampled 4170 plots in Eastern Ghats with a quadrat size of 20x20m for trees, one 10x10m for shrubs and for herbs five, 1x1m for each plot. Shali Saheb (2008) [37] quantified the medicinal plant resources of Nallamalais in 0.3ha area. The plant diversity inventories in dry forests revealed a varied range of plant diversity owing to different study sites and field methodology – Sacred groves in southern Eastern Ghats have 158 tree species. Nallamalais of Andhra Pradesh and Telangana constitute 729 herbaceous and 249 tree taxa (Sadasivaiah, 2009; Basha, 2009) [34, 2] and stressed that Northern Nallamalais harbor good forest pockets with good number of endemic species. But due to overexploitation of medicinal plants, fuel wood collection, habitat destruction and grazing, may lead to

extinction of many valuable species. Thus several authors have stressed the need for better conservation of the dry forests and especially in Eastern Ghats which includes good portion of dry deciduous forests with rich plant wealth of medicinal and economic value (Ellis, 1987; Rawat, 1997) [11].

Study area

Nallamalais are present in the southern parts of Eastern Ghats. Eastern Ghats are a discontinuous range of mountains along India's eastern coast. Southern Eastern Ghats in Andhra Pradesh comprises of a chain of ancient low hills that harbour tropical Moist deciduous, Dry deciduous forests and scrub (Champion and Seth, 1968) [5]. Geologically southern Eastern Ghats is made up of quartzite and slate formations with red, mixed red, black and lateritic soil and the forests in this area are unique in their composition specific to the rock formations. Nallamalais is one of the 234 Centres of Plant Diversity of the world identified worldwide (Davis *et al.,* 1995) [10]. Northern Nallamalais are situated north part of the river Krishna and are a group of moderately steep hills, encompassing major parts of Nagarkurnool district and in small patches in Nalgonda districts of Telangana. A thorough perusal of literature has revealed that the study area is currently known to harbour over 500 plant species. The local Chenchu tribe has rich traditional botanical knowledge is currently using over 250 plant species for curing different ailments. Despite the ecological and economic importance of the forests of Northern Nallamalais, no full-fledged quantification studies have been taken up so far to analyze the resource availability, and their conservation, and hence the present work has been taken up in Nallamalais.

Materials and methods

The present study aims at a first ever systematic attempt towards a fine scale assessment of the plant resources of Northern Nallamalais of Nagarkurnool district of Telangana state based on filed explorations and random sampling method.

a) Floristic studies

Before initiating the field work, a check list of plant taxa of Northern Nallamalais was prepared based on past literature and herbarium Further a through perusal of literature was done referring almost all recent publications published on plant taxa with references to taxonomy, quantification, economic importance plants of Nallamalais of Telangana state (Pullaiah, 2016, Reddy, 2002; Shali, 2008; Murthy and Benjamin, 2008; Reddy *et al.,* 2008) [29, 31, 37, 27, 32].

Inventory of plant resources

a) Quantitative studies

The field work plan carried out in Nallamalais of Telangana. A total of 2 hectare area of Northern Nallamalais was sampled by lying of 50 quadrates in the study area. Each quadrate size is 20×20m. All the life forms of plants such as trees, shrubs, climbers and herbs were enumerated. All trees with 10-30cm and ≥ 30 cm girth at 1.37m height (gbh) was enumerated in 20×20m quadrates, for multi stemmed trees girth was measured separately; shrubs and climbers in 5m×5m nested plot and herbs were studied in nested 1m×1m plot. The field work was carried out in two seasons to cover all the vegetation and phenology of trees.

Field work plan: 20X20 m^2 for trees, 5x5m^2 for shrubs, climbers and 1x1m^2 for herbs.

The quantitative characters of the plant species like abundance (A), density (D), frequency (F) was calculated for each species following Curits and Cottom (1956), Mueller- Dombois and Ellenberg (1974).

$$\text{Abundance} = \frac{\text{Total number of individuals in all sampling units}}{\text{Total number of sampling units in which species occur}}$$

$$\text{Density} = \frac{\text{Total number of individuals in all sampling units}}{\text{Total number of sampling units studied}}$$

$$\text{Frequency} = \frac{\text{Number of sampling units in which species occur}}{\text{Total number of sampling units}} \times 100$$

Importance Value Index (IVI)

It is the sum of relative values of any three quantitative characters: relative abundance (RA), relative density (RD) and relative frequency (RF). These quantitative characters are calculated for each species following Curits and Cottom (1956). IVI was calculated to known the dominant species in a community. IVI was computed by using the following formulae;

IVI = Relative Abundance + Relative density + Relative frequency

$$RA = \frac{\text{Abundance of the individual species}}{\text{Sum of abundance value of all species}} \times 100$$

$$RD = \frac{\text{Density value of the individual species}}{\text{Sum of density value of all species}} \times 100$$

$$RF = \frac{\text{Frequency value of the individual species}}{\text{Sum of frequency value of all species}} \times 100$$

Only the top 50 high IVI taxa are presented in the form of table and top 10 taxa are graphically represented.

A/F ratio (Distribution Pattern)

The distribution pattern of the species is interpreted based on Curtis & Cottam (1956). The pattern is determined by calculating the abundance to frequency ratio (A/F). Accordingly, if the value is <0.025, the dispersion of the species is considered regular; 0.025 to 0.05 for random dispersion and >0.05 represents the contagious dispersion pattern.

Diversity indices

Species diversity indices namely Shannon-Wiener index (Shannon and Weiner, 1962) [38], Simpson index (Simpson, 1949) [39] and Margalef Index (Margalef, 1980) [24] were calculated.

Simpson index

It is a measure of dominance since it weighted towards the abundances of commonest species. It is estimated by using following formula:

$D = \sum (ni/N)^2$ or Pi^2

Shannon-Wiener index

It is a measure of the average degree of 'uncertainty' in predicting to what species an individual chosen at random from a collection of S species and N individuals will belong. It is estimated by using following formula:

$H' = -\sum (ni/N) \ln (ni/N)$

Where, ni = number of individuals belonging to the ith species
N = Total number of individuals in the sample.

Results and discussion

SHRUBS

The total number of individuals (TNI), number of quadrates in which species occurred, and the quantitative characters like abundance (A), density (D), frequency (F), relative abundance (RA), relative density (RD), relative frequency (RF) and importance value index (IVI) of shrubs are given in Table-1.

Abundance

The total number of individuals (TNI) of shrubs in the study site was 606. The total abundance value for all the 37 shrubs is 210.22, with an average of 5.68. The highest abundance was recorded for *Barleria strigosa* (21) and lowest abundance was recorded for *Dendrocalamus strictus* (1.0).

Density

The total density of 37 taxa is 12.12, with an average of 0.32. The highest density value was recorded for *Grewia hirsuta* (2.12) and the lowest density was recorded for *Dendrocalamus strictus* (0.02).

Frequency

The total frequency for all the shrubs is 192, with an average of 5. The high frequency value was recorded for *Grewia hirsuta* with 30 and least frequency was observed in 18 taxa with 2 (e.g. *Indigofera cassioides*).

Importance Value Index (IVI)

Importance Value Index of individual shrubs encountered in the sampled quadrates of Northern Nallamalais revealed that, *Grewia hirsuta* (36.51) is the most important species followed by *Lanatana camara* (29.09) and *Phoenix louririi* (23.17). The lowest IVI value 1.68 was observed for *Dendrocalamus strictus.* The top 10 dominant IVI shrubs are presented in Fig. 1.

Diversity indices

The Sipmpson Index is 0.9198, Shannon-Wiener Index is 2.923 and Margalef Index is 5.618.

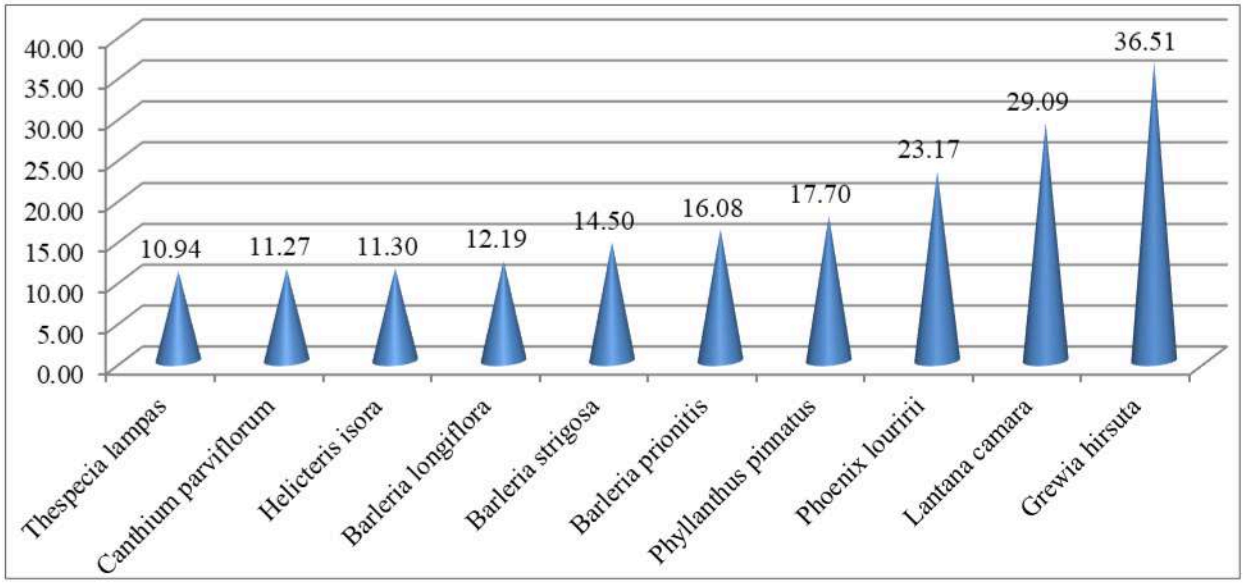


Fig 1: Top 10 IVI shrub species

Table 1: Phytosociological attributes of Shrubs

S. No.	Name of the taxon	TNI	Q	A	D	F	RA	RD	RF	IVI	A/F
1	*Abelmoschus ficulneus*	2	1	2.00	0.04	2	0.95	0.33	1.04	2.32	1.00
2	*Bambusa arundinacea*	13	2	6.50	0.26	4	3.09	2.15	2.08	7.32	1.63
3	*Barleria longiflora*	28	3	9.33	0.56	6	4.44	4.63	3.13	12.19	1.56
4	*Barleria prionitis*	40	3	13.33	0.8	6	6.34	6.61	3.13	16.08	2.22
5	*Barleria strigosa*	21	1	21.00	0.42	2	9.99	3.47	1.04	14.50	10.50
6	*Bridelia montana*	3	1	3.00	0.06	2	1.43	0.50	1.04	2.96	1.50
7	*Brynaea vitis-ideae*	4	2	2.00	0.08	4	0.95	0.66	2.08	3.70	0.50
8	*Canthium parviflorum*	25	4	6.25	0.5	8	2.97	4.13	4.17	11.27	0.78
9	*Carissa spinosum*	2	1	2.00	0.04	2	0.95	0.33	1.04	2.32	1.00

10	*Cassia auriculata*	3	1	3.00	0.06	2	1.43	0.50	1.04	2.96	1.50
11	*Catunaregum spinosa*	6	1	6.00	0.12	2	2.85	0.99	1.04	4.89	3.00
12	*Chomelia asiatica*	12	3	4.00	0.24	6	1.90	1.98	3.13	7.01	0.67
13	*Dendrocalamus strictus*	1	1	1.00	0.02	2	0.48	0.17	1.04	1.68	0.50
14	*Desmodium pulchellum*	12	2	6.00	0.24	4	2.85	1.98	2.08	6.92	1.50
15	*Dichrostachys cinerea*	2	1	2.00	0.04	2	0.95	0.33	1.04	2.32	1.00
16	*Dodonaea viscosa*	20	2	10.00	0.4	4	4.76	3.31	2.08	10.15	2.50
17	*Euphorbia cauducifolia*	2	1	2.00	0.04	2	0.95	0.33	1.04	2.32	1.00
18	*Grewia hirsuta*	106	15	7.07	2.12	30	3.36	17.52	15.63	36.51	0.24
19	*Grewia rothii*	4	2	2.00	0.08	4	0.95	0.66	2.08	3.70	0.50
20	*Grewia villosa*	4	2	2.00	0.08	4	0.95	0.66	2.08	3.70	0.50
21	*Helicteris isora*	16	1	16.00	0.32	2	7.61	2.64	1.04	11.30	8.00
22	*Indigofera cassioides*	2	1	2.00	0.04	2	0.95	0.33	1.04	2.32	1.00
23	*Lantana camara*	77	13	5.92	1.54	26	2.82	12.73	13.54	29.09	0.23
24	*Melhania hamiltoniana*	4	2	2.00	0.08	4	0.95	0.66	2.08	3.70	0.50
25	*Mimosa prainiana*	3	1	3.00	0.06	2	1.43	0.50	1.04	2.96	1.50
26	*Murraya koenigii*	20	2	10.00	0.4	4	4.76	3.31	2.08	10.15	2.50
27	*Osyris quadrifdata*	2	1	2.00	0.04	2	0.95	0.33	1.04	2.32	1.00
28	*Phoenix louririi*	66	8	8.25	1.32	16	3.92	10.91	8.33	23.17	0.52
29	*Phyllanthus pinnatus*	45	3	15.00	0.9	6	7.14	7.44	3.13	17.70	2.50
30	*Scutea myrtina*	12	1	12.00	0.24	2	5.71	1.98	1.04	8.73	6.00
31	*Solanum melangina var.incanum*	2	1	2.00	0.04	2	0.95	0.33	1.04	2.32	1.00
32	*Solanum pubescens*	4	1	4.00	0.08	2	1.90	0.66	1.04	3.61	2.00
33	*Sophora interupta*	4	1	4.00	0.08	2	1.90	0.66	1.04	3.61	2.00
34	*Thespecia lampas*	22	5	4.40	0.44	10	2.09	3.64	5.21	10.94	0.44
35	*Triumfetta rhomboidea*	5	2	2.50	0.1	4	1.19	0.83	2.08	4.10	0.63
36	*Urena lobata*	4	1	4.00	0.08	2	1.90	0.66	1.04	3.61	2.00
37	*Woodfordia fruiticosa*	8	3	2.67	0.16	6	1.27	1.32	3.13	5.72	0.44
		606		210.22	12.12	192	100.00	100.17	100.00	300.17	

TNI- Total Number of Individuals, Q- Number of quadrates, A- Abunadance, D- Density, F- Frequency, RA- Relative Abundance, RD- Relative Density, RF- Relative Frequency, IVI- Importance Value Index, A/F- Abundance/Frequency Ratio.

Conclusions and further scope to study

The field observations have strengthened that the herbs are habitat specific. Quadrates possessing high diversity in trees have registered greater diversity of herbaceous taxa along with diverse conditions of mechanisms to survive and disperse. Forests that are relatively undisturbed seem to possess these varied habitat conditions more. More upon certain specific areas should be with limited human and grazing animal's disturbance to conserve these taxa.

Ex-situ maintenance is one of the strategies to conserving the plants. This is mainly in gardens, germ-plasm banks. In the present investigation a total of 80 wild plants are conserving in Botanical garden of our college. A special care is being taken for maintenance of Orchid species. The following key strategies are proposed for effective conservation of plant resources in Nallamalais based on the present work sampling inventory.

1. State Forest department and GCC should ensure sustainable harvesting of medicinal plants. Towards this, intensive training programmes to be organized for tribal and other communities by governmental and non-governmental agencies for promoting awareness.
2. Focus immediate attention on the threatened plants identified as critically endangered by the forestry sector. The information in this regard will be communicated to Botanical Survey of India and IUCN by the investigator team.
3. *Ex situ* conservation of identified threatened species of Nallamalais should be maintained in Biodiversity Park near to Nallamalais and other botanical gardens of the state.
4. Regular monitoring of plant resources of the study area.
5. A highly coordinated action-oriented multi-disciplinary approach on plant resources conservation integrating the forest department, Non-Governmental Organizations, scientific bodies at universities and research institutions with the co-operation of local communities should be implemented.

Further scope

There is a need of indepth study of Disturbance factors that affecting the diversity of Nallamalais, regeneration capacity of trees, above ground biomass studies for trees, leaf litter composition, soil organic carbon, plant- animal interaction, ethnobotanical studies are reccomendable for the study area.

References

1. Anderson RP&E, Martinez-Meyer. Modeling species geographic distribution for preliminary conservation assessment an implementation with spring pocket mice (heteromys) of Ecuador. Biol. Conserv. 2004;116:167-179.
2. Basha SK. Diversity, Quantification and Conservation of Tree resources of Nallamalais, Andhra Pradesh. Ph.D. thesis submitted to Department of Botany, Sri Keishnadevaraya University, Anantapur, Andhra Pradesh, India, 2009.
3. Boom B. Use of plant resources by chacobo. Advances in Economic Botany. 1989;7:78-96.
4. CBD. Convention on Biodiversity, 2012. www.cbd.int/doc/publications/cbd_sustain_en.pdf

5. Champion HG, Seth SK. A Revised Survey of the Forest Types of India. Government of India Publication, New Delhi, India, 1968.
6. Colding J, Folke C. The relations among threatened species, their protection and taboos. Conserv. Ecol (online), 1997, 1-6. http://www.consecol.org /voll/iss1/art6
7. Cotton CM. Ethnobotany: Principles and applications. John wiley & Sons. Chi Chester, 1997.
8. Cullen LE, Stewart GH, Duncan RP, Palmer G. Disturbance and climate warming influences on New Zealand Nothofagus tree – line population dynamics J. Ecol. 2001;89:1061-1071.
9. Dallmeier F. Long term Monitoring of Biological Diversity in Tropical Forest areas, Methods for establishment and Inventory of permanent plots. MAB Digest. 11: UNESCO, Paris, 1992.
10. Davis SD, Heywood VH, Hamilton AC (eds.). Centres of Plant Diversity: A Guide and Strategy for Their Conservation. Volume 2: Asia, Australasia and the Pacific. Worldwide Fund for Nature (WWF) and IUCN (The World Conservation Union), IUCN Publications, University of Cambridge, 1995.
11. Ellis JL. Flora of Nallamalais. Vol.1. Fl. Ind. Ser. 3. Botanical Survey of India, Calcutta, 1987.
12. Ellis JL. Flora of Nallamalais. Vol.2. Fl. Ind. Ser. 3. Botanical Survey of India, Calcutta, 1990.
13. Forman L, Bridson D. (Ed.). The Herbarium Handbook. Royal Botanic Garden, Kew, 1989.
14. Gentry AH. Changes in plant community diversity and floristic composition on environmental and geographical gradients. Ann. Mo. Bot. Gard. 1988;75:1-34.
15. Greg-Smith P. Quantitative plant ecology. 3rd edn. Oxford, Blackwell, 1983.
16. Janzen DH. Management of habitat fragments in a tropical dry forest: growth. Annals of the Missouri Botanical Garden. 1988;75:105-116.
17. Jain SK, Rao RR. Hand Book of Field and Herbarium Methods. Today & Tomorrow Printers and Publishers, New Delhi, 1977.
18. Johns T, Kokwaro JO, Kimanani EK. Herbal remedies of the Luo of Siaya District, Kenya: establishing quantitative criteria for conservation. Economic Botany. 1990;44:369-381.
19. Kadavul K, Parthasarathy N. Plant diversity and conservation of tropical semi-evergreen forest in the Shervarayan hills of Eastern Ghats, India. Trop. Eco. 1999;40:247-260.
20. Kharkwal Geeta, Poonam Mehrotra, Rawat YS, Pangtey YPS. Phytodiversity and growth form in relation to altitudinal gradient in the Central Himalayan (Kumaun) region of India. Curr. Sci. 2005;89(5):873-878.
21. Keer JT, Ostrovsky M. From space to species: Ecological application for remote sensing. Trends Ecol. Evol. 2003;18:299-305.
22. Kilburon P. Analysis of the species-area relation. Ecology. 1966;47:831-843.
23. Lawrance WF, Ferreira LV, Merona JMR, Laurance SG. Rain forest fragmentation and the dynamics of Amazonian tree communities. Ecology. 1998;79:2032-2040.
24. Margalef R. The Biosphere between Thermodynamics and play. Editions Omega, Barcelona, 1980.
25. Moerman DE. The medicinal flora of native North America: an analysis. J. of Ethnopharmacology. 1991;31:1-42.
26. Mukesh Kumar G, Tripathi AK, Rajesh Kumar Manhas. Plant diversity and structure of sub-tropical *Shorea robusta* Gaertn. f. (Sal)forests of Doon valley, India. Indian Journal of Forestry. 2008;31(1):127-136.
27. Murthy GVS, Benjamin JHF. Nagarjunasagar-Srisailam Tiger Reserve. *In Floristic1 diversity of Tiger Reserves of India* (ed. Sanjappa, M., D.K. Singh, Paranjit Singh, Rajesh Copal) BSI, Kolkatta, 2008.
28. NRSA. Biodiversity characterization at landscape level in Eastern Ghats and East coast using satellite remote sensing and Geographical Information Systems. National Remote Sensing Agency. Department of Space & Department of Biotechnology, GOI, 2007.
29. Pullaiah. Flora of Telangana. The 29th state of India. Vol. 1-3. Regency Publications. New Delhi, 2016.
30. Raju RRV, Pullaiah T. Flora of Kurnool (Andhra Pradesh). Bishen Singh Mahendra Pal Singh, Dehradun, 1995.
31. Reddy Madhusudhana A. Grasses of Eastern Ghats of Andhra Pradesh, India. Ph, D. Thesis submitted to Sri Krishnadevaraya University, Anantapur, 2002.
32. Redddy CS, Ugle P. Survival threat to the Flora of Mudumalai Wildlife Sanctuary, India: An Assessment based on Regeneration Status. Nature and Science. 2008;6(4):42-54.
33. Reddy CS, Shilpa Babar, Giriraj A, Reddy KN, Thulsi Rao K. Structure and Floristic composition of Tree Diversity in Tropical Dry Deciduous Forest of Easten Ghats, Southern Andhra Pradesh. Asian Journal of Scientific Research. 2008;1(1):57-64.
34. Sadasivaiah B. Diversity, Quantification and Conservation of Herbaceous plant resources of Nallamalais, Andhra Pradesh. Ph.D. thesis submitted to Department of Botany, Sri Keishnadevaraya University, Anantapur, Andhra Pradesh, India, 2009.
35. Sahu SC, Dhal NK, Reddy CS, Chiranjjibi Pattanaik, Brahmam M. Phytosociological study of Tropical dry deciduous forest of Boudh district, Orissa, India. Research Journal of Forestry. 2007;1(2):66-72.
36. Santapau H. Botanical collector's Manual. Calcutta, 1955.
37. Shali Saheb T. Medicinal Plant resources and conservation in Nallamalis, Andhra Pradesh. Ph.D thesis. Sri Krishnadevaraya University, Anantapur, 2008.
38. Shannon CZ, Wiener W. The mathematical theory of communication. Univ. Illionis Press, Urbana, 1962.
39. Simpson EH. Measurement of diversity. Nature. 1949;163:688.
40. Singh KP, Singh JS. Certain structural and functional aspects of dry tropical forests and savanna. International Journal of Ecology Environmental Science. 1988;14:31-

45.
41. Supriya Devi L, Yadava PS. Floristic Diversity Assessment and Vegetation analysis of Tropical Semi Evergreen Forests of Manipur. Trop. Ecol. 2006;47(1):89-98.
42. Van Claster H, Lander Baeten, Kris Verheyen, Luc De Keersmaeker, Stijn Dekeyser, Jules E Rogister, *et al*. Diverging effects of overstorey conversion scenarios on the understorey vegetation in a former coppice-with-standards forest. For. Ecol. Manage. 2008;256:519-528.
43. Zakaria Rahmad, Asyraf Mansor, Nik Fadzly, Nik Rosely, Mashhor Mansor. Comparison of plant communities at six study plots in Penang forest reserves, Malaysis. Trop. Ecol. 2009;50(2):259-265.

Effect of Fire on Plant Diversity And Germination

[1]M. Manjula, [2] T. Shalisaheb

[1]Lecturer in Botany, [2]Associate Professor of Botany
Ravindra Degree College for Women, Kurnool.
Affiliated to Rayalaseema University, Kurnool.

[2]Govt. Degree College, Nandikotkur.
Affiliated to Rayalaseema University, Kurnool.

Abstract- **A forest fire is a natural disaster & poses a threat not only to the forest wealth but disturbs the biodiversity & the environment of a region. Fire are a widespread phenomenon in Indian forests. In India forest areas prone to forest fires annual range from 33% in some state to over 90% in others. Fire occur during early January to June each year with the highest fire frequency in March-April with the proliferation of forest fire in the study area it is necessary to understand the effect of fire on the diversity, regeneration. The burned forest had, in general much lower tree species than the fire free forest. This is due to recurrent fire in fire impacted area over the year. In sampled plots, in the post fire season of the 31 species, 16 species are found regeneration & 15 species with poor regeneration. Burned forests are valuable and should conserved with long term monitoring programs.**

Key words: Forest fire, Diversity, Regeneration. Fire impacted area, Conservation.

INTRODUCTION

A forest fire is a natural disaster and poses a threat not only to the forest wealth but disturb the bio-diversity and the ecology and environment of a region. Forests fires are as old as the forests themselves. Natural fires have been a disturbance of several ecosystems throughout evolution thus plants have adapted to this regime. Man-made fires have also coexisted in equilibrium with ecosystems for centuries, but the continuous increment in pressure on forests and unmanaged fire use by stakeholders, has led to adverse consequences for the diversity and structure of forests.

The occurrence of fires in the tropics is regular and frequent and they have been associated with the dynamics of tropical savannas (Budowski, 1956; Clayton, 1961). There are two types of forest fire- the surface fires, spreading along the ground as the surface litter (senescent leaves and twigs and dry grasses etc.) on the forest floor and is engulfed by the spreading flames and crown fires, in which the crown of trees and shrubs burn, often sustained by a surface fire. Most fires today are thought to be human-caused and are commonly considered to be a major cause of forest degradation.

Forests play a crucial role in climate change mitigation and adaptation. The burning of vegetation gives off not only carbon dioxide but also a host of other, noxious gases such as carbon monoxide, methane, hydrocarbons, nitric oxide and nitrous oxide, that lead to global warming and ozone layer depletion.

Fires are a widespread phenomenon in Indian forests. In India, forest areas prone to forest fires annually range from 33% in some states to over 90% in others. An estimated annual economic loss of Rs.440 crores is reported on account of forest fires over the country (Bahuguna and Singh, 2002).

In India, of the 63 million ha of forests, an area of around 3.73 million ha can be presumed to be affected by fires annually (Roy, 2003) and fires occur during early January to June each year with the highest fire frequency in March-April.

There is need to carry out operational fire monitoring and its impacts on biodiversity in India in response to concerns over the loss of forests and effects of widespread burning on global atmosphere since our knowledge on its causes, their effect on forest ecosystems is extremely limited.

With the proliferation of forest fires in the study area, it is necessary to understand the effects of fire on the diversity, regeneration, forests before and after it has been disturbed by fire. The key objective of the present study is to assess and compare the diversity patterns, regeneration in burnt and un-burnt plots of the study area.

REVIEW OF LITERATURE

IMPACTS OF FOREST FIRES

Sowmya and Somashekar (2010) developed forest fire risk zone mapping using remote sensing and at Bhadra wild life sanctuary in India. They are studied 6.59% area falls in the very high fire risk, followed by 3.72% in high fire risk, 32.34% in medium fire risk, 49.55% in low, 7.72% and 0.05% in water and built up area respectively.

FOREST FIRE-GLOBAL CLIMATE

Forest fires affect the global carbon cycle, and thus the climate, in three main ways (Kasischke and Stocks, 2000). First, fire releases large quantities of carbon into the atmosphere through the combustion of plant material and surface soil organic matter.

Second, fire-killed vegetation decomposes over time emitting carbon. Third, the vegetation on newly burned sites may not absorb as much carbon from the atmosphere as the decaying vegetation emits, or as much as the pre-fire vegetation absorbed, for several years or decades after a fire.

Some studies suggest universal increases in fire frequency with climate warming (Overpeak *et al.* 1990). According to Price and Rind (1994), 44% increase in lightning-caused fires with an associated 78% increase in area burned for the 2XCO2 scenario.

FIRE EFFECTS ON VEGETATION AND PLANT DIVERSITY

Forest function, structure and vegetation composition of any region is primarily influenced by forest fires (Flannigan *et al.*, 2005). Frequent disturbances such as fires may influence the relative abundance of species that are able to reproduce vegetatively, causing a shift in species composition, favoring species capable of vegetative reproduction (Hoffmann, 1998; Setterfield, 2002).

Forest fires affect vegetation by suppressing certain species and promoting other species causing changes in vegetation structure and altering successional pattern (Syaufina & Ainuddin, 2011).

The effects of fire on vegetation are often due to the independent or combined effects of fire-related cues, the immediate and obvious cues being heat and smoke (Paradesa, 2008). For fire-prone environments, dry heat has long been recognized as an effective cue for breaking dormancy in seeds of a number of species (Baskin and Baskin, 1998; Light and Van Staden, 2004).

FIRES ON PLANT GROWTH AND GERMINATION

Dry season fires are more destructive not only due to its intensity but also this period coincides with the time that woody plants higher moisture content, hence higher thermal conductivity and rapid transfer of heat to the interior of the plant tissues (Frost and Robertson 1977. Fire tends to favour those woody species which have protected meristems and below-ground reproductive organs and seeds that can survive fire and in which heat triggers germination (West, 1972; Everhan and Brokan, 1996).

In dry savannas, fires seldom occur frequently enough to limit the density of woody plants, though when they occur, often after prolonged period of above-average rainfall, mature woody plants may experience considerable mortality (Younes, 1986).

FIRE EFFECTS ON REGENERATION

According to Barlow *et al.*, (2003) there is a two-fold increase in mortality of large trees between 1 and 3 years from low-intensity fires in tropical forests. Sonali Saha and Howe (2003) observed in their experiments that low intensity ground fires killed seedlings (< 1 year old), resulting in a 30% decrease in seedlings diversity in burnt relative to unburned plots in Central India. Mohamed *et al.* (2011) found that regeneration of *Acacia origena* increased significantly after fire but in contrast, *Juniperus procera* was very sensitive to fire and most burned trees failed to recover or regenerate.

MATERIALS AND METHODS

Three-fold objectives of the present study are: to look at the plant diversity patterns and analyse regeneration of tree species in two selected fire-impacted areas (Mogilipenta and Tabellaru) in Ballapalle all located in Rajampeta Forest Division, Kadapa district, Andhra Pradesh . Rajampeta Forest division fall in Seshachalam hill ranges, Eastern Ghats of Andhra Pradesh.

STUDIES ON PLANT DIVERSITY AND REGENERATION

For the purpose of studying plant diversity patterns and tree regeneration in fire affected forest areas, two localities: Mogilipenta and Tabelleru were selected in Ballapalli Forest range, the former representing high-fire zone and the latter and no-fire zone. Geography and biotic interference factors of both the localities are presented in **Table 1a.**

SAMPLING DESIGN

TREES

Trees were enumerated in 4 plots of size 20 x 20m lay in four corners ((North-East, North-West, South-East and South-West) of 1000 x 1000m site area .

SHRUBS AND REGENERATION OF TREES

A total of 16 quadrates of 5 x 5m were laid within 1000 x 1000m site area for shrub, seedling and sapling enumeration: 4 quadrates in four within corner tree plots of 20 x 20m size; and one 5 x 5m quadrate for every 250m distance along the site border (total 12 quadrates).

HERBS/VINES

A total of 22 quadrates of size 1 x 1m were laid within 1000 x 1000m site area for herbaceous taxa enumeration: 4 quadrates within 4 corner shrub plots of 5 x 5m; 12 quadrates along the site border separated by 250m and 6 in the central portion of the sample site placed at a distance of 250m.

RESULTS AND DISCUSSION

For the purpose of studying plant diversity patterns and tree regeneration in fire affected forest areas, two localities: Mogilipenta and Tabelleru were selected in Ballapalli forest range, the former representing high-fire zone and the latter and no-fire zone. Both

destructive and non-destructive approach of biomass estimation has been done in three burnt and three unburnt sampling sites in Rajampeta Forest Division.

PLANT DIVERSITY OF THE SAMPLE PLOTS

In all the sampling plots laid for studying plant diversity, a total of 125 species belonging to 54 families were recorded. present systematic enumeration of plant taxa based on Bentham and Hooker's classification. Of these, 34 species were trees, 13 shrubs, 7 climbers and 71 herbs (**Table 2**). Contribution of herbs to the total species is high (56.8%), followed by trees (27.2%), shrubs (10.4%) and climbers (5.6%). Poaceae is the largest family with 28 species followed by Euphorbiaceae 9, Fabaceae 8 and Acanthaceae 6 species.

SPECIES DISTRIBUTION IN PRE-FIRE AND POST-FIRE SEASONS

In pre-fire season, in high fire zone, 44 species are recorded; in no fire zone, 74 species. In post-fire season, in high fire zone 55 species are recorded and no-fire zone, 88 species. It is clearly evident that species diversity is more in no-fire zone than in high fire zone (**Table 2**).

COMMON TO NO-FIRE AND HIGH-FIRE ZONES

A total of 26 plant species recorded common in no-fire and high fire zones in both the seasons.

EXCLUSIVE TO PRE-FIRE SEASON

Four species are exclusive to high-fire zone are: climber (1)-*Thunbergia fragrans;* herbs (3)-*Apocopis vaginata, Senecio tenuifolius,* and *Tragia involucrata* var. *angustifolia.*

EXCLUSIVE TO POST-FIRE SEASON

Twenty seven species are exclusive to no-fire zone

.In the present study, burned forest had, in general, much lower tree species richness than the fire-free forest (**Table 2**). In case of trees, of the 34 recorded,.

TREE REGENERATION

Regeneration is a key process for the existence of species in a community. Presence of seedlings and saplings of tree species in a forest is an indication of its regeneration and complete absence of seedlings and saplings is an indication of its poor regeneration. In the sampled plots, in the post-fire season, of the 31 species, 16 species are found with fair regeneration and 15 species with poor regeneration (**Table 4**). Absence of seedlings and saplings of some species in the forest area is attributed to their poor seed germination, establishment of seedlings and biotic pressure (**Fig. 1**).

Our observations have revealed that anthropogenic fires stunt the regeneration of many tree species, although its impact is less on species diversity. Change in species composition is accompanied by reduction in stature of regenerating tree species caused by anthropogenic fires to over and above due to seasonal drought. The dry deciduous forest showed a significant tendency of increase in the proportion of coppices with increased fire frequency. When comparing the inventories, it was found that the ability of species to re-sprout increased tremendously over time, independently of fire occurrence and vegetation type

CONCLUSIONS

In all the sampling plots laid for studying plant diversity, a total of 125 species belonging to 54 families were recorded. Of these, 34 species were trees, 13 shrubs, 7 climbers and 71 herbs. Poaceae is the largest family with 28 species. In pre-fire season, in high fire zone, 44 species are recorded; in no fire zone, 74 species. In post-fire season, in high fire zone 55 species are recorded and no-fire zone, 88 species. It is clearly evident that species diversity is more in no-fire zone than in high fire zone.

A total of 26 plant species recorded common in no-fire and high fire zones in both the seasons. Four species are exclusive to high-fire zone and no tree is recorded in this category. It is interesting to note that no tree species exclusively recorded in this season meaning that all trees recorded in the terrain have one or other level tolerance to fire. Twenty seven species are exclusive to no-fire zone including 8 trees. These species appear withstanding fire impact on their growth.

In the present study, burned forest had, in general, much lower tree species richness than the fire-free forest. This is due to recurrent fire in fire impacted area over the years. Trees slowly return by sprouting or from the seed bank but are dominated by grasses. Trees sprouts occur with low density and lower growth rate, but account for a significant part of the richness of the community.

Regeneration is a key process for the existence of species in a community. In the sampled plots, in the post-fire season, of the 31 species, 16 species are found with fair regeneration and 15 species with poor regeneration. *Buchanania axillaris, Ochna obtusata, Pterocarpus santalinus, Syzygium alternifolium, Terminalia alata* and *T. pallida* trees shown good regeneration compared with other trees. Our observations have revealed that anthropogenic fires stunt the regeneration of many tree species, although its impact is less on species diversity.

REFERENCES

1. Bahuguna Vinod K. and Satendra Singh (2002) Fire Situation in India. *Indian Forest Fire News* **(26):**23-27.
2. Barlow, J., Carlos A. Peres, Bernard O. Lagan and Torbjorn Haugaasen (2003) Large tree mortality and the decline of forest biomass following Amazonian wildfires. *Ecology Letters* **6**:6-8.
3. Baskin, C.C., Baskin, J.M. (1998) *Seeds: Ecology, Biogeography, and Evolution of Dormancy and Germination.* Academic Press, San Diego, California., 666 pp
4. Budowski, G. (1956) Tropical savannas, a sequence of forest felling and repeated burnings. *Turrialba* **6**, 23-33.
5. Clayton, W.D. (1961). Derived savanna in Kabba province, Nigeria. *Journal of Ecology*, 49: 595-604
6. Everhan, E.M and Brokan, N.VL. (1996) Fire and plants: population and community. Biology Series 14). *Botanic Review* **62**, 113-183.
7. FAO (2001) *Global Forest Resources Assessment*. FAO Forestry paper 140, Rome.
8. Flannigan, M.D., Amiro, B. D., Logan, K.A., Stocks, B.J. & Wotton, B.M. (2005) Forest Fires and Climate Change in the 21st Century. *Mitigation and Adaptation Strategies for Global Change. Forest Fires and Climate Change.* Canadian Forestry Association Teaching Kit 17-19.
9. Frost, P. and Robertson, F. (1977). The ecological role of fire in savannas. In (Ed. Walker) *Determinants of Tropical Savannas.* The International Union of Biological Sciences. IRL Press, Oxford.p. 93 – 140.
10. Hoffmann, W.A. (1998) Post-burn reproduction of woody plants in a neotropical savanna:the relative importance of sexual and vegetative reproduction. *Journal of Applied Ecology* **35:** 422-433.
11. Kasischke, E.S., and Stocks, B.J. (2000). Modelling of fire and ecosystem processes and the effects of climate change on carbon cycling in boreal forests. p. 347-355 in *Fire, Climate Change, and Carbon Cycling in the Boreal Forest*. E.S. Kasischke and B.J. Stocks (eds), Ecological Studies 138, Springer-Verlag, New York.
12. Light, M.E., van Staden, J. (2004) The potential of smoke in seed technology. *South African Journal of Botany* 70, 97-101
13. Mohamed Aref, Hashim Ali El Atta1 and Abdul Rahman Mohamed Al Ghamde (2011) Effect of Forest Fires on Tree Diversity and some Soil Properties. *International Journal of Agriculture and Biology* **13**:659:664.
14. Overpeck JT, Rind D, Goldberg R. (1990) Climate-induced changes in forest disturbance and vegetation. *Nature* **343 :** 51-53.
15. Roy, P.S. (2003) forest fire and degradation assessment using satellite remote sensing and geographic information system. *Satellite Remote Sensing and GIS Applications in Agricultural Meteorology* pp. 361-400.
16. Setterfield, S.A. (2002) Seedling establishment in an Australian tropical savanna: effects of seed supply, soil disturbance and fire. *Journal of Applied Ecology* 39, 949-959.
17. Sonali Saha and Henry F. Howe (2003) Species Composition and Fire in Dry Deciduous Forest *Ecology* **84** (12): 3118-3123.
18. Sowmya, S.V., and R.K.Somashekar (2010) Application of remote sensing and geographical information system in maping forestfire risk zone at Bhadra wild life sanctuary, India. *J. Environmental Biology* **31**: 969-974.
19. Syaufina and A.N. Ainuddin (2011) Impacts of Fire on South East Asia Tropical Forests Biodiversity: A Review. *Asian Journal of Plant Sciences* 10 (4): 238- 244.
20. Younes, T (1986) *Responses of Savannas to Streses and Disturbance.* Special Issue 10. International Biological. International Union of Biological Sciences.
21.

TABLE 1a: FEATURES OF SAMPLE SITES FOR PLANT DIVERSITY AND REGENERATION STUDIES

ZONES	HIGH-FIRE	NO-FIRE
Location	Mogillipenta	Tabelleru
Geo. coordinates	13° 46' 17.6" N 79°17' 14.3" E	13° 47' 47.6'' N 79° 14' 45.4'' E
Altitude	839 m	843 m
Forest Division	Rajampeta	Rajampeta
Forest Range	Balla palli	Balla palli
District	Kadapa	Kadapa
Edaphic factors		
Soil type	Loam	Loam
Soil color	Black	Black
Topographic factors		
Canopy	60%	80%
Slope	35°	10°
Biotic interference		
Lopping	Absent	Absent
Collection of litter	Absent	Absent
Grazing	Absent	Absent
Weeds	Low	Absent
Extraction	Absent	Absent
Encroachment	Absent	Absent
Foot paths/Roads	>25km	>15km
Cut stumps	Absent	Absent
Soil Removal	Absent	Absent
Fire	High	Absent

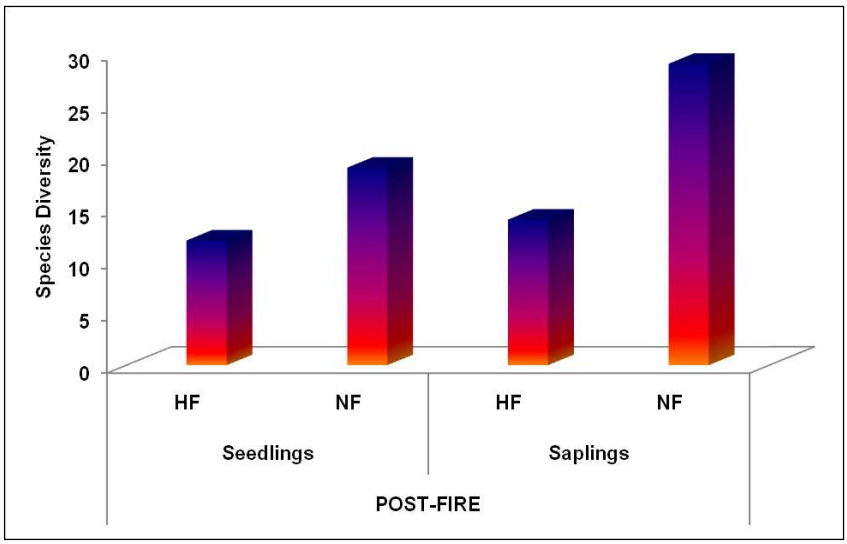


Figure -1: Regeneration of tree species diversity of post-fire season

TABLE 2: LIFE FORM WISE OCCURRENCE IN HIGH-FIRE AND NO-FIRE ZONES

S. No	NAME OF THE SPECIES	FAMILY	PRE-FIRE		POST-FIRE	
			HF	NF	HF	NF
TREES						
1	*Actinodaphne madraspatana*	Lauraceae	-	-	-	+
2	*Anogeissus latifolia*	Combretaceae	+	+	+	+
3	*Bridelia airy-shawii*	Euphorbiaceae	-	+	+	+
4	*Buchanania axillaris*	Anacardiaceae	+	+	+	+
5	*Careya arborea*	Lecythidaceae	-	+	-	+
6	*Casearia elliptica*	Flacourtiaceae	-	+	-	+
7	*Chloroxylon swietenia*	Flindersiaceae	-	-	-	+
8	*Cycas beddomei*	Cycadaceae	+	+	+	+
9	*Diospyros melanoxylon*	Ebenaceae	-	-	-	+
10	*Dolichandrone atrovirens*	Bignoniaceae	+	+	+	+
11	*Eriolaena hookeriana*	Sterculiaceae	-	-	-	+
12	*Erythroxylum monogynum*	Erythroxylaceae	-	-	+	+
13	*Gardenia gummifera*	Rubiaceae	+	+	+	+
14	*Glochidion velutinum*	Euphorbiaceae	-	-	+	+
15	*Helicteres isora*	Sterculiaceae	-	-	-	+
16	*Holarrhena pubescens*	Apocynaceae	-	+	-	+
17	*Madhuca indica*	Sapotaceae	-	-	-	+
18	*Memecylon edule*	Melastomataceae	-	-	-	+
19	*Miliusa tomentosa*	Annonaceae	-	+	-	+
20	*Ochna obtusata* var. *obtusata*	Ochnaceae	+	+	+	+
21	*Phoenix loureirii*	Arecaceae	+	+	+	+
22	*Phyllanthus emblica*	Euphorbiaceae	+	+	+	+
23	*Polyalthia cerasoides*	Annonaceae	-	+	-	+
24	*Pterocarpus santalinus*	Fabaceae	+	+	+	+
25	*Semecarpus anacardium*	Anacardiaceae	-	-	+	+
26	*Shorea tumbuggaia*	Dipterocarpaceae	-	+	-	-
27	*Suregada angustifolia*	Euphorbiaceae	-	+	-	+
28	*Syzygium alternifolium*	Myrtaceae	+	+	-	+
29	*Syzygium cumini*	Myrtaceae	-	-	+	+
30	*Tectona grandis*	Verbenaceae	-	-	-	+
31	*Terminalia alata*	Combretaceae	+	+	+	+
32	*Terminalia pallida*	Combretaceae	+	+	+	+

TABLE 3: TREE REGENERATION POST-FIRE SEASON

S. No.	Name of the species	POST-FIRE			
		Seedlings		Saplings	
		HF	NF	HF	NF
1	*Actinodaphne madraspatana*	0	0	0	4
2	*Anogeissus latifolia*	2	9	1	19
3	*Bridelia retusa*	0	3	3	20
4	*Buchanania axillaris*	36	13	58	40
5	*Careya arborea*	-	-	-	-
6	*Chloroxylon swietenia*	0	0	0	3
7	*Cycas beddomei*	0	3	5	32
8	*Diospyrus melanoxylon*	0	3	0	3
9	*Dolichandrone atrovirens*	0	0	0	3
10	*Eriolaena hookeriana*	0	0	0	1
11	*Erythroxylum monogynum*	6	0	6	2
12	*Gardenia gummifera*	14	8	17	20
13	*Glochidion velutinam*	1	1	4	3
14	*Helicteres isora*	0	0	0	8
15	*Holarrhena pubescens*	0	0	0	4
16	*Madhuca indica*	0	1	0	2
17	*Memecylon edule*	0	0	0	4
18	*Ochna obtusata*	43	22	42	50
19	*Phoenix loureirii*	-	-	-	-
20	*Phyllanthus emblica*	0	1	0	8
21	*Polyathia cerasoides*	0	1	0	1
22	*Pterocarpus santalinus*	18	22	22	37
23	*Semecarpus anacardium*	2	2	2	17
24	*Shorea tumbaggaia*	0	1	0	3
25	*Sygygium cumini*	0	0	0	2
26	*Syzygium alternifolium*	80	34	138	92
27	*Tectona grandis*	0	0	0	1
28	*Terminalia alata*	3	11	5	32
29	*Terminalia pallida*	26	8	53	25
30	*Wendlandia tinctoria*	2	6	2	21
31	*Ziziphus xylopyrus*	0	2	0	4
Total		**233**	**151**	**358**	**461**

HF-High Fire; NF-No Fire

International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Thermoacoustic Parameters of Some Liquid Mixtures of O-chloroaniline with F, NMF and N, N-DMF

N. Umamaheswara Reddy[1], T. Kalimulla[1],

[1]N. Umamaheswara Reddy, Department of Physics, Government Degree, College, Banaganapalle, AP, India.

[2*]Dr T. Kalimulla Department of Physics, Government Degree College, Nandikotkur, AP, India.

Abstract

In this study, the density (ρ), speed of sound (u), and viscosity (η) of the binary liquid mixtures of an industrially important solvent O-Chloroaniline (O-CA) with Formamide (F), N-Methylformamide (NMF) and N,N-Dimethyl formamide (N,N-DMF) have been measured over the entire composition range and From these experimental values, thermo-acoustic parameters like Z, K_s, V, L_f, V_f, π_i, H and τ are calculated at temperatures from T = 303.15, 308.15 and 313.15K at atmospheric pressure. These results were compared with literature values.

Keywords: Ultrasonic velocity, Density, Viscosity, Binary liquid mixture and Acoustic parameters.

Introduction

The speed of sound (U) density (ρ) and viscosity (η) of binary or ternary liquids are indispensable in most fluid mechanics, solution theory, molecular thermodynamics, and various methodical uses.[1-5] These values carry a significant role to elucidate the behavior of liquids and their mixtures.[6, 7] The analysis of excess functions and deviations from ideality is essential to interpret the interactions in the mixing process. Therefore, the assessment and forecast of these mixtures as functions of temperature and composition are of noticeable importance. Researchers are highly devoted to discovering the real causes of possible interaction of organic molecules in binary mixtures using physical property data.[8-10] We display ρ and η values in the pure state and for their binary systems of O-Chloroaniline (O-CA) with amides, formamide (F), N-Methylformamide (NMF), and N, N-dimethyl formamide (N, N-DMF) at T = (303.15 to 318.15) K and atmospheric pressure over the entire range of composition. All liquids are used for laboratory and industrial purposes. Here, the O-Chloroaniline liquid (O-CA) has been considered as first component, while the other amides liquids F, NMF, and N,N-DMF have been considered as second component. This work is part of our program to give information/data for the characterization of molecular interactions between solvents in binary systems.[11,12] The liquids were chosen for the present study on the basis of their medical and Industrial importance. O-Chloroaniline is Intermediate for rubber chemicals, pigments, pesticides and dyes. On the other hand, Formamide is an amide derived from formic acid used as a feedstock in the manufacture of formate esters, as an ionizing solvent, as an RNA stabilizer in gel electrophoresis, and in tissue preservation. More intriguingly, it may be a key compound in the origin of life on Earth. *N*-Methylformamide (NMF) is closely related to other formamides, not ably formamide and dimethyl formamide (DMF).However, industrial use and production of NMF are far less than for either of these other formamides. DMF is favored over NMF as a solvent due to its greater stability.NMF is mainly used as a reagent in various

organic syntheses with limited applications as a highly polar solvent.[13,14] *N*, *N*-Dimethyl formamide (DMF) Dimethyl formamide is odorless whereas technical grade or degraded samples often have a fishy smell due to impurity of dimethylamine. DMF is a polar aprotic solvent with a high boiling point. It facilitates reactions that follow polar mechanisms, such as SN_2 reactions. In the present study[15], our focus is on the study of liquid mixtures of substituted amides with O-Chloroaniline because there have been a few studies on these mixtures.[15-19] It is expected that there will be a significant degree of H-bonding in these binary mixtures.[20]

The liquid mixtures of O-CA+F (O-Chloroaniline + Formamide), O-C+NMF (O-Chloroaniline + N-Methylformamide), O-CA+N, N-DMF (O-Chloroaniline + N, N-Dimethyl formamide) are considered here and their U, ρ, η are measured using the relevant apparatus. From these experimental values, thermo-acoustic parameters like Z, K_s, V, L_f, V_f, π_i, H and τ are calculated. All the above said parameters were measured composition range and at 303.15, 308.15 and 313.15K.

The expression used to find the ultrasonic speed is

$$\mathbf{U = f * \lambda}\ ms^{-1}$$

Where, f is the frequency of the generator which is utilized to energize the quartz crystal. In the present examination, a steady frequency (2 MHz) interferometer was utilized and henceforth 'f' value is 2×10^6 hertz.

THERMO ACOUSTIC PARAMETERS

Different thermo acoustic parameters like, acoustic impedance (Z), isentropic compressibility (K_s), molar volume (V), free length (L_f), free volume (V_f), internal pressure (π_i), enthalpy (H) and relaxation time (τ) are calculated utilizing the experimentally determined values of U, ρ and η. Experimental and literature values of U, ρ and η are shown in table 1, 2 & 3.

TABLE.1

Examination of trial and writing estimations of ρ,η, U at 303.15 K.

Liquid	T/K	ρ . 10^{-3} /(kg.m^{-3})		η. 10^3 / (kg . m^{-1}. s^{-1})		U/ (m.s^{-1})		α (kK^{-1})	C_P (J $mol^{-1}K^{-1}$)
		Exp.	literature	Exp.	literature	Exp.	literature		
O-CA	303.15	1.2026	1.2026	3.8257	3.8256	1469.5	1469.6	---	131.6
F	303.15	1.1238	1.1237	2.8018	2.8018	1585.4	1585.4	0.9967	107.11
NMF	303.15	0.9947	0.9946	1.5860	1.5859	1408.6	1408.5	0.9967	124.95
N,N-DMF	303.15	0.9388	0.9386	0.7532	0.7485	1467.2	1469.8	0.9967	152.00

TABLE.2

Examination of trail and writing estimations of ρ,η,U at 308.15 K.

Liquid	T/K	ρ . 10^{-3} /(kg.m^{-3})		η. 10^{3} / (kg . m^{-1}. s^{-1})		U/ (m.s^{-1})		α (kK^{-1})	C_P (J $mol^{-1}K^{-1}$)
		Exp.	literature	Exp.	literature	Exp.	literature		
O-CA	308.15	1.1980	1.1980	3.4123	3.4122	1453.4	1453.3	---	133.8
F	308.15	1.1195	1.1194	2.4980	2.4980	1580.5	1580.6	0.9961	105.20
NMF	308.15	0.9902	0.9903	1.4624	1.4627	1400.64	1400.6	0.9961	126.05
N,N-DMF	308.15	0.9353	0.9357	0.7210	0.7210	1432.96	1433.2	0.9961	153.02

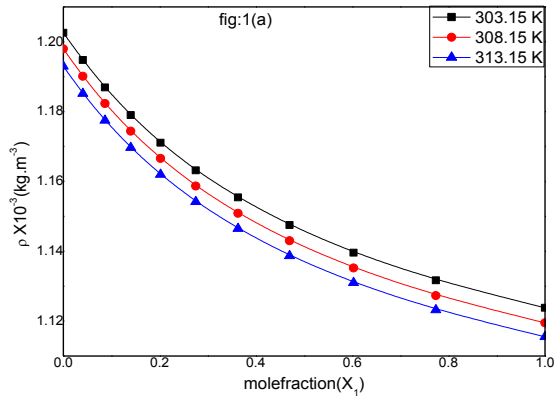
TABLE. 3

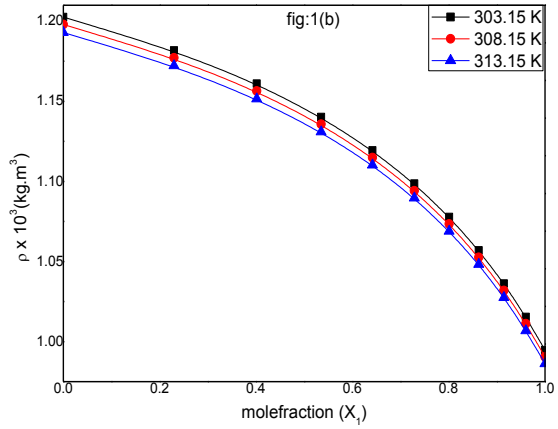
Examination of trail and writing estimations of ρ,η,U at 313.15 K.

Liquid	T/K	ρ . 10^{-3} /(kg.m^{-3})		η. 10^{3} / (kg . m^{-1}. s^{-1})		U/ (m.s^{-1})		α (kK^{-1})	C_P (J $mol^{-1}K^{-1}$)
		Exp.	literature	Exp.	literature	Exp.	literature		
O-CA	313.15	1.1930	1.1930	3.0606	3.0602	1435.3	1435.2	---	136.0
F	313.15	1.1155	1.1154	2.2435	2.2435	1572.0	1572.0	0.9998	108.56
NMF	313.15	0.9859	0.9861	1.3528	1.3520	1383.24	1382.5	0.9998	129.47
N,N-DMF	313.15	0.9304	0.9302	0.6923	0.6900	1418.12	1418.0	0.9998	157.14

RESULTS AND DISCUSSION

The liquid mixtures are chosen such that they contain O-CA as solute and F/ NMF/ N, N-DMF as solvents. The experimentally determined values of ρ, U, η along with the literature values for these parameters are given in tables1, 2 and 3. To find the molecular interactions strength, values of acoustic, thermodynamic and excess parameters were calculated. For the mixtures of O-CA+F, O-CA+NMF, O-CA+N, N-DMF, the experimental values of ρ, U, η are given in fig. 1(a, b, c) to fig. 3(a, b, c).Using these values, various parameters like Z, K_s, V, L_f, V_f, π_i, H and τ are calculated.





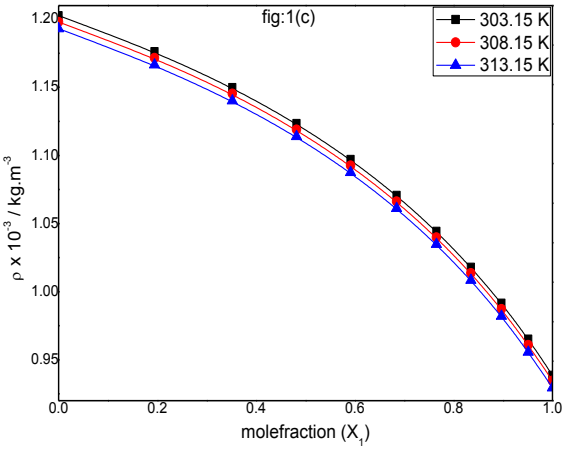


Fig. 1. Variation of ρ with mole fraction at various temperatures for (a) O-CA+F (b) O-CA+NMF(c) O-CA+N, N-DMF.

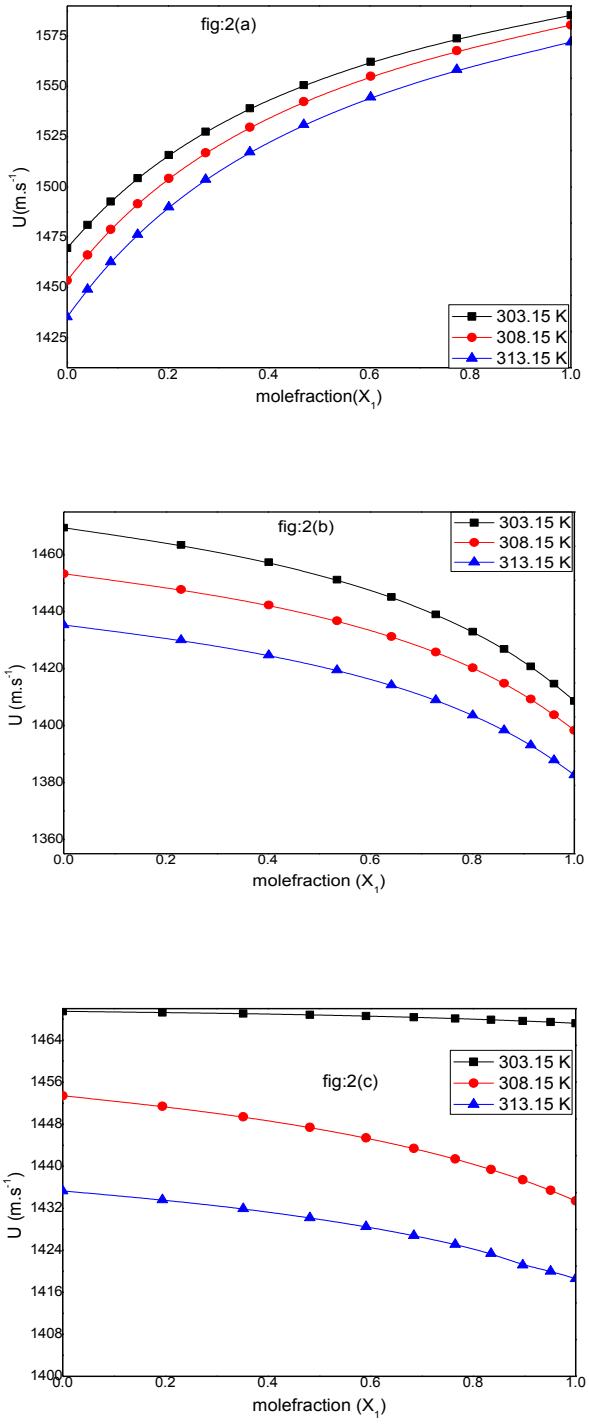


Fig. 2. Variation of U with mole fraction at various temperatures for (a) O-CA+F (b) O-CA+NMF(c) O-CA+N, N-DMF.

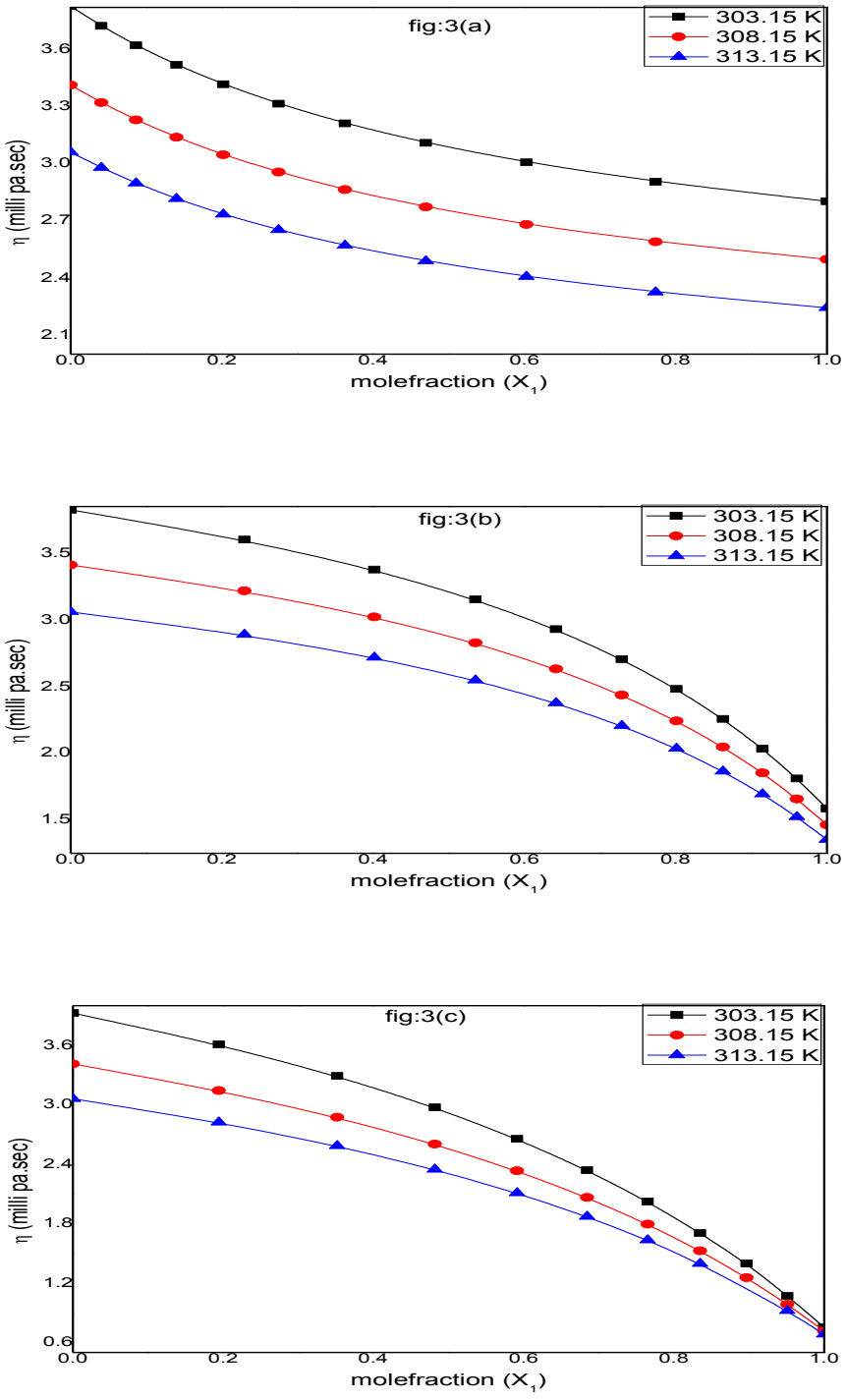


Fig. 3. Variation of η with mole fraction at various temperatures for (a) O-CA+F (b) O-CA+NMF(c) O-CA+N, N-DMF.

Speed of sound (U), Viscosity (η) and Density (ρ)

Figures 1(a, b, c) tell us that in all these liquid mixtures, the U values are increasing with rise in concentration of O-CA at the specified temperatures. The increasing U values indicate that, strong

molecular interactions are present among the molecules of liquid systems under study. The cause of these interactions may be forces due to dipole-induced dipole or due to hydrogen bonding. With the increasing temperature the U values are decreasing for all our mixtures. With the increasing temperature thermal agitation increases in the molecules of liquid, there by distance between the molecules increases and it causes the decrease in interactions. So the estimations of U are diminishing with expanding temperature.[20-26] We can also observe in fig.2 (a, b, c) and fig.3 (a, b, c) that the values ofρ, η are increasing with increasing concentration of O-CA in the liquids. The increasing values of ρ and η with increasing concentration of O-CA indicates the increase in magnitude of intermolecular interactions in these systems under study. The decrease in values of ρ and η with increasing temperature reflects the decrease in intermolecular forces due to thermal agitation in the liquid systems under consideration.

CONCLUSION

Ultrasonic speeds (U), viscosities (η) and densities (*ρ*) of formamide (F), N-Methylformamide(NMF) and N, N-dimethyl formamide (DMF) at different temperatures over the entire composition range have been measured. Examination of Table 2 shows that the speed of sound(U), density (p) and viscosity ***(η)*** of the pure amides follow the order at 303.15 K, F ***(****ρ* = 1.1237 g ~ cm - >~ N)M F (*ρ* = 0.9946 g ~ cm - >~ D)M F (*ρ* = 0.9386g~cm-~an)d F (η =2.8018mp.s)>NMF ***(***η = 1.5859mp.s) > DMF ***(***η = 0.7485 mp.s). The physical data suggest that F is extensively associated through H-bonding. NMF is also associated through H-bonding, but much less extensively, as can be understood by the existence of only one aminic hydrogen capable of H-bond formation and by the steric effect. Unlike these two amides, DMF is associated through weak physical forces, such as, dipole- dipole and dipole-induced dipole interactions. The results are used to qualitatively discuss specific interactions between unlike molecules.

References

1. Rama Rao G V, Viswantha Sarma AV and Rambabu C, Indian J. Pure Appl. Phys., 42 (2004),820
2. A.Nagarjuna, Shaik.Babu, K.Govinda rao, T.Kalimulla, Asian Journal of chemistry, 2018 30(9) 2008-2012.
3. Pandey J D, Rai R D, Shukla R K, Shukla A K and Mishra N, Indian J. Pure Appl. Phys., 31 (1993),84
4. S.Sreeharisastry, Shaik. Babu, T.Vishwam, Ha.Sie Tiong, Physics and chemistry of liquids, 52(2) (2014) 272-286.
5. S.Sreeharisastry, Shaik. Babu, T.Vishwam, Ha.Sie Tiong, J. Chem. Thermodyn., 68 (2014) 183-192.
6. Narendra K, Srinivasu Ch and Narayanamurthy P, J. Appl. Sci., 12 (2012) 136.
7. S.Sreeharisastry, Shaik. Babu, T.Vishwam, Ha.Sie Tiong. J. Therm. Analy. Calor., 116 (2014) 923-935
8. P. Nagababu, Shaik.Babu, Dheiver F. Santos , M. Gowrisankar, Chemical data collections, 2019 20(2) 100196.
9. Rodolfo R. Holanda, Dheiver F. Santos, Tatiana G. D. Da Silva, Shaik.Babu, Cesar C. Santana, Walisson J. Souza, Bulletin of Materials Science, 2019 42(3) https://doi.org/10.1007/s12034-019-1795-3
10. Dheiver F. Santos, Shaik.Babu*, Russian Journal of Physical Chemistry-A 2019 93(7) 1312-1316.
11. K. Govinda Rao, Shaik. Babu, Rasayan Journal of Chemistry, 2019 12(3) 1110-1116.

12. A.I. Vogel, Text Book of Organic Chemistry, fifth ed., John Wiley, New York, 1989.
13. Shaik Parveen Sulthana, M. Gowrisankar, Shaik.Babu, Dheiver Santos, International Journal of
14. Ambient Energy, 2019 https://doi.org/10.1080/01430750.2019.1673816.
15. T.Kalimulla, D.Das, M.Gowrisankar, K.Govindarao, Babu.Shaik, Rasayan Journal of Chemistry, 2019 12(4) 1909-1918.
16. D. Das, Shaik. Babu, S. Slama, N.O. Alzamel, F. Alakhras, N. Ouerfelli, Russian Journal of Physical Chemistry-A, 2019 93(13) 93-99.
17. T.Vishwam, K.Parvateesam, Shaik.Babu, S.Sreeharisastry, V.R.K.Murthy, Indian Journal of pure and applied physics, 2016 54 597-611.
18. Gonzalez-Salgado D, Tovar CA, Cerdeirina CA, Carballo E and Romani L, Fluid Phase Equilib., 199, (2002) 121.
19. T.Kalimulla, G. V. Gangadhara Rao, K.Govindarao, Shaik.Babu, Materials Today: Proceedings 5 (2018) 25850–25861
20. Neeti, S.K. Jangra, J.S. Yadav, Dimple, V.K. Sharma, Journal of Molecular Liquids 163 (2011) 36–45.
21. Shamim Akhtar, A. N. M. Omar Faruk And M. A. Saleh, *Phys. Chem. Liq.*,2001, Vol. 39, pp. 383-399.
22. Sk.Suriyashihab, K. Govindarao, M.Gnana Kiran, Shaik.Babu, Rasayan Journal of Chemistry, 2017 10(1)59-63.
23. M.W. Fort RJ, Adiabatic compressibilities in binary liquid mixtures, Trans Faraday Soc. 61 (1965) 2102–10.
24. S.Sreeharisastry, Shaik. Babu, T.Vishwam, K.Parvateesam, Ha.Sie Tiong, Physica-B, 2013 42040-48.
25. H. Salhi, Shaik.Babu*, A.A. Al-Arfaj, M.A. Alkhaldi, N.O.Alzamel, S. Akhtar, N. Ouerfelli, Rasayan Journal of Chemistry, 2016 ,9(4) 864-877.
26. H. Salhi, Shaik. Babu, N. Al-Eidan, N.H. Mekni, N. Al-Otaibi,K.Y. Alqahtani, N.A. Al-Omair, N. Ouerfelli, Mediterranean Journal of Chemistry, 2017 6(2) 33-41.

Some Properties Of Simple Ternary Semigroups

T.Sunitha[#1], Dr. G. Shobhalatha*[2] and Dr. U Nagi Reddy[#3]
[#1]Research Scholar, Dept. Of Mathematics, Rayalaseema University, Kurnool-518007
[#1]Lecturer in Govt. Degree college, Nandikotkur, Kurnool.
[*2]Professor, Dept. of Mathematics, Sri Krishnadevaraya University, Anantapur -515003
[#3]Asst. Professor ©, Dept. of Mathematics, Rayalaseema University, Kurnool -518007.

***ABSTARCT**: Completely simple semigroups was studied by P. R. Jones and simple ternary semigroups was studied by G. Sheeja and S. Sri Balaji in 2013. In this paper we considered Simple Ternary semigroups and we proved some proved their some properties. Mainly we prove that If $(T,.)$ is a ternary semi-group then T is left, right and lateral simple if and only if every fuzzy quasi ideal of T is a constant function.*

***Key Words:** Ternary Semigroup, Regular, Simple Semigroup, Ideals, Fuzzy Quasi ideal.*

1. INTRODUCTION:

A semi-group not containing proper ideals or congruences of some fixed type. Various kinds of simple semi-groups arise, depending on the type considered: ideal-simple semi-groups, not containing proper two-sided ideals (the term simple semi-group is often used for such semi-groups only); left (right) simple semi-groups, not containing proper left (right) ideals; (left, right) 0-simple semi-groups, semi-groups with a zero not containing proper non-zero two-sided (left, right) ideals and not being two-element semi-groups with zero multiplication; bi-simple semi-groups, consisting of one $\mathcal{D}$-class (cf. Green equivalence relations); 0-bi-simple semi-groups, consisting of two $\mathcal{D}$-classes one of which is the null class; and congruence-free semi-groups, not having congruences other than the universal relation and the equality relation. In 1932, Lehmer introduced the concept of a ternary semigroup. He investigated certain ternary algebraic structures called triplexes. Santiago developed the theory of ternary semigroups and semiheaps. He studied regular and completely regular ternary semigroups. The notion of quasi ideals and bi-ideals in ternary semigroups presented by Dixit and Dewan, Kar. Maity investigated congruences of ternary semigroups and Iampan studied minimal and maximal lateral ideals of ternary semigroups. In this paper, we proved some results on simple ternary semigroups.

Definition 1.1: A non-empty set T is said to be ternary semigroup if there exists a ternary operation $\cdot : T \times T \times T \to T$ written as $(a,b,c) \to a.b.c$ satisfies the following identity $ab(cde) = a(bcd)e = (abc)de$ for any $a,b,c,d,e \in T$.

Definition 1.2: A ternary semigroup T is said to be a ordered ternary semigroup if T is a ordered set with the relation "$\leq$" such that $a \leq b \Rightarrow aa_1a_2 \leq ba_1a_2$, $a_1aa_2 \leq a_1ba_2$ and $a_1a_2a \leq a_1a_2b$ for all $a,b,a_1,a_2 \in T$.

Definition 1.3: A non-empty subset A of a ordered ternary semigroup T is called a Left (lateral, right) ideal, of T if it satisfies following:

1) $TTA \subseteq A (ATT \subseteq A, TAT \subseteq A \, respectively)$
2) If $a \in A \,\&\, b \in T$ such that $b \leq a$ then $b \in A$.

Definition 1.4: Let X is a non empty set. A fuzzy set μ of the set X is a function $\mu : X \to [0,1]$.

Definition 1.5: Let $F(T)$ denote the set of all fuzzy sets in a ternary semigroup T . For A,B,C$\in F(T)$, $A \subseteq B$ and $B \subseteq C$ if and only if $A(x) \leq B(x)$ *and* $B(x) \leq C(x)$ in the ordering of [0,1], $\forall x \in T$.

Definition 1.6: A fuzzy set $A \in F(T)$ is said to be a fuzzy sub semigroup of a ternary semigroup T if $A(xyz) \geq \min\{A(x), A(y), A(z)\} \forall x, y, z \in T$.

Definition 1.7: A fuzzy set $A \in F(T)$ is said to be a fuzzy left (resp., lateral and right) ideal of a ternary semigroup T if $A(xyz) \geq A(z)$, (resp., $A(xyz) \geq A(x)$, and $A(xyz) \geq A(y)$) $\forall x, y, z \in T$.

Definition 1.8: Let f and g be two fuzzy subset of T , define the relation $\subseteq$ between f and g respectively as,

$f \subseteq g$ if $f(x) \leq g(x)$

$(f \cup g)(x) = \max\{f(x), f(y)\}$

$(f \cap g)(x) = \min\{f(x), g(x)\}, \forall x \in T$

Definition 1.9: A ternary semigroup T is called left (right/lateral) simple if for every left (right/lateral) ideal A of T, we have $A = T$.

Definition 1.10: An ternary semigroups $(T, .)$ is called left (right, lateral) regular. If for each $a \in T$ there exits $x, y \in T$ such that $a = a^3xy (a = xya^3, a = xa^3y)$. An ternary semigroup $(T, .)$ is called strongly regular if it is left, right & lateral regular.

Clearly, an ternary semigroup T is strongly regular if and only if ` $a \in TTa^3 \bigcap a^3TT \bigcap Ta^3T$ for every $a \in T$.

Definition 1.11: A ternary semigroup $(T, .)$ is called regular if for each $a \in T$ there exist $x \in T$ such that $a = axaxa.$. Equivalently, $a \in aTaTa$ for any $a \in T$.

Definition 1.12: An equivalence relation ρ on an ordered ternary semigroup T is called congruence if $(a,b,c) \in \rho$ implies $(acd, bcd) \in \rho, (cad, cbd) \in \rho$ for every $c, d \in T$.

Definition 1.13: A congruence ρ on T is called semi lattice congruence on T, if $(a, a^3) \in \rho$

Definition 1.14: A ternary semigroup T is called a semi lattice of left, right & lateral simple semigroup if there exists a semi lattice congruence ρ on T such that the $\rho -$ class $(x)\rho$ of T containing x is a left, right & lateral simple sub semi group of T for every $x \in T$.

Equivalently, there exists a semi lattice Y and a family $\{T_\alpha\}_{\alpha \in Y}$ of left, right and lateral simple sub semigroups of T such that

i. $T_\alpha \cap T_\beta \cap T_\gamma = \phi$ for each $\alpha, \beta, \gamma \in Y, \alpha \neq \beta, \beta \neq \gamma$;

ii. $T = U_{\alpha \in Y} T_\alpha$;

iii. $T_\alpha T_\beta T_\gamma \subseteq T_{\alpha\beta\gamma}$ for each $\alpha, \beta, \gamma \in Y$.

Definition 1.15: A ternary sub semigroup F of an ordered ternary semigroup T is called a filter of T if

1. $a, b, c \in T, abc \in F \Rightarrow a \in F, b \in F \,\&\, c \in F$;
2. $a \in F, T \ni c \geq a \Rightarrow c \in F$.

We denote by $N(a)$ the filter of T generated by $a (a \in T)$ and by "N" the equivalence relation on T defined by

$aNb \Leftrightarrow N(a) = N(b)$.

N is semi-lattice congruence on T.

2. Maine Results:

Lemma 2.1: Let T be an ordered ternary semigroup. Then T is Left (Right/Lateral) simple if and only if $TTa = T (aTT = T \;\; or \;\; TaT = T)$ for every $a \in T$.

Lemma 2.2: Let T be an ordered semigroup. If T is Left, Right and Lateral simple, then T is regular.

Proof: Let $a \in T$

By hypothesis, $T = aTT = TTa = TaT$

Then we have, $a \in aTT = aTTaTTa$

$= aTaTa$

$\therefore a = aTaTa$

It follows that T is regular.

Theorem 2.3: Let $(T, .)$ be a ordered ternary semigroup .Then T is left, right and lateral simple if and only if every fuzzy quasi ideal of T is a constant function.

Proof: Suppose that T is left, right and lateral simple ternary semigroup.

Let f be a fuzzy quasi ideal of T and $a \in T$.

We consider the set, $E_T = \{e \in T / e^3 = e\}$

Then E_T is non-empty.

There exist $x \in S$ such that $a = axaxa$. then we have,

$$(ax)^3 = axaxax$$
$$= axaxa$$
$$= ax$$

So, $ax \in E_T$.

1) f is a constant mapping on E_T.

Let $t \in E_T$. Then $f(e) = f(t)$ for every $e \in E_T$.

In fact, Since T is left, right and lateral simple .We have,

$$TTt = T, tTT = T \text{ and } TtT = T$$

Since $e \in T$, we have, $e \in TTt, e \in tTT$ and $e \in TtT$

So, there exist $x, y \in T$ such that $e = xyt, e = txy$ and $e = xty$.

Hence,

$$e^3 = eee = (xyt)(xyt)(xyt) = (xytxytx)yt$$
$$e^3 = eee = (txy)(txy)(txy) = t(xytxytx)y$$
$$e^3 = eee = (xty)(xty)(xty) = xt(yxtyxty)$$

And we have,

$$((xytxytx), y, t) \in A_{e^3}, (t, (xytxytx), y) \in A_{e^3} \text{ and } (x, t, (yxtyxty)) \in A_{e^3}.$$

Since f is a fuzzy quasi ideal of T,

we have

$$f(e^3) = ((f \circ T \circ T) \cap (T \circ T \circ f) \cap (T \circ f \circ T))(e^3)$$
$$= \min\{(f \circ T \circ T)(e^3), (T \circ T \circ f)(e^3), (T \circ f \circ T)(e^3)\}$$
$$= \min\{\bigvee_{p,q,r \in A_{e^3}} \min\{f(p), T(q), T(r)\}, \bigvee_{u,v,w \in A_{e^3}} \min\{T(u), T(v), f(w)\},$$
$$\bigvee_{i,j,k \in A_{e^3}} \min\{T(i), f(j), T(k)\}\}$$
$$= \min\{\min\{f(t), S(xytxytx), S(y)\}, \min\{S(xytxytx), S(y), f(t)\},$$
$$\min\{S(x), f(t), S(yxtyxty)\}\}$$
$$= \min\{\min\{f(t), 1, 1\}, \min\{1, 1, f(t)\}, \min\{1, f(t,)\}\}$$
$$= f(t).$$

Since $e \in E_T$, it follows that $e^3 = e$ and f is a fuzzy quasi ideal of T, and we have $f(e) = f(e^3)$.

Thus, $f(e) = f(t)$.

On other hand, Since T is left, right and lateral simple and $e \in T$, we have $TTt = T, tTT = T \text{ and } TtT = T$

Since, $t \in E_T \subseteq T$, as in the previous case we also have

$$f(t) \geq f(t^3) \geq f(e).$$

2) f is a constant mapping on T.

Let $a \in T$ then $f(t) = f(a)$ for every $t \in E_T$.

Since T is regular, there exist $x \in T$ such that $a = axaxa$.

Then,

$$(ax)^3 = (axax)ax$$
$$= a(xaxa)x$$
$$= ax(axax).$$

This implies that, $aax, xaa, axa \in E_s$

Then by (1), we have $f(aax) = f(t), f(xaa) = f(t)$ and $f(t)$.

$(aax)(axaxa)(axaxa) \geq axaxa \geq a$

Since, $(axaxa)(axaxa)(xaa) \geq axaxa \geq a$ *and*

$(axaxa)(axa)(axaxa) \geq axaxa \geq a$

We have $(aax, axaxa, axaxa) \in A_a$ & $(axaxa, axaxa, xaa) \in A_a$ and $(aax, axaxa, axaxa) \in A_a$.

Since f is a fuzzy quasi-ideal of s, we have

$$f(a) = ((f \circ T \circ T) \cap (T \circ T \circ f) \cap (T \circ f \circ T))(a)$$
$$= \min\{(f \circ T \circ T)(a), (T \circ T \circ f)(a), (T \circ f \circ T)(a)\}$$
$$= \min\{\bigvee_{p,q,r \in A_a} \min\{f(p), T(q), T(r)\}, \bigvee_{u,v,w \in A_a} \min\{T(u), T(v), f(w)\},$$
$$\bigvee_{i,j,k \in A_a} \min\{T(i), f(j), T(w)\}\}$$
$$= \min\{\min\{f(aax), T(axaxa), T(axaxa)\}, \min\{T(axaxa), T(axaxa), f(xaa)\},$$
$$\min\{T(axaxa), f(axa), T(axaxa)\}$$
$$= \min\{\min\{f(t), 1, 1\}, \min\{1, 1, f(t)\}, \min\{1, f(t), 1\}$$
$$= f(t).$$

On the other hand, since T is left, right, &lateral simple, we have

$TTa = T,\ aTT = T$ & $TaT = T,\ t \in TTa,\ t \in aTT$ & $t \in TaT.$

Then $t \leq uua,\ t \leq avv$ & $t \leq waw$ for some $u, v, w \in T.$

Then $(u, u, a) \in A_t, (a, v, v) \in A_t$ & $(w, a, w) \in A_t.$

Since f is a fuzzy quasi-ideal of T, we have

$$f(t) = ((f \circ T \circ T)(t), (T \circ T \circ f)(t), (T \circ f \circ T)(t)\}$$
$$= \min\{\bigvee_{x_1, y_1, z_1 \in A_t} \min\{f(x_1), T(y_1), T(z_1)\} \bigvee_{x_2, y_2, z_2 \in A_t} \min\{T(x_2), T(y_2), f(z_2)\}$$
$$\bigvee_{x_3, y_3, z_3 \in A_t} \min\{t(x_3), f(y_3), T(z_3)\}\}$$
$$= \min\{\min\{f(a), T(v), T(v)\} \min\{T(u), T(u), f(a)\} \min\{T(w), f(a), T(w)\}$$
$$= \min\{\min\{f(a), 1, 1\} \min\{1, 1, f(a)\} \min\{1, f(a), 1\}$$
$$= f(a).$$

Summarizing two cases above, we have shown that f is a constant function.

Conversely,

Let $a \in T$ since the set TTa is a left ideal of T, and so TTa is a quasi-ideal of T.

The characteristic function f_{TTa} of Tta is fuzzy quasi-ideal of T. By hypothesis, f_{TTa} is a constant function, that is there exist $c \in \{0,1\}$ such that $f_{TTa}(x) = c$ for every $x \in T$ .Let $aTT \subset T$ and t be an element of T such that $t \notin aTT$ .Then $f_{(aTT)}(t) = 0$.

Also since $a^3 \in TTa,\ f_{TTa}(a^3) = 1$, leading to a contradiction to the fact that f_{TTa} is a constant function thus $TTa = T$

Similarly, we can prove that $aT = T$ & $TaT = T$

Therefore T is left, right & lateral simple

Lemma 2.4: Let T be a ternary semigroup. Then the following statements are equivalent: $(x)NN$ is a left, right & lateral simple sub semi group of T for every $x \in T$

Lemma 2.5: A ternary semigroup $(T, .)$ is a semi lattice of left, right and lateral simple semigroup if and only if $(A) = A$ and

$ABC = BCA = CBA = CAB = BAC = ACB$ for all quasi-ideals ABC of T .

Theorem 2.6: Let $(T,.)$ be a ternary semigroup. Then S is a semi lattice of left, right and lateral simple semigroups if only if for every fuzzy quasi-ideal f of T, we have $f(a) = f(a^3)$ and $f(abc) = f(cba) = f(cab) = f(bca) = f(bac) = f(acb)$ for all $a,b,c \in T$

Proof: Let Y be a semi lattice and let $\{T_\alpha\}_{\alpha\in Y}$ be a family of left and right simple sub semigroups of ternary semigroup T such that

i. $T_\alpha \cap T_\beta \cap T_\gamma = \phi$ for each $\alpha,\beta,\gamma \in Y, \alpha \neq \beta, \beta \neq \gamma.$

ii. $T = U_{\alpha\in Y} T_{\alpha i}$

iii. $T_\alpha T_\beta T_\gamma \subseteq T_{\alpha\beta\gamma}$ for each $\alpha,\beta,\gamma \in Y$

Let f be a fuzzy quasi-ideal of T .Then we have

i. Let $a \in T$. Then $f(a) = f(a^3)$ indeed

It is sufficient to prove that T is strongly regular,

Since $a \in T = U_{\alpha\in Y} T_\alpha, \exists \alpha \in Y$ such that $a \in T_\alpha$. since T_α is left, right and lateral simple, we have

$T_\alpha = T_\alpha T_\alpha a$

$T_\alpha = aT_\alpha T_\alpha$

$T_\alpha = T_\alpha a T_\alpha$

Then we have $(aT_\alpha T_\alpha) = (aT_\alpha T_\alpha aT_\alpha T_\alpha a)$

$= (aT_\alpha aT_\alpha a)$

Since $a \in \alpha,$ we have $a \in (aT_\alpha aT_\alpha a),$ then there exists $x \in T_\alpha$ such that $a \leq axaxa.$ since $x \in (aT_\alpha aT_\alpha a)$

There exists $y \in T_\alpha$ such that $x \leq ayaya.$

Thus, $a \leq axaxa$

$\leq a(apa)a(apa)a$

$\leq a(apapa)a(apapa)a$

$\leq aa(aqaqa)apaaa(apaqaqaa)a$

$\leq aaa(qaaap)aaa(paqaq)a^3$

$\leq a^3(qa^3p)a^3(paqaq)a^3$

$\subseteq a^3T_\alpha a^3 T_\alpha a^3$

$\subseteq (a^3T_\alpha T_\alpha) \cap (T_\alpha a^3 T_\alpha) \cap (T_\alpha T_\alpha a^3)$

$\Rightarrow T$ is strongly regular.

ii. Let $a,b,c \in T.$

Then $f(abc) = f(bca) = f(cab) = f(cba) = f(bac) = f(acb) = f(bca)$

$(abc)^5 = abcabcabcabcabc$

$= Q(abcab)Q(cabca)Q(bcabc)$

$= Q(bcabc)Q(abcab)Q(cabca)$

$= [bcabc \cup (bcabcTT \cap TbcabcT \cap TTbcabc)]$

$[abcab \cup (abcabTT \cap TabcabT \cap TTabcab)]$

$[cabca \cup (cabcaTT \cap TcabcaT \cap TTcabca)]$

$\subseteq [bcabc \cup (bcabcTT][abcab \cup TabcabT)][cabca \cup TTcabca]$

$\subseteq (bcabcTt)(TabcabT)(TTcabca)$

$(\because bcT \subset T, Tab \subset T, Tca \subset T)$

$$\subseteq [bcaTt][TcabT][TTbca] \qquad \because RML = R \cap M \cap L$$
$$= (bcaTt) \cap (TcabT) \cap (TTbca)$$
$$\because (abc)^5 \in (bcaTT) \cap (TcabT) \cap (TTbca)$$

$\because$ f is quasi-ideal.

$$(f \circ T \circ T) \cap (T \circ f \circ T) \cap (T \circ T \circ f) \subseteq f \ \&$$
$$(f \circ T \circ T) \cap (T \circ T \circ f \circ T \circ T) \cap (T \circ T \circ f) \subseteq f$$
$$[(f \circ T \circ T) \cap (T \circ f \circ T) \cap (T \circ T \circ f)](abc)^5 \subseteq f(abc)^5$$
$$f(abc)^5 \geq \min\{(f \circ T \circ T)(abc)^5, (T \circ f \circ T)(abc)^5, (T \circ T \circ f)(abc)^5\}$$
$$= \min\{ \bigvee_{p,q,r \in A_{(abc)^5}} \min\{f(p), T(q), T(r)\}, \bigvee_{t,s,u \in A_{(abc)^5}} \min\{T(t), f(s), T(u)\},$$
$$\bigvee_{x,y,z \in A_{(abc)^5}} \min\{T(x), T(y), f(z)\}\}$$
$$= f(abc)$$
$$\therefore f((abc)^5) = f(abc).$$

REFERENCES

[1] R. Biswas, Fuzzy subgroups and anti fuzzy subgroups, Fuzzy Sets and System, 35 (1990), 121-124.

[2] A.H. Clifford and G. Peston , The algebraic theory of semigroups. Vol. I, American Mathematical Society 1961.

[3] V.N. Dixit and S. Dewan , A note on quasi and bi ideals in ternary semigroups, international journal of Mathematical Society, 18(3) (199), 501-508.

[4] T.K. Dutta and S. Kar, On regular ternary semirings, Advanced in Algebra and Related topics world scientific (2003), 343 – 355.

[5] S. Kar and P. Sarkar., Fuzzy quasi-ideals and fuzzy bi-ideals of ternary semigroups, Annals of Fuzzy Mathematics and Informatics.Vol. 4,2,pp. 407- 423, 2012.

[6] N.Kehayopulu, Fuzzy bi-ideals in semigroups, comment, Math. Univ. St. Pauli 28 (1979), 17 -21.

[7] U. Nagi Reddy and G. Shobhalatha, Some Characterizations Of Ternary Semigroups, September –2015, ISSN 2229-5518 IJSER © 2015 .http://www.ijser.org.

[8] U. Nagi Reddy and G. Shobhalatha, Ideals in Regular Po Γ-Ternary Semigroups, nternational Journal of Research in Engineering and Technology eISSN: 2319 - 1163 | pISSN: 2321-7308.

[9] U. Nagi Reddy, and G. Shobhalatha, Note on Fuzzy Weakly Completely Prime - Ideals in Ternary Semigroups, International Journal of Mathematical Archive-7(5), 2016, 193-198, ISSN 2229 – 5046, www.ijma.info

[10] U. Nagi Reddy, U. Meena Kumari, C.and Shobhalatha, G . Some Properties of Fuzzy Quasi ideals in Ternary Semigroups, International Journal of Development Research, Volume 7 Issue 12 Pages 17512-17518, December - 2017.

[11] U. Nagi Reddy, K.Rajani . and Dr. G. Shobhalatha, A Note on Fuzzy Bi-Ideals in Ternary Semigroups, Annals of Pure and Applied Mathematics Vol. 16, No. 2, 2018, 295-304 ISSN: 2279-087X (P), 2279-0888(online) Published on 17 February 2018 www.researchmathsci.org DOI: http://dx.doi.org/10.22457/apam.v16n2a5

[12] T Sunitha, Dr. U. Nagi Reddy, Dr. G. Shobhalatha,.and C. Meena Kumari.:Ternary semigroups T Satisfying the identity $aba = b$ for all $a, b \in T$, Journal of Computer and Mathematical 11 Sciences, Vol 10(4),780-786April 2019, ISSN 2319-8133.