Forest Resources, Diversity, Utilization and Conservation

Forest Resources, Diversity, Utilization and Conservation

Editor

Dr. Velmala Madhu

Assistant Professor

Department of Botany

Gopal Rao Patil Government Degree College, Bhainsa.

Paramount Publishing House

• NEW DELHI • HYDERABAD

Forest Resources, Diversity, Utilization and Conservation

First Edition - 2022

ISBN : 978-93-93259-95-0

Price: **Rs. 675/-**

Paramount Publishing House
Plot No: A-531, D.No: 4-32-521, Phase-1, Allwyn Colony, Kukatpally, Hyderabad, Ph: 7799000082

Sales Office

Hyderabad
Plot No: A-531, D.No: 4-32-521, Phase-1, Allwyn Colony, Kukatpally, Hyderabad, Ph: 7799000082

New Delhi
C/14, SDIDC Work Centre Jhilmil Colony, New Delhi-100095. Phone: 011-2162365.
paramountpublishers@gmail.com | alluriasr2005@yahoo.com
Published by Krishna Prasad Alluri for Paramount Publishing House and printed by him at Sai Thirumala Printers..

Contents

Studies on Essential Oil Extraction in Plectranthusamboinicus (lour.) Leaves and Evaluation of Antioxidant and Antimicrobial Activities

Silvy Mathew[1]*, Sreeja K[2]

[1]Assistant Professor, Post Graduate Department of Botany,
Vimala College (Autonomous), Thrissur, Kerala, India
[2]Post Graduate Department of Botany,Vimala College (Autonomous), Thrissur, Kerala, India
*Corresponding author : silvymathew@vimalacollege.edu.in

Abstract

Essential oils are complex volatile compounds, naturally synthesized by various parts of the plant during the secondary metabolism of plants. A wide range plants having the medicinal properties have been explored and used for the extraction of essential oils worldwide due to their antimicrobial properties the bacterial, fungal, and viral pathogens. Plectranthusamboinicus (Lour.) Spreng. is a perennial herb belonging to the family Lamiaceae which occurs naturally throughout the tropics and warm regions of Africa, Asia and Australia. The various bioactive compounds present in P.amboinicus is used for various ailments.

In this work, the studies were carried out in P.amboinicus using agar diffusion method for screening the most effective essential oils and agar dilution to determine the inhibitory concentration of essential oil. Antibacterial activity of essential oil is proven against Pseudomonas putida, Escherichia coli and Streptoccocus sp. Antibacterial activity is done by disc diffusion method. The results were observed in terms of IZ around the disc caused by diffusion of antibacterial properties from essential oil impregnated disc into the surrounding medium. Antioxidant property is evaluated using impregnated disc of essential oil in the test tubes with solution a graph along with standard is plotted against it using the data of optical density and based on percentage of DPPH inhibition activity of the solution.

Keywords: *Plectranthus,Lamiaceae,antioxidant, antimicrobial.*

Introduction

Plectranthus is a large genus, with more than 300 species from the family of Lamiaceae. It is a perennial herb belonging to the family Lamiaceae which occurs naturally throughout the tropics and warm regions of Africa, Asia and Australia. It has a rich diversity of ethnobotanical and medicinal uses. Several species of the genus possess interesting medicinal properties such as the extract of P. barbatus is used for the treatment of stomachache and as a pugitive, nausea and

ISBN: 978-93-93259-95-0

gastritis and intestinal spasms in Brazil. P. caninus, P. laxiflorus and P. barbatus are used in the treatment of teeth and gum disorders. It is also reported that P. amboinicus and P. barbatus are used to treat a wide range of diseases such as for the treatment of digestive system, skin conditions and allergies, infections and fever, genito-urinary conditions, pain, respiratory conditions and muscular-skeletal conditions (Lukhoba, 2006).

The production of essential oils and their utilization as potential natural sources for new phytomedicines could be of economic value (Khalid and Gohary, 2014). The leaves of the P.amboinicusare often eaten raw or used as flavoring agents, or incorporated as ingredients in the preparation of traditional food. The literature survey revealed the occurrence 76 volatiles and 30 non-volatile compounds belonging to different classes of phytochemicals such as monoterpenoids, diterpenoids, triterpenoids, sesquiterpenoids, phenolics, flavonoids, esters, alcohols and aldehydes (Arumugam et al., 2016). The presence of various important constituents or secondary metabolites such as flavonoids, glycosides, phenols, tannins, and steroids, which have been identified through various spectroscopic methods (Punet& Kumar,2020). Chang et al., 2010 investigated therapeutic efficacy of P. amboinicus in treating Rheumatoid Arthritis (RA) using collagen-induced arthritis animal model.

There 26 compounds were identified by GC and GC-MS from the essential oil of P. amboinicus and studied its chemical composition and larvicidal potential against the malarial vector mosquito Anopheles stephensi by Senthilkumar and Venkatesalu, (2010). The major chemical compounds were carvacrol (28.65%) followed by thymol (21.66%). Goncalves et al., 2012 evaluated the antimicrobial activity of the essential oil, obtained from leaves of P.amboinicus, the minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC). The MIC and MBC of the essential oil were 0.09 ± 0.01%.Leaf extract of P. amboinicus is also subjected to synthesis of nickel oxide nanoparticles using nickel nitrate as the precursor. Also, it is showed a moderate positive effect in antibacterial test and a positive reaction in the antifungal activity against the fungal strain Candida (Ramesh et al., 2021).Hasibuan and Ilyas (2013) studied about the antioxidant and cytotoxic activities of P. amboinicus (Lour.) Spreng. Extracts. The antioxidant activity was tested using DPPH and Beta Carotene-Linoleic Acid methods.This plant is also subjected to the preparation of silver nanoparticles (Ag NPs) using its leaf extract. The synthesized Ag NPs showed better antimicrobial property towards gram negative E. coli and towards tested Penicillium spp. than other tested microorganisms using disc diffusion method (Ajitha et al., 2014, Chiu et al., 2012).

Materials and Methods

Fresh leaves of P. amboinicus are collected fromVallathol Nagar Grama Panchayat Cheruthuruthy, Thrissur. P. amboinicus commonly known Indian borage and it is a medicinal plant which comes under Lamiaceae. It is a fleshy, succulent herb with a distinctive taste and scent. It is known as panikoorka in malayalam and have other lesser known names, it shows

ISBN: 978-93-93259-95-0

fungicidal, insecticidal, antitumourous, antiinflammatory, antidiabetic along with antimicrobial and antioxidant activities. The leaves were cut into fine pieces using scissors and then they are weighed 100gms by using weighing machine. Plant collection was authenticated and avoucher specimen no. VCTBH0024 has been deposited at Vimala College (Autonomous), Thrissur.

Fig.1. Plectranthusamboinicusand extraction of essential oil

3.2. Essential oil distillation:

Extraction of essential oil from P. amboinicus is subjected to hydrodistillation method using clevenger apparatus for 3 hours. Plant material (leaves) was immersed directly in a round bottom flask filled with water. The pooled organic phases were anhydride sodium sulphate was used to remove water after the extraction. Essential oil was stored in air tight container in the refrigerator at -250C in sealed glass vials.

Antibacterial activity assay

Microorganisms used:

The following food-borne pathogens were used in their in the antibacterial test. Pseudomonas putida, Escherichia coli and Streptococcus sp. The strains are obtained from St. Mary's college, Thrissur. E.coli is a Gram-negative, facultative anaerobic, rod-shaped, coliform bacterium that is commonly found in the lower intestine of warm-blooded organisms. It causes food contamination. P. putida is a Gram-negative, rod-shaped, saprotrophic soil bacterium. The in vitro antibacterial

ISBN: 978-93-93259-95-0

activity of essential oil from P.amboinicuswas evaluated using an Agar disc-diffusion method (Manandhar et al., 2019) against selected two gram-negative pathogenic bacteria (Escherichia coli, Pseudomonas putida) and one gram positive bacteria Streptococcus sp.

The instruments used for the antibacterial activity were autoclaved at 121^0 C at 15 ibf pressure.1.3 gram of nutrient broth were weighed out, then dissolve broth in 100ml. 5 test tubes were inoculated with the strain of bacteria to this under aseptic conditions. Added 2.8 gram in 100 ml nutrient agar this nutrient agar and again autoclaved at 121^0 C at 15 ibf pressure. By using laminar air flow pour the nutrient agar solution to the sterilised petriplates. Next day inoculated each bacterial strain in to the petridishes by using an inoculation loop. On next day the disc were impregnated with the essential oil by dipping the extract followed by the drying the normal temperature.

A sterile (6mm diameter) impregnated with different concentrations of essential oil, was placed on the surface of each plate, and incubated for 24 hours at 370 C for bacteria. The essential oil were placed on disc by using a micropipette and firmly placed on to the inoculated agar ensuring even distribution to avoid overlapping of zones. The disc is impregnated with the antibiotic amoxicillin trihydrate were used to control sensitivity of the test organisms. The process is repeated in strains of bacteria. After 24 hours antibacterial activity was evaluated by measuring the diameter of the zones of inhibition against tested bacteria. The results of agar diffusion assays were evaluated by measuring the inhibition zone diameter (in mm), after incubation. All the experiments were carried out in triplicate and average and standard deviation (SD) were calculated for the inhibition zone diameters.

Determination of antioxidant activity

2, 2-diphenyl-2-picrylhydrazyl hydrate assay (DPPH assay)

Radical scavenging activity of essential oil against stable DPPH (2, 2-diphenyl-2-picrylhydrazyl hydrate, Sigma-Aldrich Chemie, Steinheim, Germany) was determined by using a spectrophotometer. When DPPH reacts with an antioxidant compound, which can donate hydrogen, it is reduced. The changes in colour were measured at 515 nm on a UV/visible light spectrophotometer. Radical scavenging activity of extracts was measured by slightly modified method of Brand-Williams et al., (1995), as described below. 1 ml of methanolic solution containing 0.198 mM of DPPH (2, 2-diphenyl 1-1- picrylhydrazyl) was added to 1 ml of various concentrations of the extracts and standard ascorbic acid. The absorbance of the mixture was measured at 517 nm with Labtronics NT 290 spectrophotometer after 30 min of incubation time at room temperature in the dark. The experiment was carried out in triplicate. Radical scavenging activity was calculated by the following formula:

$$\mathbf{1(\%) = (1-(As/Ac)) \times 100}$$

ISBN: 978-93-93259-95-0

Where Ac is the absorbance of the negative control and As is the absorbance of the sample. Absorption of blank sample containing the same amount of methanol and DPPH solution was prepared and measured daily.

Result and discussion

The use of essential oils with antimicrobial and antioxidant properties to increase the shelf life of food is a promising technology, and the essential oils of the Lamiaceae family, such as rosemary, thyme, and sage, have been extensively studied with respect to their use as food preservatives.

Antimicrobial activity

Antimicrobial studies, carried out with the agar disc diffusion test, showed that the essential oils of P. amboinicus exihibited activity against gram negative bacteria tested. The test provided positive result for two species of gram negative bacteria (P.putida, E. coli). The inhibitory zone diameter is maximum for E.coli (20cm). The result of agar diffusion assays were evaluated by measuring the inhibition zone diameters (in cm), after incubation. All the experiments were carried out in triplicate and average and standard deviation were calculated for the inhibition zone diameters. Antimicrobial studies, carried out with agar diffusion test,showed that the essential oils of P. amboinicus exihibited significant activity against gram negative bacteria of two different species with highest Escherichia coli.

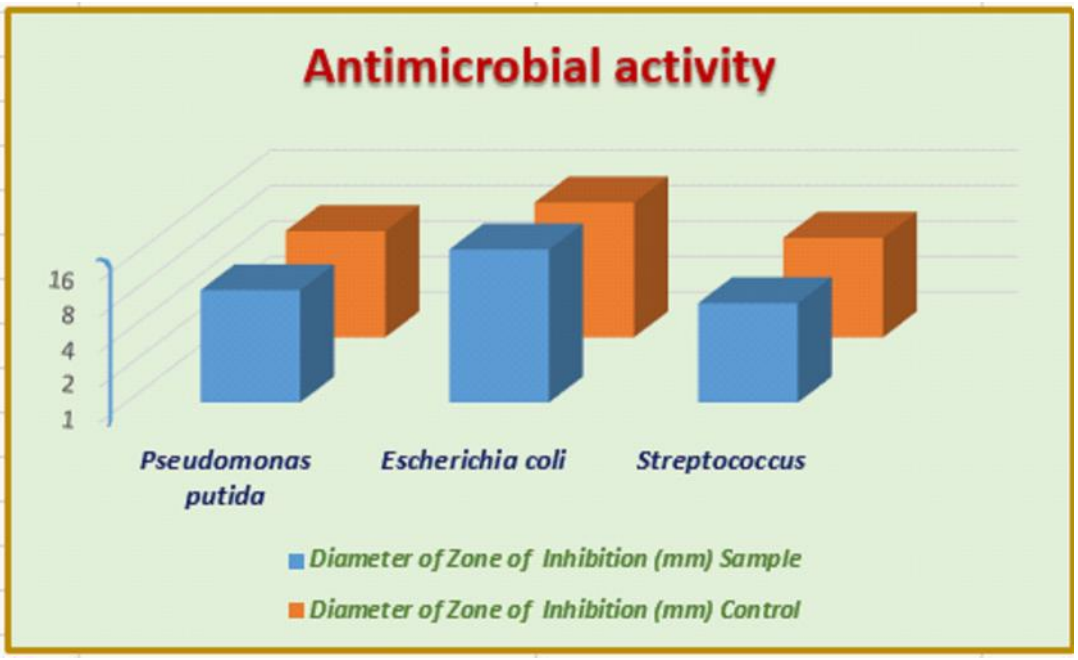


Fig.2. Antimicrobial activity of essential oil of P. amboinicus

ISBN: 978-93-93259-95-0

These results showed that P.amboinicus can be used in traditional medicine. Literature shows that there are many reports regarding the studies of antimicrobial potential of medicinal plants. For example, the essential oil of P. neochilus (PN-EO) which is hydrodistillated using essential oil of P.neochilus displays promising antimicrobial activity against some cariogenic bacteria, including Streptococcus mutans, which is one of the main causative agents of dental caries. In the present study it reveals that the essential oil from P.amboinicus showed maximum activity against E.coli (20 mm) and the least activity towards the gram positive bacteria Streptococcus (7mm). Taken together, our results suggest that this essential oil might be promising for the development of new oral care products. This confirms that Lamiaceae species are recognized by the presence of terpenoids with antifungal, antibacterial, and insecticidal actions.

Antioxidant activity

The DPPH radical is a widely used model to evaluate the antioxidant property of plant extracts. DPPH is a stable nitrogen-centered free radical, the colour of which changes from violet to yellow upon reduction by either the process of hydrogen or electron-donation. Substances which are able to perform this reaction can be considered as antioxidants and therefore radical scavengers.

Fig.3. The extracted oil from P. amboinicusand its antioxidant assay

The radical scavenging activity of the extracts of P. amboinicus at different concentrations is shown in table.1. In DPPH assay the ability of compound to act as donor for hydrogen atom or electron was measured spectrophotometrically. Reduction capacity of DPPH radical is obtained by decrease in its absorbance at 515nm.

Table.1. DPPH free scavenging activity of essential oil from Plectranthusamboinicus

SL NO	CONCENTRATION	OD VALUE
1	1	0.667
2	2	0.266
3	3	0.13
4	4	0.073
5	5	0.074

ISBN: 978-93-93259-95-0

DPPH Assay

In DPPH assay the ability of compound to act as donor for hydrogen atom or electron was measured spectrophotometrically. Reduction capacity of DPPH radical is obtained by decrease in its absorbance at 515nm. The percentage inhibition of DPPH radicals were increased as concentration of extracts was increased [Table.1 and Fig.4.]. The results showed that essential oil extracts of P. amboinicus had significant antioxidant activity. So the antioxidant potential may be due to these polyphenols. Hence the further studies are needed to evaluate the in-vivo antioxidant activity of the plant in various animal models.

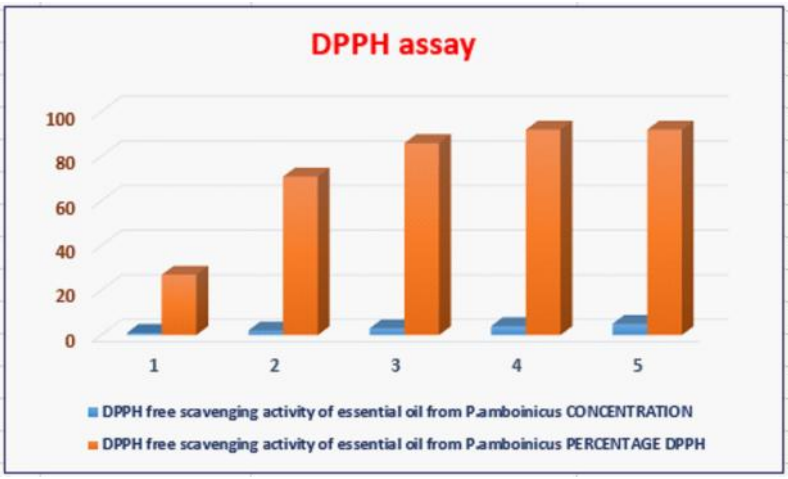


Fig.4.% ofDPPH free scavenging activity of essential oil from P.amboinicus

Conclusion

The present study was undertaken to investigate the P. amboinicus is an important aromatic medicinal herb packed with many bioactive constituents and nutrients, which are important for maintaining good health. This study on essential oil fromP.amboinicusshown high antimicrobial activity in P. putida, E.coli and Streptococcus sp.cultures and also showed positive antioxidant activity which reveals it has significance in pharmacology. Apart from its bioactive properties, it can be used for other purposes which cater to future needs in medicine.

References

1. Lukhoba, C. W., Simmonds, M. S., & Paton, A. J. (2006). Plectranthus: A review of ethnobotanical uses. Journal of ethnopharmacology, 103(1), 1-24.
2. Arumugam, G., Swamy, M. K., &Sinniah, U. R. (2016). Plectranthusamboinicus (Lour.) Spreng: botanical, phytochemical, pharmacological and nutritional significance. Molecules, 21(4), 369.
3. Khalid, A. K., & El-Gohary, A. E. (2014). Effect of seasonal variations on essential oil production and composition of Plectranthusamboinicus (Lour.) grow in Egypt. International Food Research Journal, 21(5), 1859.
4. Punet Kumar, S., & Kumar, N. (2020). Plectranthusamboinicus: a review on its pharmacological and pharmacognostical studies. American Journal of Physiology, 10(2), 55-62.

5. Chang, J. M., Cheng, C. M., Hung, L. M., Chung, Y. S., & Wu, R. Y. (2010). Potential use of Plectranthusamboinicus in the treatment of rheumatoid arthritis. Evidence-Based Complementary and Alternative Medicine, 7(1), 115-120.

6. Senthilkumar, A., &Venkatesalu, V. (2010). Chemical composition and larvicidal activity of the essential oil of Plectranthusamboinicus (Lour.) Spreng against Anopheles stephensi: a malarial vector mosquito. Parasitology research, 107(5), 1275-1278.

7. Goncalves, T. B., Braga, M. A., de Oliveira, F. F., Santiago, G. M., Carvalho, C. B., e Cabral, P. B., ... & Nagao-Dias, A. T. (2012). Effect of subinihibitory and inhibitory concentrations of Plectranthusamboinicus (Lour.) Spreng essential oil on Klebsiellapneumoniae. Phytomedicine, 19(11), 962-968.

8. Ramesh, R., Yamini, V., Sundaram, S. J., Khan, F. L. A., &Kaviyarasu, K. (2021). Investigation of structural and optical properties of NiO nanoparticles mediated by Plectranthusamboinicus leaf extract. Materials Today: Proceedings, 36, 268-272.

9. Hasibuan, P. A. Z., &Ilyas, S. (2013). Antioxidant and cytotoxic activities of Plectranthusamboinicus (Lour.) Spreng. extracts. International Journal of Pharmacy Teaching & Practices, 4(3), 1-3.

10. Ajitha, B., Reddy, Y. A. K., & Reddy, P. S. (2014). Biosynthesis of silver nanoparticles using Plectranthusamboinicus leaf extract and its antimicrobial activity. SpectrochimicaActa Part A: Molecular and Biomolecular Spectroscopy, 128, 257-262.

11. Chiu, Y. J., Huang, T. H., Chiu, C. S., Lu, T. C., Chen, Y. W., Peng, W. H., & Chen, C. Y. (2012). Analgesic and antiinflammatoryactivities of the aqueous extract from Plectranthusamboinicus (Lour.) Spreng. both in vitro and in vivo. Evidence-based complementary and alternative medicine, 2012.

12. Manandhar, S., Luitel, S., &Dahal, R. K. (2019). In vitro antimicrobial activity of some medicinal plants against human pathogenic bacteria. Journal of tropical medicine.https://doi.org/10.1155/2019/1895340.

13. Brand-Williams, W., Cuvelier, M. E., &Berset, C. L. W. T. (1995). Use of a free radical method to evaluate antioxidant activity. LWT-Food science and Technology, 28(1), 25-30.

 ISBN: 978-93-93259-95-0

Soybean Cultivation: Effect of Organic and Inorganic Inputs

Parshuram V. Pawar, Hanumnat R. Aglave[1], Digamber R. More[2], M M V Baig[3]*

Department of Botany, Madhavrao Patil Mahavidyalaya, Palam, Dist. Parbhani
[1]Department of Botany, Lokmanya Mahavidyalaya, Sonkhed, Dist. Nanded
[2]Department of Botany, Narayanrao Waghmare Mahavidyalaya, Akhada Balapur, Dist Hingloi
[3]Department of Botany, Yeshwant Mahavidyalaya. Nanded 431602, Dist Nanded
Corresponding email: mmvbaig@gmail.com[3]

Abstract

This study was carried out to investigate the integrated effects of organic inputsviz. Sulfur and rhizobium Inoculum and chemical fertilizers comprising of single superphosphate and muriate of potashon the growth, nodulation and yield of soybean. The trial was composed of 16 treatment combinations of phosphorus (75kg/ha), potassium(88kg/ha), Sulfur(100kg/ha), and inoculum(400g/100kg seed). Each set of16 treatments were randomized and replicated 3 times. The soybean variety MAUS-158was sown in 1m by 1m plots with a spacing of 10cm. Data on number of nodules and nodule viability at 45 days after sowing (DAS), plant height at 90 DAS, number and weight of 100 seeds per plot and yield per plot at harvest were collected and analyzed using Analysis of Variance (ANOVA). Results showed highly significant effects of treatments on the growth, nodulation and yield of soybean. The control treatment generally had the significant effect in terms of plant height, nodule viability, weight of 100 seeds and yield. Inoculated seeds had the highest number of nodules and percent nodule viability.

Keywords: *Soybean, Rhizobium, Sulfur, Phosphorus and Potassium*

Introduction

The soybean, Glycine max (L.) Merill, is an essential food legume that plays an essential role in the human way of life. It has a large proportion of proteins (40%) and edible oil (20%), both of which include the essential amino acids in major amounts (Raghuvanshi and Bisht, 2010). Meal made from soybeans is used in animal feed diets because it is an excellent source of protein (Mary et al., 2013). It is the most significant seed legume in the world, contributing nearly two-thirds of the world's total protein concentrate for cattle feeding and accounting for 25 percent of the world's total edible oil production (Agarwal et al., 2013). By fixing nitrogen through biological nitrogen fixation in the soil, which is carried out by symbiotic bacteria that reside in the root nodule of soybeans, soybeans increase the soil's health and fertility, which in turn benefits the plants that are grown there (Javaid and Mahmood, 2010). Additionally, soybean has the ability to improve the nutritional situation, boost the productivity of other crops, and shield the environment from the allelopathy tendencies of agricultural chemicals (FAO, 1998; Shala and Stacey, 2001).

ISBN: 978-93-93259-95-0

After the United States, Brazil, Argentina, and China, India is in fifth place when it comes to the total area of soybean production (FAO, Stat 2012). During the 2013-14 growing season in India, soybeans were grown on a total area of 122 lakh ha, with a productivity of 779 kg/ha, and a total yield of 95 lakh metric tonnes. This represents an appreciable rise in soybean cultivation over the past four decades in India (USDA, 2015). The states of Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, and Andhra Pradesh are the most productive when it comes to the cultivation of soybeans. Between the months of June and November, rain is the primary source of water for soybean cultivation in Maharashtra. In the state of Maharashtra, the districts of Satara, Sangli, Kolhapur, Solapur, Pune, Ahmednagar, and Nanded are important for the cultivation of soybeans. Despite having made rapid strides for both area coverage and total production, soybean still suffers on productivity front. There are many constraints which limited the soybean productivity including edaphic, climatic, production, and technology aspects hindering the soybean productivity in India. Despite having made rapid strides for both area coverage and total production, soybean still suffers on productivity front (Baig et al., 2002; Agarwal et al., 2013). The dissemination of new agricultural technologies to farmers is one strategy for enhancing agricultural productivity, in particular, as well as the standard of living in rural areas more generally (Doss, 2003 and 2006; Rajbhoj and Baig, 2011).

Many studies have been conducted in an effort to understand the influence of single and compound mineral fertilizers on yield of soybean in tropical soils. On the other hand, there is still a dearth of knowledge concerning the interplay between Sulfur, inoculums, phosphorus, and potassium as it pertains to soybean production. As a result, in order to close this informational gap, this study was carried out.

In light of the need to close the productivity gap, the present research was carried out with the intention of gaining an understanding of the factors that impede soybean production in the Marathwada region of Maharashtra.

Materials and Method

This study was carried out in the Farmers fields at Nanded during Kharif season for three consecutive year of 2018-19, 2019-20, 2020-21. The temperature is generally in the range of 32^{o}C -21^{o}C with total annual rainfall exceeding 900 to 1100 mm. The soil of the trail field is typical black cotton soil and the soybean was rotated with wheat during rabi season.

The trials were composed of 16treatment combinations as described in table1 with phosphorus (75kg/ha), potassium(88kg/ha), Sulfur(100kg/ha), and inoculum(400g/100kg seed). Each set of 16 treatments were randomized and replicated 3 times. The soybean varietyMAUS-158 was procured from VNMA University, Parbhani and was sown in1m by1m plots with a seed spacing of 10 cm. Seeds were treated with commercial rhizobium inoculum 1 hour prior to planting. Calcium carbonate agricultural Sulfur was applied as a 10cm top-dress at planting. Approximately 21 days after germination, single super phosphate and muriate of potash were applied to treated plots as a side-dress 5cm from the furrow, and 5cm deep.

ISBN: 978-93-93259-95-0

Data collected included the number of nodules and nodule viability at 45 DAS, plant height at 90 DAS number and weight of 100 seeds per plot and yield per plot at harvest. The data was subjected to Analysis of Variance (ANOVA) to test the main treatment effects,

Table 1. Treatment combinations for Sulfur, phosphorus, potassium, seeds and inoculum

Treatment	Seed	Inoculum	Sulfur	Phosphorus	Potassium
1	+				
2	+	+			
3	+			+	
4	+				+
5	+	+		+	
6	+	+			+
7	+			+	+
8	+	+		+	+
9	+		+		
10	+	+	+		
11	+		+		
12	+		+		+
13	+	+	+	+	
14	+	+	+		+
15	+		+	+	+
16	+	+	+	+	+

Results and Discussion

Pre-sowing soil properties

The property of the soil of the study site is given in table 2. The soil has a pH of 7.45. Optimal soil pH ranges between 7.5-8.0, so no additional limingis recommended for this location. Phosphorus (threshold 30mg/kg) and potassium levels (threshold 110mg/kg) are both below the sufficient thresholds for soybean production and would benefit from amendments. Phosphorus deficiencies have been widely reported in most soils of Marathwada (Ghodke and Takankhar 2020).

ISBN: 978-93-93259-95-0

Table 2. Fertility properties of soil of the experimental site

Test	Units	Value
Soil pH	-	7.45
Coarse Sand	%	15.30
Fine Sand	%	18.00
Silt	%	24
Clay	%	45.5
Bulk density	Mg m^{-3}	1.29
Particle density	Mg m^{-3}	2.44
Porosity	%	48.50
Phosphorus(P)	Kg ha^{-1}	23
Potassium(K)	Kg ha^{-1}	246
Calcium(Ca)	Kg ha^{-1}	5
Sulfur(S)	Kg ha^{-1}	16.7
Organic Matter	%	0.42

Effect of treatments on growth, nodulation and yield of soybean

Results showed highly significant effects of treatments on the growth, nodulation and yield of soybean (Table 3). Addition of organic and mineral fertilizers led to significant increase of legumes. The no input treatment generally had the most appreciable improvement in plant height, nodule viability, weight of 100 seeds and yield. This result could be explained on the basis that the initial soil properties of the experimental site were relatively suitable for soybean production. Liming may have pushed the pH above 8. At this pH level, phosphorus becomes fixed and made unavailable to the growing plants (Brady and Weil, 2008). Inoculated seeds had the highest number of nodules and percent nodule viability (5 and 69% respectively). This indicates a good nitrogen economy and potential soil residual fertility effects. Mineral fertilizers have been reported to have harmful effects on soil microbes including rhizobium bacteria (Rajbhoj and Baig, 2011). Inoculating leguminous seeds with rhizobium inoculants has the potential of increasing and sustaining nitrogen availability to both present and subsequent crops (Rajbhoj et al., 2016). The least amount of soybean yield (0.25 ton/ha) was obtained in the plot that had a combination of Sulfur, inoculums and phosphorus. This also suggests the effect of liming a soybean suited soil o the yield. Primarily, at high pH, phosphorus becomes unavailable, thus adversely impacting on the growth and yield of the crop.

These results therefore show that the soil and climate of Marathwada can potentially support commercial soybean production. But to ensure sustainability in production, it is important to inoculate seeds with rhizobium inoculants.

ISBN: 978-93-93259-95-0

Table 3. Effect of treatments on growth, nodulation and yield of soybean

Treatment	Plant height 90 days(cm)	Nodule count	Nodule weight(g)	Nodule Viability (%)	Weight of 100seeds(g)	Yieldton/ha
No Input	53	1	0.06	34	16	2.12
S+I(**)	53	1	0.06	27	15	1.60
P+K	49	0	0.01	4	15	1.00
K	42	1	0.04	27	15	0.77
S+K	50	3	0.15	58	7	0.70
S+I+K	47	2	0.05	12	15	0.69
I+K	46	1	0.07	42	13	0.66
S+P+K	47	1	0.08	35	14	0.62
S+I+P+K	45	3	0.11	49	16	0.56
I	47	5	0.23	69	14	0.54
S	50	0	0.03	21	15	0.62
I+P+K	56	1	0.06	23	16	0.41
I+P	44	1	0.07	24	14	0.37
P (**)	46	1	0.05	29	12	0.35
S+I+P	48	2	0.12	36	14	0.25
S+P	44	1	0.07	24	15	0.16
AVG	47	1	0.08	32	14	0.70
LSD	7.4	0.5	0.1	41.2	4. 7	0.90
CV%	11.6	142.7	109.8	93.3	25.7	104

Averages, Least Significant Differences (LSD) atanalpha of 0.05, and Coefficient of Variations (CV%) for yield, nodule count, weight, and viability, R8 stand count and 100 seed weight omission trials. In the treatment column: I- inoculum, P-phosphorus, K-potassium, S-Sulfur.P-values for each treatment main-effect or interaction are represented as follows: (.)<0.10, (*)<0.05, (**)<0.01, (***)<0.001.

Conclusion

This study gives information on which inputs are most suited to optimize soybean output and is a helpful resource for establishing an input approach to soybean production. The fact that No Input was able to operate as effectively as it did appear to be a good coincidence. Nevertheless, it is useful in that it demonstrates the range of possibilities available in the Marathwada region. The fact that the no input treatment generated a yield of 2.12 tonnes per hectare demonstrates the possibility for future higher yields, particularly when climate-appropriate and sound agronomic practices are utilized.

References

1. Agarwal, D. K., Billore, S. D., Sharma, A. N., Dupare, B. U. and Srivastava, S. K. (2013). Soybean: Introduction, Improvement, andUtilization in India-Problems and Prospects. Agric. Res. 2(4): 293-300.

2. Baig, M.M.V., Baig, M.I.A. and Muley, S.M.,(2002) Enhanced growth of groundnut by plant growth promoting rhizobacteria. International Arachis Newsletter, 22, 60-63.

3. Brady, N.C. and Weil, R.R. (2008). The Nature and properties of soil. 13th edn, prentice Hall Inc. New Jersy.

4. Doss, C. R. (2003). Analyzing technology adoption using micro studies: Limitations, challenges and opportunities for improvement.Agric. Econ. 34: 207-219.

5. Doss, C. R. (2006). Understanding farm level technology adoption: Lessons learnt from CIMMYT's micro-survey in Eastern Africa.CYMMIT Economic Working, Mexico, D.F. pp. 7-30.

6. FAO Stat, (2012). http://faostat3.fao.org

7. FAO, (1998). Food and Agriculture Organization of the United Nations. Energy for Sustainable Development and Food Security inAfrica. Food and Agriculture Organization of the United Nations, Rome, Italy.

8. Ghodke P. D. and Takankhar V. G. 2020. Soyabean (Glycine max) Response to Applied Fertilizers through INM onDeep Black Soil of Marathwada Region in Relation to Available Nitrogen,Phosphorus, Potassium and Suphur. International Journal of Current Microbiology and Applied Sciences 9(11): 1609-1614.

9. Javaid, A. and Mahmood, N. (2010). Growth, nodulation and yield response of soybean tobiofertilizers and organic manures. PakistanJ. Bot. 42: 863-871.

10. Mary O. Agada. (2014). Constraints to increasing soybean production and productivity in Benue state, Nigeria. Asian J. Agric. Extn,Econ.and Socio. 4(4): 277-284.

11. Rajbhoj, B. G., & Baig, M. M. V. (2011). Performance of local rhizobial strain from Marathwada region of Maharashtra state as inoculant of Urd bean (Vigna mungo (L.) Hepper) with different carriers. Biosciences, Biotechnology Research Asia, 8(2), 833-836.

12. Rajbhoj, B. G., Mane, V. P., & Baig, M. M. V. (2016). Effectiveness of Native Rhizobium on Nodulation Soybean (GLYCINE MAX. L) with Different Carriers. International Journal of Advanced Biotechnology And Research, 7(3), 873-876.

13. Shala and Stacey. (2001). United States Department of Agriculture: Economic Research Service. Food Security Assessment, RegionalOverview Information Bulletin.

14. USDA. (2015). www.usda.gov.in

 ISBN: 978-93-93259-95-0

Ecobiology of the Lycaenid Butterfly, Zizula hylax hylax Fabricius

M. Bhupathi Rayalu[1]*, Prof. J. Suneetha[2]

[1]Department of Botany. Government Degree College, Kovvur, East Godavari Dist. A.P.
[2]Principal, Government Degree College, Kovvur, East Godavari Dist. A.P.
*E-mail: bhupathirayalu@gmail.com

Abstract

The life history of the Dark grass blue butterfly, Zizula hylax hylax Fabricius and larval performance in terms of food consumption and utilization, and the length of life cycle on its host plant Desmodium triflorum (L.) DC. are described for the first time. The study was carried out at Kovvur (17° 0126' N and 81° 7274' E), Andhra Pradesh, India during the monsoon months (June - August) of the current calendar year. Zizula hylax hylax completes its life cycle in 16 - 18 (17.20 ± 0.84) days (Egg: 3; Larva: 8-10; Pupa: 5 days). The values of nutritional indices across the instars were AD (Approximate Digestibility) 66.64 - 96.10%; ECD (Efficiency of Conversion of Digested food) 3.53 - 64.77%; ECI (Efficiency of Conversion of Ingested food) 3.39 - 42.77%, measured at the temperature of 28 ± 20 C and RH of 80 ± 10% in the laboratory. These relatively high values of ECD and ECI explain at least partially the ecological success of Zizula hylax hylax in the present study environment.

Key words: *Life history, Zizula hylax hylax, captive rearing, immature stages, food utilization indices.*

INTRODUCTION

Of the estimated 20,000 - 30,000 species of butterflies occurring globally, at least 1,500 species occur in India. Several field guides for the identification of the Indian butterflies are available [1-5]. A list of the works giving the descriptions of the life histories was given by Pant & Chatterjee [6], of which those of Bell [7] are important. However, review of these early works indicated that for many species data, particularly on the duration of immature stages, are either absent or incomplete.

For the development of effective breeding/rearing programs and conservation management of butterflies, information on the life history and exact habitat requirements is essential. Further, immature stages of butterflies are increasing importance as sources of systematic characters, and often give important clues as to the placement of species in major groups [8, 9]. Haribal [2] noted that such information is lacking for 70% of the Indian butterflies. In this context the present study furnished the necessary information about immature stages, larval performance on its host plant Desmodium triflorum (L.) DC., and the length of life cycle from egg to adult eclosion for the Tiny grass Blue butterfly, Zizula hylax hylax Fabricius. This species is distributed throughout tropical and sub-tropical Africa, Asia and Oceania.

ISBN: 978-93-93259-95-0

MATERIALS AND METHODS

The present study was carried out at Kovvur (17° 0126' N latitude and 81 7274' E longitude) during the monsoon months (June - August) of the current calendar year. The present study site is located very proximity to river Godavari. The natural plant community of the area is regularly searched during 0800 to 1700 h for the reproductive activity of the Tiny grass blue butterfly, Zizula hylax hylax. Adult butterflies were seen mostly near the larval host plant Desmodium triflorum. Once adult butterflies were located detailed observations were made in order to observe the period of copulation and oviposition. After detecting ovipositions, the leaves with eggs were collected in Petri dishes (15 cm × 2.5 cm depth) and brought to the laboratory. The leaf piece with an egg was then placed in a smaller Petri dish (10 cm × 1.5 cm depth), that was lined with moistened blotter to prevent leaf drying. Such Petri dishes were kept in a clean, roomy cage fitted with wire gauge. Since ants were never detected, no special protection device was tried to avoid predation of eggs. They were examined regularly at 6 h interval for recording the time of hatching. Each of the freshly emerged larvae was transferred to a clean Petri dish inside of which lined with moistened blotter with the help of a camel hairbrush. The larvae were supplied daily with weighed quantity of tender leaf pieces of the host plant. The faeces and the leftover of the food was collected and weighed each day (24 h). The growing larvae were observed regularly to note the instar change and characters including length and weight measurements. As the larvae grew, they needed more space. Increased space was provided by transferring the growing larvae to bigger Petri dishes (15 cm × 2.5 cm depth). Larval performance in terms of food utilization indices were calculated as described by Waldbauer [10] as:

$$\text{GR: Growth Rate} = \frac{\text{Weight gained by the instar}}{\text{Mean weight of instar} \times \text{Number of feeding days}}$$

$$\text{CI: Consumption Index} = \frac{\text{Weight of food ingested}}{\text{Mean weight of instar} \times \text{Number of feeding days}}$$

AD: Approximate digestibility (also called Assimilation Efficiency)

$$= \frac{\text{Weight of food ingested - Weight of faeces}}{\text{Weight of food ingested}} \times 100$$

ECD: Efficiency of Conversion of Digested food (also called Net Conversion Efficiency)

$$= \frac{\text{Weight gained by the instar}}{\text{Weight of food ingested - Weight of faeces}} \times 100$$

ISBN: 978-93-93259-95-0

ECI: Efficiency of Conversion of Ingested food (also called Gross Conversion Efficiency)

$$= \frac{\text{Weight gained by the instar}}{\text{Weight of food ingested}} \times 100$$

Fresh weight measurements were used for the purpose. Five replications were maintained for the study of all parameters. The preparation of full grown larvae to pupate, particulars of pupae including color, shape, size, weight and the time of adult eclosion were also recorded. Millimetre graph paper was used for taking measurements. The laboratory temperature was 28 ± 2^0 C and relative humidity 80 ± 10% with normal indirect sunlight conditions that varied in duration between 12 h during November/ January and 14 h during June/July.

In describing the details of adult characters, the butterflies that have emerged from the pupae in the laboratory, and those caught in the wild were used.

RESULTS

Adult Stage (Figure: 1a)

The adult butterflies on the top are dark brown fading toward the bases, the male wings have purple iridescence. Underside both sexes are pale grey, with multiple arcs of brown dashes Antennae black; head, thorax and abdomen are dark brown, with a little violet pubescence on the head and thorax. This violet pubescence is not found in the females. Beneath the thorax and abdomen it is grayish white. Wing span is between 15 - 20 mm. Adults were found probing for nectar on the Cleome viscosa L., Gomphrena procumbens Pav. ex Moq., Sida acuta Burm. f. and Lippia nodiflora (L.) Michx.

Adult female behavior during oviposition:

The gravid female laid eggs singly on the undersurface of the both young and mature leaves of its host plant. About 6 -10 eggs were laid at a time but on different leaves. There was no bias for the age of the leaf. Oviposition took place during 0900 - 1600m h.

Egg stage (Figure: 1b)

The eggs were sky blue in color, and flattened round disc like shape, and measured 0.30 (0.30 ± 0.00) mm in height. They hatched in three days of incubation. It passed through four distinct instars over a period of 8 - 10 (9.20 ± 0.84) days.

Larval stage (Figure: 1c-f)

Larva was onisciform (slater shaped). Instar I lasted for 2 - 3 (2.40 ± 0.55) days. On the first day of hatching, the instar measured 1.10 - 1.70 (1.46 ± 0.23) mm in length. It grew to 1.60 - 1.90 (1.76 ± 0.15) mm in length and 0.70 - 0.90 (0.82 ± 0.08) mm in width. Head capsule

ISBN: 978-93-93259-95-0

black in color and measured 0.40 - 0.50 (0.46 ± 0.05) mm in diameter. Body cream colored. Larva mainly chooses to reside on the underside of leaflet. It feeds mainly on the epidermal layer of the leaves. By the next day larval body turned into light green. Instar II lasted for 3 - 4 (3.26 ± 0.45) days. The larva attained a length of 3.00 - 4.20 (3.44 ± 0.45) mm and a width of 1.20 - 1.60 (1.34 ± 1.15) mm. Head capsule greenish and measured 1.00 (1.00 ± 0.00) mm in diameter. Body was greener than previous instar. There was a thick green colored streak along the mid-dorsal surface of the body. Body was fully covered with minute transparent hairs. Segmentation was clear. Instar III lasted for 2 - 3 (2.60 ± 0.55) days. The larva attained a length of 6.80 - 7.30 (7.10 ± 0.20) mm and a width of 2.10 - 2.90 (2.48 ± 0.32) mm. Head capsule measured 1.10 - 1.50 (1.36 ± 0.15) mm in diameter. Instar IV lasted for '1' (1.00 ± 0.00) day. The larva attained a length of 8.00 - 9.00 (8.30 ± 0.41) mm and a width of 2.80 - 3.00 (2.96 ± 0.09) mm. Head measured 1.90 - 2.20 (2.02 ± 0.11) mm in diameter. In their characteristics both Instar III and Instar IV resembles Instar II. Body contracted before pupation.

Pupal stage (Figure: 1g)

Pupal stage lasted '5' (5.00 0.00) days. It was 7.00 - 8.00 (7.30 ± 0.45) mm in length and 2.30 - 2.80 (2.54 ± 0.21) mm in width at its broadest point. It was green in color and without any ornamentation or markings. Its weight was about 19.20 - 36.80 (26.46 ± 6.57) mg.

Duration of life cycle The total development time from egg to adult eclosion ranged between 16 - 18 (17.20 ± 0.84) days. (Egg: 3; Larva: 8-10; Pupa: 5 days).

Food consumption, growth and utilization

The data on the amount of food consumed by each of the four instars and the corresponding data on weight gained by different instars are given in Table 1. Of the total amount of food consumed, the percentage shares of the successive instars were 7.58, 13.44, 21.94, and 57.04% and the proportions of weight gained by the successive instars were 0.93, 2.51, 8.06, and 88.49%. Thus, there was over 78% of the total food consumption in the third and fourth instars together and 96% of total weight gained in the third and fourth instars together. There was a direct relationship between food consumption and growth across the four instars (Fig. 2). The values of consumption index (CI) decreased from first to final instar. The values of growth rate (GR) increased from first to final instar. Values of CI ranged between 2.32 - 8.48 mg/day/mg and those of GR between 0.29 -0.99 mg/day/mg. Table 1 also included the data on AD, ECD, and ECI. The values of AD from instar to instar decreased from a high of 96.10% in first instar to a low of 66.64% in the last instar.The values of ECD and ECI increased progressively from the first instar to the last instar. The values of ECD varied from 3.53 - 64.77% and those of ECI from 3.39 - 42.77%. Thus there was an inverse relationship between the values of AD and those of ECD and ECI.

ISBN: 978-93-93259-95-0

DISCUSSION

The total development time from egg laying to adult eclosion was determined as 17.20 0.84 days at about 28 ± 2^0 C. This behavior is in line with the expectations of short life cycles in tropical butterflies [11]. Since temperature influences instar duration and the overall development time [12- 15], the duration of life cycle may vary from our records depending on the prevailing temperatures. As no temperature extremities occur at the study site, the duration of life cycle did not vary much over the overlapping seasons.

Over the entire period of its growth, a larva consumed on average over 0.16 g of leaf material, increasing consumption in the last two instars. This tendency of greater consumption by the last two instars has been reported in lepidopterous larva in general [10, 12, 13, 16 - 18], and it compensates the energy expenditure of non-feeding pupal stage [19]. The values of CI are near to the range (0.27 - 6.90) predicted for forb foliage chewers [20]. Food consumption rate depends on the conversion efficiency of ingested food to biomass (ECI), the rate increasing as the conversion efficiency decreases or vice versa [20]. In this sense, the high CI value (8.48) of instar I is probably due to low conversion efficiency and this character is reflected in the low values of ECI for instar I compared to other successive instars. Higher growth rates occur with penultimate and final instars [21].

Table 1. Food consumption, growth and food utilization efficiencies of Zizula hylax hylax larva fed with Desmodium triflorum leaves.

Instar number	Wt. of food ingested (mg)	Wt. of faeces (mg)	Wt. gained by larva (mg)	GR (mg/day/mg)	CI (mg/day/mg)	AD (%)	ECD (%)	ECI (%)
I	11.80 ± 01.24	0.46 ± 00.04	0.40 ± 00.05	0.29	8.48	96.10	03.53	03.39
II	20.94 ± 05.28	3.20 ± 01.33	1.08 ± 00.72	0.30	5.84	84.72	06.09	05.16
III	34.17 ± 05.07	7.44 ± 01.52	3.46 ± 03.16	0.32	3.81	78.23	12.94	10.12
IV	88.84 ± 07.21	30.17 ± 02.05	38.00 ± 02.35	0.99	2.32	66.64	64.77	42.77

ISBN: 978-93-93259-95-0

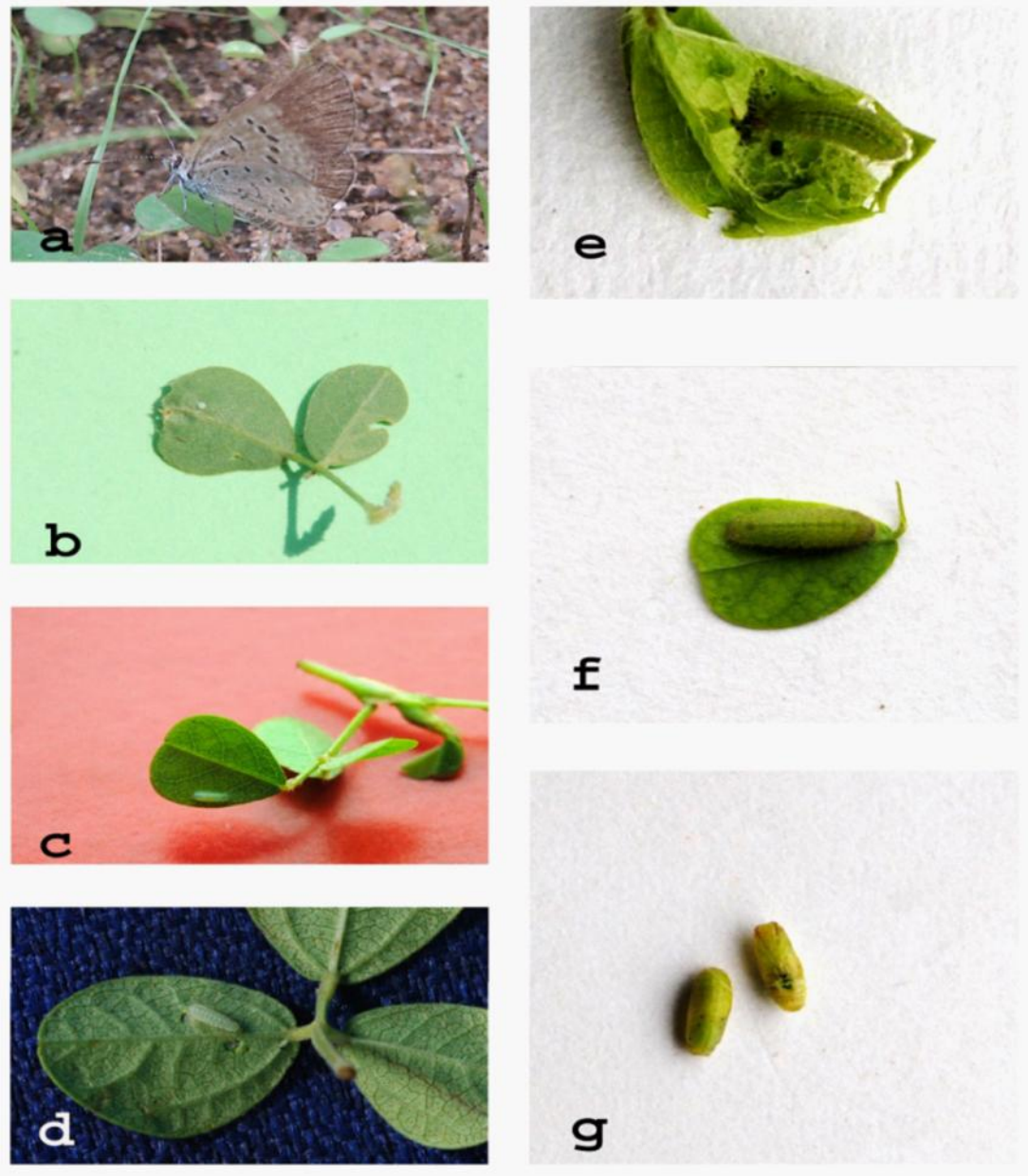


Fig-1: Life stages of Zizula hylax hylax

(a)Adult (b)Eggs (c)Instar I (d)Instar II (e)Instar III (f)Instar IV (g)Pupa

ISBN: 978-93-93259-95-0

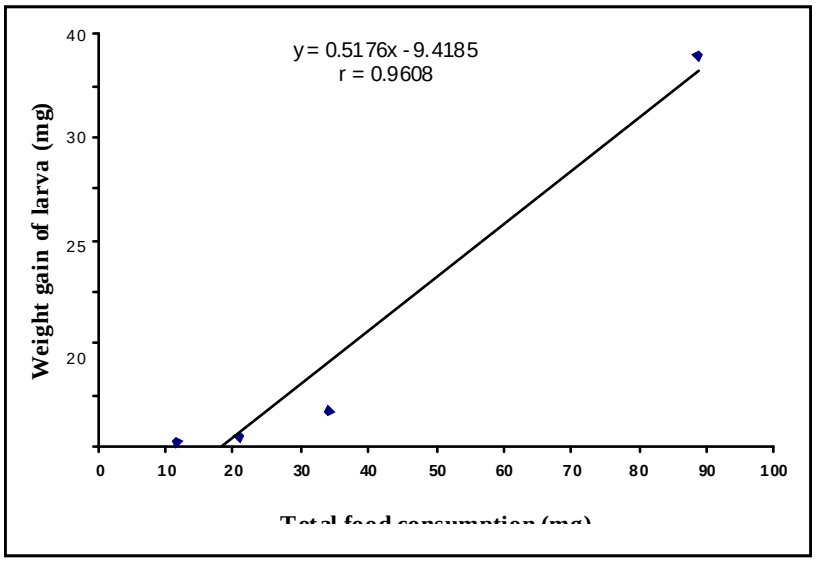


Figure 2. Relationship between food consumption and growth in Zizula hylax hylax on Desmodium triflorum

The values of AD that were obtained in this study are comparable with the range of AD values (19 - 81%) for lepidopterous larvae [22]. The average AD percentage is over 81.42% and this high AD substantiates the statement of Slansky and Scriber [20] that foliage chewers often attain high AD values. Such high AD values also are expected when food item is rich in nitrogen (and also water) [22]. Similar results were repeated with Pieris brassicae (L.) [23], Euploea core (Cramer) [24], Ariadne merione merione (Cramer) [25], Danaus genutia Cramer [26], and Byblia ilithyia Drury [27]. The values of ECD increase from early to last instars [20]. Such a trend is also observed with the ECDs of Zizula hylax hylax, with the lowest value in instar I and the highest in instar V. The ECDs obtained are low compared to the ADs and such low values are not unusual [10]. This is indicative of low efficiency of conversion of digested food to body tissues. This poor utilization of food is often attributed to deficiency in some essential nutrient in food [28] or a factor causing an increase in energy expenditure on metabolism [29]. The values of ECI (3.39 - 42.77) obtained are comparable with the range of values expected for forb foliage chewers (1 - 78%) [20]. The values of ECD and ECI, particularly those of the last two instars, are also relatively high (12.94, 64.77; 10.12, 42.77), thus respectively indicating tissue growth efficiency and ecological growth efficiency, which enabled Zizula hylax hylax to thrive successfully in its habitat.

Thus, the present study provides information on the oviposition larval host and larval performance in terms of food consumption, growth and utilization, and the length of life cycle from egg to adult eclosion of the Tiny grass blue butterfly, Zizula hylax hylax. The present data may be profitably utilized in the successful conservation management of this butterfly species

ISBN: 978-93-93259-95-0

either in parks, Zoos and butterfly houses or in the field. Butterfly houses are popular exhibits in Zoos and have an immense educational [30] and conservational potential [30, 31]. The present study also indicted that captive rearing the larvae at about 28 ± 2^0C permits enough stock of adults for restocking the areas poor in populations of the Tiny grass blue butterfly.

REFERENCES

1. Wynter-Blyth, M.A. (1957). Butterflies of the Indian Region. Bombay Natural History Society, Bombay. pp.523.
2. Haribal, M. (1992). The butterflies of Sikkim Himalayas and their natural history. Sikkim Nature Conservation Foundation (SNCF), Gangtok. pp217.
3. Gay, T., Kehimkar, I.D., Punetha, J.C. (1992). Common Butterflies of India. Oxford University Press, Bombay. pp.67.
4. Gunathilagaraj, K., Perumal, T.N.A., Jayaram, K., & Ganesh Kumar, M. (1998). Field guide. Some South Indian Butterflies. Nilgiri Wildlife & Environment Association, Udhagamandalam, India. pp.274.
5. Kunte, K. (2000). Butterflies of Peninsular India. Universities Press (India) Limited, Hyderabad. pp.254.
6. Pant, G.D & Chatterjee, N.C. (1950). A list of described immature stages of Indian Lepidoptera. Part 1. Rhopalocera. Indian Forest Records (New Series) 7: 213-225.
7. Bell, T.R. (1909-1927). The common butterflies of the plains of India. J. Bombay Nat. Hist. Soc. vol. 19(1) - vol. 31(4).
8. DeVries, P. J., Kitching, I. J. & Vane-Wright, R. I. (1985). The systematic position of Antirrhea and Caerois, with comments on the higher classification of the Nymphalidae (Lepidoptera). Syst. Entomol. 10: 11 - 32.
9. Freitas, A. V. L., Murray, D. & Brown Jr., K. S. (2002). Immatures, natural history and the systematic position of Bia acotorion (Nymphalidae). J. Lep. Soc. 56(3): 117 - 122.
10. Waldbauer, G. P. (1968). The consumption and utilization of food by insects (Eds. Beament, Treherne, and Wigglesworth) Advances in insect physiology, Academic Press, London and New York, p. 229 - 288.
11. Owen, D. F. (1971). Tropical Butterflies. Clarendon Press, Oxford. pp.205.
12. Mathavan, S. & Pandian, T. J. (1975). Effect of temperature on food utilization in the monarch butterfly Danaus chrysippus. Oikos 26: 60 - 64.
13. Palanichamy, S., Ponnuchamy, R. & Thangaraj, T. (1982). Effect of temperature on food intake, growth and conversion efficiency of Eupterote mollifera (Insecta: Lepidoptera). Proc. Indian Acad. Sci. (Animal Science) 91: 417 - 422.
14. Pathak, M. and Pizvi, P. Q. (2003). Age specific survival and fertility table Papilio demoleus at different set of temperatures and host plants. Indian J. Entomol. 65(1): 123 - 126.
15. Braby, M. F. (2003). Effect of temperature on development and survival in Delias nigrina (Fabricius) (Lepidoptera: Pieridae). Australian J. Entoml. 42(2): 138 - 143.
16. Scriber, J. M. & Slansky, F. J. (1981). The nutritional ecology of immature insects. Annu. Rev. Entomol. 26: 183 - 211.
17. Selvasundaram, R. (1992). Food utilization and bioenergetics of Caloptilia theivora (Walsingham) (Lepidoptera : Garcillariidae) infesting tea. Hexapoda 4(2): 119 - 128.
18. Gosh, D. and Gonchaudhuri, S. 1996 Biology and food utilization efficiency of Pericallia ricini (Fab.) (Lepidoptera: Arctiidae) in Tripura. Uttar Pradesh J. Zool. 16(3): 109 - 112.
19. Pandian, T. J. (1973). Food intake and energy expenditure patterns in two insect primary consumers. Cur. Sci. 42: 423-425.

ISBN: 978-93-93259-95-0

20. Slansky, F. & Scriber, J. M. 1985. Food consumption and utilization (Eds. Kerkuit, G.A. and Gilbert, L.I.) Comprehensive Insect Physiology, Biochemistry and Pharmacology, Pergamon, Oxford, p. 85 - 163.

21. Scriber, J. M. & Feeny, P. (1979). Growth of herbivorous caterpillars in relation to feeding specialization and to the growth form of their food plants. Ecology 60: 829 - 850.

22. Pandian, T. J. & Marian, M. P. (1986). Prediction of assimilation efficiency of Lepidopterans, Proc. Indian Acad. Sci. (Animal Science) 95: 641 - 665.

23. Yadava, P. S., Vats, L. K. and Kaushal, B. R. 1979. Food consumption on assimilation and growth in the larvae of Pieris brassicae Linn. J. Anim. Physiol. 26: 257 - 264.

24. Venkata Ramana, S. P., Atluri, J. B. & Subba Reddi, C. (2001). Autecology of the Common crow butterfly. Ecol., Environ., and Conserv. 7(1): 47 - 52.

25. Atluri, J. B., Samatha, B., Bhupathi Rayalu, M., Sandhya Deepika, D. & Subba Reddi, C. (2010). Ecobiology of the common castor butterfly Ariadne merione merione (Cramer) (Lepidoptera: Rhopalocera: Nymphalidae). J. Res. Lep. 42: 13 - 20.

26. Atluri, J. B., Bhupathi Rayalu, M., & Sandhya Deepika, D. (2010). Life history and larval performance of the Common tiger butterfly, Danaus genutia Cramer (Lepidoptera: Rhopalocera: Danaidae). The Bioscan. 5(3): 511-515.

27. M. Bhupathi Rayalu, M. Tarakeswara Naidu, J.B. Atluri, & C. Subba Reddi. (2011). Life history and larval performance of the Joker butterfly, Byblia ilithyia (Lepidoptera: Rhopalocera: Nymphalidae). J. Entomol. Soc. Iran. 31 (1): 71-85.

28. Bailey, C. G. & Mukerji, M. K. (1976). Consumption and utilization of various host plants by Melanoplus bivittatus (Say) and M. femurrubrum (DeGeer) (Orthoptera: Acrididae). Canadian J. Zool. 54: 1044 - 1050.

29. Muthukrishnan, J. (1990). Bioenergetics in insect-plant interactions. Proc. Indian Acad. Sci. (Animal Science) 99(3): 243 - 255.

30. Veltman, K. (2009). How can zoos import and display butterflies for educational purpose in a sustainable way? Int. Zoo Yb.43: 124 - 130.

31. Mathew, G. (2001). Conservation of invertebrates through captive breeding: A study with reference to butterflies. KFRI Research Report no. 220.

ISBN: 978-93-93259-95-0

Timber Yielding Plants and Their Utilities in Nirmal District of Telangana State

Suman Kumar Pothuganti[1]., Vijigiri Dinesh[2], Eanguvar Srinivas Reddy[3]

[1]International Center for Research in Agro Foresty, Vijayavada, AP.
[2]Department of Botany, Shri Renukadevi Arts, Commerce and Science Mahavidyalaya, Mahur, Dist Nanded, Maharashtra, India
[3]Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, Dist Nanded, Maharashtra, India

Abstract

Trees are important to humankind not only economically, environmentally and industrially but also spiritually, historically and aesthetically, for they support human life through various means by providing a wide range of products for survival and prosperity. Trees are mostly used for timber purposes, The present ethno-botanical explorations conducted in forest areas of Nirmal resulted in the information on the timber yielding plants used for different purposed.

Information gathered from Nirmal district indicates that the tribals, and other village people of this region possess good knowledge of plants used for different purposes, but their continuous and progressive exposure to modernization may result in extinction of the such rich heritage of knowledge in the course of time. Besides medicine, food, fiber plants which yield timber are extensively used in the region for various purposes. Present communication deals with 51 species belongs to 27 families.

Key words: *Timber resources, their utility, Nirmal, Telangana State.*

Introduction

Since time immemorial human beings are depending on the plants for food, shelter and medicine. Besides this wood had considerable importance in the livelihood of ancient people, use of wood in making several things such as, agricultural implements, boat building, handicrafts, packing cages, toys, construction, furniture, musical instruments, turnery, carving, etc. Till date wood is considered as most important forest product. The wood has contributed a lot to advancement of civilization. Today the wood is the most widely used commodity other than food and clothing. It is one of the most. Though the forest is vanishing at alarming rates the requirement of the wood has not declined. The most commonly used wood in India is from following plants, Acacia nilotica (L.) Del.; Bombax ceiba L.; Albizia lebbeck (L.) Bth.; Toona ciliate Roem.; Juglans regia L. Salix alba L. Morus alba L.; Cedrus deodara (Roxb. Ex Lamb) G. Don,; Picea smithiana (Wall.) Boiss.; Pinus roxburghii Sarg; Dalbergia latifolia Roxb.; Dalbergia sissoo Roxb,; Pterocarpus marsupium Roxb.; Pterocarpus santalinus L.f.; Diospyros ebenum Koenig,; Adina cordifolia (Roxb) Hook. f.; Tectona grandis L.f.; Shorea robusta Roxb. ex Gaertn. f.

ISBN: 978-93-93259-95-0

Nirmal district is a district located in the northern region of the Indian state of Telangana. The district headquarters is located in the town of Nirmal. The district is situated on the Deccan Plateau comprising fertile lands drained by the Godavari River, that flows along its southern boundary. The district is spread over an area of 3,845 square kilometres (1,485 sq mi). The district is landlocked; It shares boundaries with Adilabad to the north, Komaram Bheem to the northeast, Mancherial to the east, Jagityal and Nizamabad (along with the Godavari) to the south and Nanded District of Maharashtra to the west.

Methods of survey: For documentation of information and collection of plant material, several tours were undertaken during the period 2020-22. Data presented here is based on personal observations and interviews with local inhabitant and methodology used is based on the methods available in literature Jain (1989) and Jain and Mudgal (1999).

Ethnobotanical information gathered was documented in datasheets prepared. For collection of plant material, local informer accompanied to authors. Plant identification was done by using regional flora and flora of adjoining districts, Cooke (1958) Pullaih et al. (1992) and Pullaih and Rao (1995).

Enumeration:-

The present ethno-botanical explorations conducted in forest areas of Nizamabad resulted in the timber resources from 51 plants species belonging to 27 families. Following data includes botanical name of species, vernacular name, family and its utility.

Results and discussions:-

Information gathered from Nizamabad district indicates that the tribals, and other village people of this region utilize wood resources for various purposes, but their continuous and progressive exposure to modernization may result in extinction of the such rich heritage of knowledge of making of different articles by using wood, in the course of time.

Majority of preparation are by using the plants such as, Acacia chundra, Alangium salvifolia, Azadirachta indica, Bauhinia racemosa, Chloroxylom swietenia, Gmelia arborea, Lagerstroemia parviflora, Melia azadirachta, Tectona grandis and Terminalia elliptica. Majority of the species used are from families Mimosaceae , Caesalpiniaceae, Anacardiaceae and Fabacae.

Maximum number of plants used for house construction (49 species)agricultural implements (28 species) for furniture (18 species).

ISBN: 978-93-93259-95-0

Sr.No	Botanical Name, Family	Local name	Agricultural Implements	Furniture	House Construction	Walking sticks	Packing Cages
1.	*Acacia chundra* (Roxb. Ex Rottler) Willd Mimosaceae	Sundra	+	+	+	+	-
2.	*Acacia leucophloea* (Roxb.) Willd., Mimosaceae	Tella-tumma	+	+	+	-	-
3.	*Acacia nilotica* (L.) Willd. ex Del. Mimosaceae	Nalla-tumma	+	+	+	-	-
4.	*Aegle marmelos* (L.) Corr. Rutaceae	Maredu	-	-	+	+	-
5.	*Alangium salvifolium* (L.f.)Wangerin Alangiaceae	Ooduga	+	+	+	+	-
6.	*Albizia amara* (Roxb.) Boir. Mimosaceae	Narlangi	-	-	+	+	-
7.	*Albizia lebbeck* (L.) Bth. Mimosaceae	Dirisana	-	-	+	-	+
8.	*Anogelssus latifolia* (Roxb.ex DC.) Combretaceae	Tiruman	+	+	+	-	-
9.	*Azadirachta indica* A. Juss. Meliaceae	Vepa	+	+	+	-	+
10.	*Bauhinia purpurea* L. Caesalpiniaceae	Devacanchanam	-	+	+	+	-
11.	*Bauhinia racemosa* Lam. Caesalpiniaceae	Ari	+	+	+	+	-
12.	*Bombax ceiba* L. Bombacaceae	Buruga	-	-	+	-	+
13.	*Borassus flabelliber* L. Arecaceae	Thati	-	-	+	-	-
14.	*Buchanania cochinchinensis* (Lour.) Almeida. Anacardiaceae	Morli	-	-	+	+	-
15.	*Butea monosperma* (Lam) Taub. Fabaceae	Moduga	-	-	+	-	-
16.	*Cassia fistula* L. Caesalpinaceae	Rela	+	-	+	-	-
17.	*Casuarina equisetifolia* L. Casuarinaceae	Sarugudu	-	-	+	-	-
18.	*Chloroxylon swietenia* DC. Rutaceae	Tella bitlu	+	+	+	+	-
19.	*Dalbergia sissoo* Roxb. Fabaceae	Sissam	-	-	+	-	-
20.	*Diospyrous chloroxylon* Roxb. Ebenaceae	Ullinda	+	-	+	-	-
21.	*Eucalyptus globulus* Labill. Myrtaceae	Neelagiri	-	-	+	-	-
22.	*Ficus benghalensis* L. Moraceae	Marri	-	-	+	-	-
23.	*Ficus religiosa* L. Moraceae	Ravi	-	-	+	-	+
24.	*Ficus racemosa*L. Moraceae	Medi	-	-	+	-	-
25.	*Flacourtia indica* (Burm.f.) Merr. Flacourtiaceae	Mulielka	+	-	+	-	-

ISBN: 978-93-93259-95-0

Sr.No	Botanical Name, Family	Local name	Agricultural Implements	Furniture	House Construction	Walking sticks	Packing Cages
26.	*Gmelina arborea* Roxb Verbenaceae	Gummudu-teku	+	+	+	+	-
27.	*Holoptelea integrifolia* (Roxb.) Ulmaceae	Namalinara	+	-	+	+	-
28.	*Lagerstroemia parviflora* Roxb. Lythraceae	Chennangi	+	+	+	+	-
29.	*Lannea coromandelica* (Houtt.) Merr. Anacardiaceae	Dumpidi	+	-	+	+	-
30.	*Limonia acidissima* L. Rutaceae	Velga	+	-	+	-	-
31.	*Madhuca langifolia* (Koen) Mac Bride. Sapotaceae	Ippa	-	-	+	-	-
32.	*Mangifera indica* L Anacardiaceae	Mamidi	-	-	+	-	+
33.	*Melia azedarach* L. Meliaceae	Turka Vepa	+	+	+	+	-
34.	*Millingtonia hortensis* L. F. Bignoniaceae	Sadakamalli	-	-	+	+	-
35.	*Moringa oleifera* Lam. Moringaceae	Munaga	-	-	+	-	+
36.	*Pongamia pinnata* (L.) Pierre. Fabaceae	Kanugu	+	-	-	-	-
37.	*Psidium guajava* L Myrtaceae	Jama	+	-	+	+	-
38.	*Santalum album* L. Santalaceae	Chandan	-	+	+	-	-
39.	*Sapindus emarginatus* Vahl Sapindaceae	Kunkudu	+	-	+	+	-
40.	*Semecarpus anacardium* L.f. Anacardiaceae	Jidi	-	-	+	+	-
41.	*Sesbania grandiflora* (L.) Poir. Fabaceae	Avisa	-	-	+	+	-
42.	*Soymida febrifuga*(Roxb.) A. Juss. Meliaceae	Somidi	+	-	+	-	-
43.	*Sterculia urens* Roxb. Sterculiaceae	Tapsy	+	-	+	+	-
44.	*Syzygium cumini* (L.) Skeels. Myrtaceae	Naredu, Allanaradu	+	-	+	-	-
45.	*Tamarindus indica* L. Caesalpinaceae	Chinta	-	+	-	-	-
46.	*Tectona grandis* L.f. Verbenaceae.	Teku	+	+	+	+	-
47.	*Terminalia cuneata* Roth. Combretaceae	Tella maddi	+	+	+	-	-
48.	*Terminalia elliptica* Willd. Combretaceae	Nalla maddi	+	+	+	+	-
49.	*Thespesia populnea* (L.) Soland. ex Corr. Malvaceae	Gangaravi	-	-	+	+	-
50.	*Wrightia tinctoria* R. Br. Apocynaceae	Palakodisa	+	+	+	-	-
51.	*Zizyphus jujube* Mill. Rhamnaceae	Rani, Nara	+	-	+	-	+

ISBN: 978-93-93259-95-0

References

1. Ambasta, S. P.1992.The useful Plants of India, Publication & Information Directorate, CSIR, New Delhi.
2. Anonymous. 1948-1976.The Wealth of India- Raw Materials, Vol. I - XI. Publicatin and InformatinDiectorate, New Delhi.
3. Asolkar, L. V., Kakkar, K. K. and Chakra, O. J. 1992. Second supplement to glossary of Indian Medicinal plants with Active principles. Part I (A-K), (1965-81). Publications & Information Directorate, CSIR, New Delhi.
4. Cooke, T. 1958. The Flora of the Presidency of Bombay, Vols 1-3 Reprinted edition, Government of India.
5. Jain, S. K. (ed.)1989. Methods and approaches in Ethnobotany, (Society of Ethnobotanists, Luknow),
6. Jain, S. K. 1991. Dictionary of Indian folk medicine and Ethonobotany, Deep publications, New Delhi.
7. Jain, S. K. 1996. Ethnobiology in Human welfare, Deep publications, New Delhi.
8. Jain, S. K. 1999. Dictionary of Ethnoveterinary Plants of India, Deep Publications, New Delhi.
9. Jain, S. K. and Mudgal, V. A. 1999. A Handbook of Ethnobotany, Bhisensingh Mahendrapal Singh, Dehradun.
10. Pullaiah. T and Ravi Prasad Rao, B. 1995 . Flora of Nizamabad, Andhra Pradesh India, Bhisensingh Mahendrapalsingh, Dehradun.
11. Sharma, P. P. and Singh, N. P. 2001. Ethnobotany of Dadra Nagar Haveli and Daman, (Union Territories), Botanical Survey of India, Kolkata.
12. Kharwal, A. D. and Rawat, D. S. 2009. Ethnobotanical Studies on Timber Resources of Himachal Pradesh (H. P.), India.
13. Pullaiah. T, Prasanna P.V & G. Obulesu. 1992.Flora of Adilabad District Andhra Pradesh, India. CBS Publisher & Distributers.

ISBN: 978-93-93259-95-0

Anti-fungal Effect of Aqueous Extracts of Different Plants Against Sclerotium Rolfsii Causing Wilt on Sunflower

T. Uma Kiran[1]*, Prof. M. Mamatha[2]

[1*]Asst. Professor of Botany, Government Degree College, Armoor
[2]Dept. of Basic & Social Sciences, FCRI, Hyderabad

Abstract

Evaluation of anti-fungal activity 14 different phytoextracts against Sclerotium rolfsii causing Wilt disease in Sunflower was tested in-vitro conditions. The plants selected for this study were Syzgium aromaticum, Cinnamomum verum, Piper nigrum, Phyllanthus emblica, Calotropis procera, Nerium oleander, Psidium guajava, Eucalyptus globulus, Citrus limon, Lawsonia inermis, Zingiber officinale, Allium sativum, Allium cepa and Azadirachta indica. Aqueous extracts of these plants Syzgium aromaticum, Cinnamomum verum, Piper nigrum, Phyllanthus emblica and Allium sativum showed 100% growth inhibition of the pathogen at 20% concentration.

Key words: *Wilt disease, Sunflower, Anti-fungal activity, Phytoextracts, Growth inhibition.*

Introduction

In Indian economy Oil seeds play a significant role. 13% of gross cultivated area is from oilseeds. Many oil seeds like Soybean, Groundnut, Mustard, Sesame, Sunflower, Castor, Safflower, Linseed are cultivated in India. Total oilseed output from soybean contributes to largest average contribution followed by Mustard, Groundnut, and Sunflower.

One of the Important oil yielding crops in the world is Sunflower and it gained that significance due to the availability of high levels of unsaturated fatty acids in the oil which reduce the levels of blood cholesterols. The oil also contains many vitamins like A, B, E and nutrients such as selenium, copper, zinc (Gonzalez et.al., 2002). Another important superior quality of sunflower over other oilseed crops is its adaptability to various climatic conditions, withstanding ability to drought conditions. But its potential yield is reduced due to many factors and one of them is susceptibility to diseases. 80 different pathogens attacking sunflower were listed by Gulya and Masirevi (1991). Leaf spot, Mildews, Wilt and Rot diseases caused by different fungi and bacteria cause great loss to the crop. These micro-organisms decrease the quality and quantity of the sunflower oil remarkably. (Mirza and beg, 1983).

A soil-borne pathogen Sclerotium rolfsii, mostly occurring in tropical, sub-tropical and temperate regions of the world causes mainly root rot, stem rot, wilt diseases on more than 500 agricultural and horticultural crops. (Aycock, 1966; Domsch et.al., 1980; Farr et.al., 1989).

ISBN: 978-93-93259-95-0

Soil infestation with S. rolfsii showed reduction in germination of sunflower. Reduction in plant length, weight was observed in sunflower. (Fouzia Yaqub and Saleem Shahzad, 2005). Many synthetic fungicides are used for effective management of these diseases. But they are known to cause environment, soil and water pollution. These fungicides are show adverse effects on human and cattle health. Now a days a search for safe and eco-friendly fungicides has increased in research. So, in this study, experiments were carried out with different plant extracts to evaluate their anti- fungal effect on the pathogen, S rolfsii.

Materials and methods:

Isolation and culture of Sclerotium rolfsii from diseased Sunflower leaves: Wilt disease infected parts from sunflower growing fields were collected from Indalwai village areas, Nizamabad district of Telangana state. Pure culture of the pathogen from diseased plant parts were isolated by cutting the parts into 1 cm sections, these sections were sterilized using 5% Sodium hypochlorite solution for 2 minutes and rinsed thrice with sterile distilled water. These sterilized leaf discs were placed in Potato dextrose agar medium containing petri plates and incubated at 25 ± 2 ºC for 7 days. The fungal inoculum after seven days from the pure culture was isolated and inoculated onto PDA medium and incubated for 7 days to obtain sub cultures on different petri plates at 25 ± 2 ºC.

Preparation of Plant extracts:

Aqueous phytoextracts were prepared from fresh leaves of 14 different plants selected for the study. The fresh plant material collected was washed twice with tap water and once with distilled water. The air-dried leaves were separately ground with distilled water. For every 100 gm of fresh plant material 100 ml of distilled water (1:1w/v) was used to make the phytoextract. The extracts obtained were filtered using 2 layers of cheese cloth. The filtrate is now considered as 100% concentrated standard phytoextract, which was stored in fridge for further experimental studies.

ISBN: 978-93-93259-95-0

Table - 1: List of plants used in the present study:

S.No	Plant name	Botanical name	Part used
1	Neem	*Azadirachta indica*	Leaves
2	Onion	*Allium cepa*	Bulb
3	Garlic	*Allium sativum*	Bulb
4	Ginger	*Zingiber officinale*	Rhizome
5	Henna	*Lawsonia inermis*	Leaves
6	Limon	*Citrus limon*	Leaves
7	Eucalyptus	*Eucalyptus globulus*	Leaves
8	Guava	*Psidium guajava*	Leaves
9	Nerium	*Nerium oleander*	Leaves
10	Calotropis	*Calotropis procera*	Leaves
11	Amla	*Phyllanthus emblica*	Leaves
12	Pepper	*Piper nigrum*	Seeds
13	Cinnamon	*Cinnamomum verum*	Bark
14	Clove	*Syzgium aromaticum*	Buds

Plant extracts in PDA media have been modified in the following ways:

Concentrations of 20% was prepared from 100 % stock plant extract. After thoroughly mixing, separate extracts of 20% \(v/v) were added to double strength PDA medium, which was later autoclaved at 121? for 15 minutes. The sterilised medium was poured into 90mm sterile petri plates and allowed to solidify. A sterile cork borer was used to cut 5mm disc from 7 -day old pathogen culture and was inoculated onto the solidified PDA medium surface. Three replications were maintained and the plates were incubated at 25 ± 2^0 C. The medium without any plant extract served as control.

The mycelial growth of S. rolfsii in different petri plates were taken on 3rd, 5th and 7th day. Growth inhibition of fungus was calculated using the formula given by Vincent (1947). I= C - T/ C * 100 Where I = Percent inhibition of growth C = growth of pathogen in control petri plate (cm) T = growth of pathogen in plant extract amended petri plate (cm)

Results and Discussion:

14 plant extracts were tested for their efficacy in inhibiting the growth of the pathogen, S. rolfsii by poisoned food technique. Fungal growth inhibition was different for different plant extracts. At 20% concentration, phytoextracts of Garlic (Allium sativum), Henna (Lawsonia inermis), Amla (Phyllanthus emblica), Pepper (Piper nigrum), Cinnamon (Cinnamomum verum), Clove (Syzgium aromaticum) have shown 100% successful growth inhibition of the pathogen.

Maximum growth inhibition was exhibited by Ginger (Zingiber officinale), Eucalyptus (Eucalyptus globulus), Nerium (Nerium oleander) when compared to control. Phytoextracts of Neem (Azadirachta indica), Onion (Allium cepa), Lemon (Citrus limon), Guava (Psidium guajava),

ISBN: 978-93-93259-95-0

Calotropis (Calotropis procera) have exhibited more than 50% of growth inhibition of the pathogen S. rolfsii as compared to the control plate.

Table- 2: Effect of different plant extracts at 20% concentration on mycelial growth of *Sclerotium rolfsii*

S.No	Plant extract @ 20% concentration	Average growth of the pathogen on day -3	I = growth inhibition on 3rd Day	Average growth of the pathogen on day -5	I = growth inhibition on 5th Day	Average growth of the pathogen on day -7	I = growth inhibition on 7th Day
1	Control	4.76	0%	8.2	0%	8.86	0%
2	Neem (*Azadirachta indica*)	1.63	65.75%	2.43	70.37%	4.13	53.39%
3	Onion (*Allium cepa)*	1.03	78.36%	2.46	70%	3.66	58.69%
4	Garlic (*Allium sativum*)	0	100%	0	100%	0	100%
5	Ginger (*Zingiber officinale*)	1.16	75.63%	1.93	76.46%	2.5	71.78%
6	Henna (*Lawsonia inermis*)	0	100%	0	100%	0	100%
7	Lemon (*Citrus limon*)	1.93	60%	3.16	61.46%	4.17	52.93%
8	Eucalyptus (*Eucalyptus globulus*)	1.36	71.43%	2.16	73.66%	3.13	64.67%
9	Guava (*Psidium guajava*)	1.6	66.39%	3.1	62.2%	4.3	51.47%
10	Nerium (*Nerium oleander*)	1.4	70.56%	2.23	72.8%	3.36	62.07%
11	Calotropis (*Calotropis procera*)	1.53	67.86%	2.83	65.49%	4.26	51.92%
12	Amla (*Phyllanthus emblica*)	0	100%	0	100%	0	100%
13	Pepper (*Piper nigrum*)	0	100%	0	100%	0	100%
14	Cinnamon (*Cinnamomum verum*)	0	100%	0	100%	0	100%
15	*Clove (Syzgium aromaticum)*	0	100%	0	100%	0	100%

ISBN: 978-93-93259-95-0

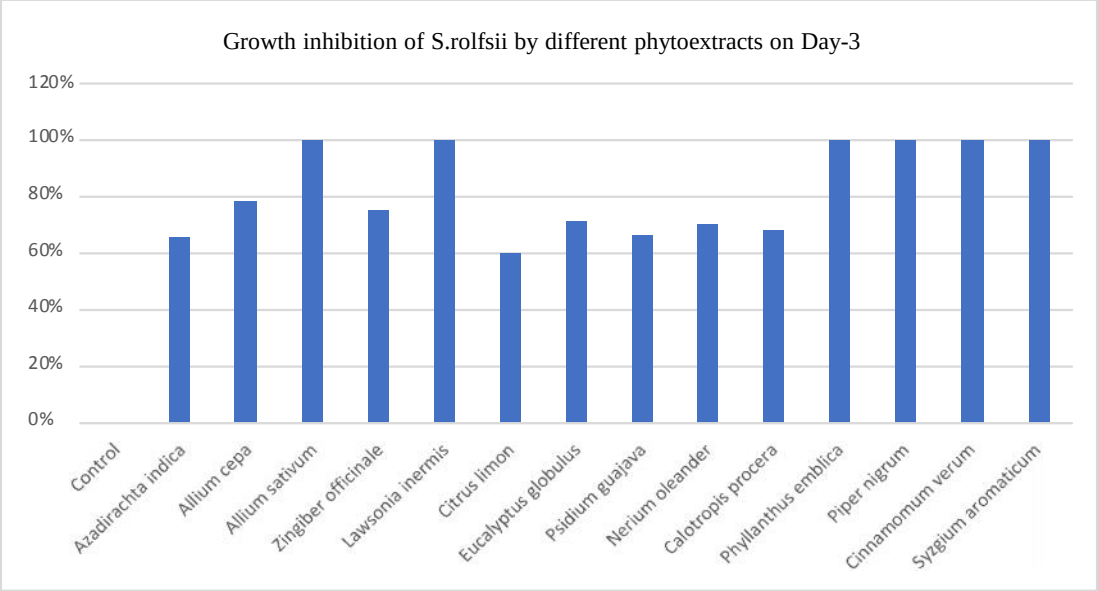


Figure 1- Effect of different plant extracts at 20% concentration on growth of S. rolfsii on day- 3

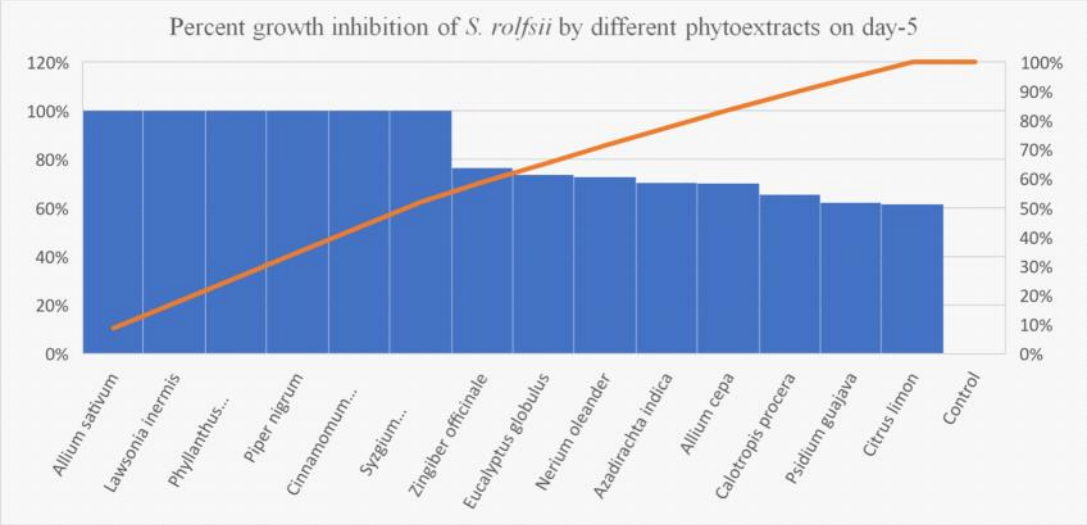


Figure 2 - Effect of different plant extracts at 20% concentration on growth of S. rolfsii on day- 5

ISBN: 978-93-93259-95-0

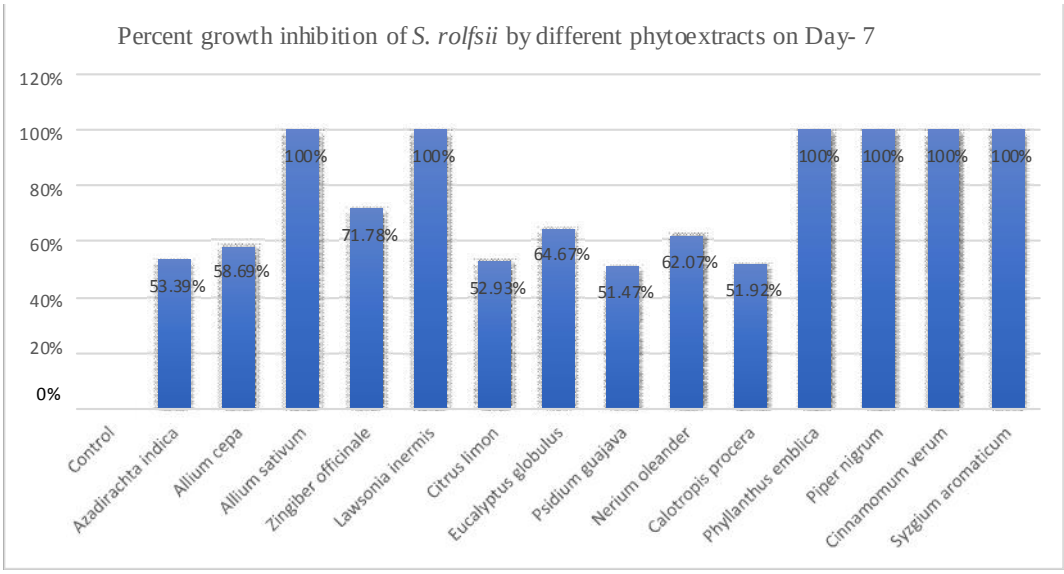
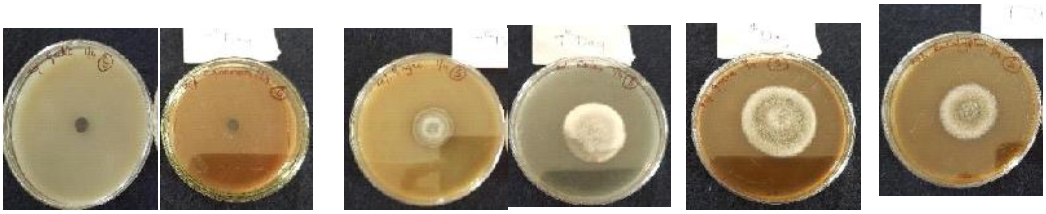


Figure 3 Effect of different plant extracts at 20% concentration on growth of S. rolfsii on day- 7



a) b) c) d) e) f)

Figure - 4 Growth inhibition of S. rolfsii on a) Allium sativum, b) Cinnamomum verum, c) Zingiber officinale, d) Allium cepa, e) Psidium guajava and f) Eucalyptus globulus plant extracts at 20% concentration on day-7

References:

1. Ahmed, Y., M.S. Mirza and M. Aslam. 1984. Sclerotium rolfsii on maize. FAO Plant Prot. ull., 32: 147.
2. Aycock, R. 1966. Stem rot and other diseases caused by Sclerotium rolfsii. NC. Agric. Exp. Sta. Tech. Bull, No. 174. 202pp.
3. Bag, T.K. 2004. Two new orchid hosts of Sclerotium rolfsii from India. Plant Pathol., 53: 255.
4. Blum, L.E.B. and R. Rodriguez-Kabana. 2004. Effect of organic amendments on sclerotial germination, mycelial growth, and Sclerotium rolfsii induced diseases. Fitopatologia Brasileira, 29: 66-74.
5. Chang, T. 1994. Pathogenicity of Sclerotium rolfsii on Edgeworthia papyrifera and sclerotial survival. Bull Taiwan For. Res. Inst. New Series. 9: 191-196.
6. Conway, K.E. and S.F. Tomasino. 1985. Sclerotium rolfsii, a problem to apple nursery stock in Oklahoma. Phytopathol., 75: 499.
7. Domsch. K.H., W. Gams and T.H. Anderson. 1980. Compendium of Soil Fungi. Academic Press, London, NewYork.

ISBN: 978-93-93259-95-0

8. Farr, D.F., G.F. Bills, G.P. Chamuris and A.Y. Rossman. 1989. Fungi on plant and plant products in the United States. American Phyto phythological Society, St. Paul.

9. Iqbal, S.M., A. Bakhsh, S. Hussain and B.A. Malik. 1995. Microbial antagonism against Sclerotium rolfsii, the cause of collar rot of lentil. Lens-Newsletter, 22: 48-49.

10. Jahangir, A.M., M.K. Mohibullah, M. Ayub and M. Khan. 1995. Detection of fungi causing root rot of apple nurseries in Swat. Sarhad J. Agri., 11: 754-748.

11. Jomduang, J. 1995. Evaluation of Malaysian isolates of Trichoderma harzianum and Gliocladium virens for the biological control of Sclerotium foot rot of chilli. Thesis Dissertation, Department of Plant Protection, Universiti Putra Malaysia. 175pp.

12. Keen, B.A. and H. Raczkowski. 1921. The relation between clay content and certain physical properties of soil. J. Agric. Sci., 11: 441-449.

13. Khalequzzaman, K.M. 2003. Effect of inocula levels of Meloidogyne javanica and Sclerotium rolfsii on the plant growth, yield and galling incidence of soybean. Pak. J. Pl. Pathol., 2: 56-64.

ISBN: 978-93-93259-95-0

Diversity of Beetles (Insecta:*Coleoptera*) Ffrom the Vicinity of Penganga Wildlife Sanctuary in Umarkhed, District Yavatmal, Maharashtra, India

Pradip Laxman Rudraswad[1], Dinesh K. Dabhadkar[2]
Department of Zoology, G.S.Gawande College, Umarkhed- 445206
Email:p.rudra1437@gmail.com[1]

Abstract

The present investigation was conducted in the month of Oct -Nov 2022 on the coleopteran diversity from the vicinity of paingang river range total of 12 species belonging to 5 different families of beetles viz. Gyrinidae, Tenebrionidae, Carabidae, Scarabaeidae and Meloidae were collected and identified from various habitats.

Keywords: *Coleoptera, Beetles, Insecta, Arthropoda, painganga, wildlife sanctuary*

Introduction

The order Coleoptera which include beetles is the most diverse order of class Insecta (Phylum: Arthropoda). This is the largest group of comparable units among all animals. India being situated in tropics is well known for richness of Coleopteran fauna. Beetles are found in almost every habitat and range in size from 1-100 mm. It includes more than 3, 50000 identified species and represents about 40% of all insects and 30% of all animals (Choate, 2003). About 1,5088 species of coleopteran insects are known from Indian region (Kazmi, 2004). Perhaps the single most important factor in the success of coleopterans is the development of elytra which protect the folded hindwings permitting occupation of encoded spaces and hidden habitats by adult. Beetles are tiny to very large insects of variable shape and color but mostly strongly sclerotized, compact and more or less flattened. The compound eyes are normally conspicuous. Some species have reduced wings (Arnett, 1973). Beetles are exceedingly variable both ecologically and biologically. The majorities of beetle are terrestrial herbivores; many are predatory, frequently with highly specialized host ranges or life cycles (Forest Science Project (FSP) Technical Report). While the identity and activity of a few of the forest beetles are well known, most of those, other than the major pests, have been little studied. Their complex ecosystem roles have not been determined. Although some of this deficiency is owing to a general lack of emphasis on total ecosystem function and dynamics, it is well know that lack of identification manuals has severely hindered studies of the whole beetle component of forest diversity (Scudder et al.,2005).

ISBN: 978-93-93259-95-0

Materials and Methods

I) Study area: The area in the vicinity along the both side way of pain ganga river and roadconsists of a very diverse type of flora & fauna hence this region of pain ganga river Range in the pain ganga wildlife sanctuary was selected as a study area (Fig1) located in the umarkhed tahashil in the Indian State of Maharashtra the named given, on the basis of pain ganga river which is splitting into two region vidarbha and marathwada. Presently the total area of the Reserve is around 325sq. km. The forestis tropical dry deciduous in nature dominated by teak (Tectona grandis). A survey of beetles was undertaken in the study area along five different transects.

Transect I - Area containing the wetlands

Transect II - Dry area with shrubs

Transect III - Area predominant with teaktrees *(Tectona grandis)*

Transect IV - The area containing dungpatches

Transect V - Area containing stones and rocks patches.

2) Collection and identification of beetles

In order to adequately sample the beetles from various habitats, a wide variety of collecting and trapping methods were used. Most beetles are harmless and were collected by hand. Butterfly nets were employed for catching flying beetles. A simple umbrella method was used for collecting beetles from trees. Some beetles were collected during night with the help of light traps with a source of white light. Dung beetles from the family Scarabaeidae were collected from the dung with the help offorceps.

Results and Discussion

In the present investigation, 12 species of beetles were identified. The checklist of beetles, their habitat is given in Table I. In present study diversity of beetles of 5 different families viz. Gyrinidae (Whirligig beetles), Tenebrionidae (Darkling beetles), Carabidae (Ground beetles), Scarabaeidae (Scarab beetles) and Meloidae (Blisterbeetles) were recorded. The percentage of different beetle families recorded in the study area is given in Fig. II. A preliminary study was conducted on beetles of Kalatop-Khanjjiar Wildlife Sanctuary, Himachal Pradesh that enumerated 18 species to 16 genera over nine families (Sharma et al., 2004). The Coleopteran fauna from the Indian Thar Desert, Rajasthan was examined (Kazmi et al., 2004) in which 102 species of 13 different families were recorded.

Aquatic coleoptera (Insecta) belonging to 40 taxa in 7 families of streams in the Nizke Beskydy Region (Slovakia) were studied (Zatovicova et al. 2004). Total 13 species of water beetles belonging to families Dytiscidae, Hydrophilidae & Gyrinidae were recorded from the

ISBN: 978-93-93259-95-0

Kolkas region of Melghat Tiger Reserve, Central India (Thakare et al., 2011). In the present study, single water beetle from family Gyrinidae (Whirligig beetles) was recorded.

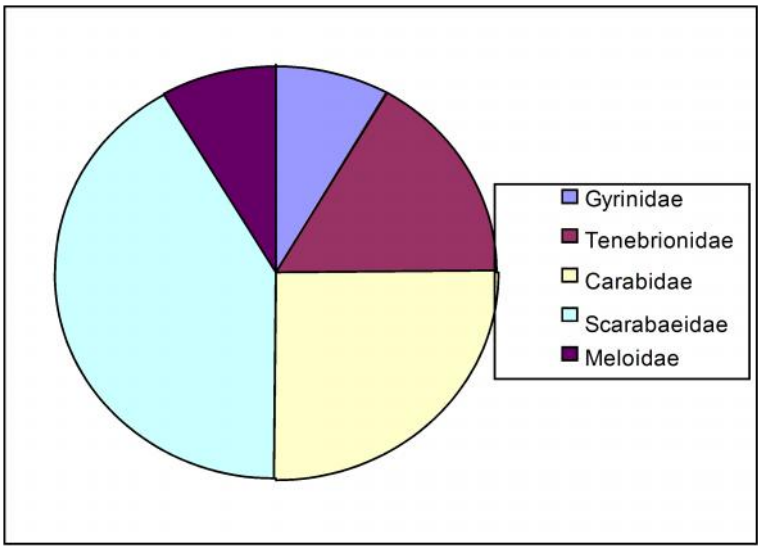
5 species of Scarab beetles from the subfamilies Scarabaeinae and Cetoniinae of family Scarabaeidae were recorded in this study. The study of scarab beetles of Bandhavgarh National Park, Madhya Pradesh recorded 44 species in 24 genera and 8 subfamilies (Chandra et al., 2005). The faunistic record of scarabaeidae from the G.N.H.P. Himachal Pradesh, India documented 9 species of 4 subfamilies (Chandra et al., 2007). Biodiversity pattern of cavernicolous ground beetles and their conservation status in the Azores were studied (Borges et al., 2007) in which total 10 species were studied. In the present study 3 ground beetles (Coleoptera: Carabidae) were recorded from the study area.

Table I: Checklist of beetles and their habitat from the study area

Family/ Genus	Occurrence
Gyrinidae	
Dineutus indicus	Transect I
Tenebrionidae	
Platynotus sp.	Transect V
Cossyphus depressus	Transect V
Carabidae	
Calosoma orientale	Transect II
Chaenius sp. 1	Transect III
Scarites sp.	Transect V
Scarabaeidae	Transect IV
Onitis sp.	Transect II
Chiloloba acuta	Transect IV
Onthophagus catta	Transect IV
Onthophagus dama Copris sp.	Transect II
Meloidae	
Mylabris sp.	

Fig. II: Family wise distribution of beetles in the study area

ISBN: 978-93-93259-95-0



Acknowledgement

We are thankful to Department of Science and Technology, Government of India for providing funding to the Ph.D. program in the form of UGC-NET-JRF Fellowship for the present study.

The authors are grateful to the Director and experts, Zoological Survey of India (ZSI), Central Zone Regional Centre, Jabalpur, Madhya Pradesh, India for his assistance and help in identification of scarab beetles. Special thanks to The Principal Chief Conservator of Forest (PCCF), Government of Maharashtra and Conservator of Forest.

Literature Cited

Arnett RH Jr, 1973. Beetles of the U.S.A. manual for identification, American Entomological Institute, *Ann Arbar* MI. 1112PP.

Borges AV, Oromi P, Serrano RM, Amorim IR and Pereiara F, 2007. Biodiversity patterns of carvernicolous ground beetles and their conservation status in the Azores with the description of a new species : *Trechus isabelae* n.s.p. (Coleoptera : Carabidae : Trechinae). *Zootaxa*, 1478: 21-31.

Chandra K and Ahirwar SC, 2005. Scarabaeid beetles of Bandhavgarh National Park, Madhya Pradesh.

Zoos' print journal, 20 (8): 1961-1964.

Chandra K, 2007. On a collection of pleurostict Scarabaeidae (Coleoptera) from the Great Himalayan National Park, Himachal Pradesh, India. *Zoos' print journal*, 22 (9) : 2821-2823.

Choate PM, 2001. Manual for identification of the ground beetles (Coleoptera : carabidae) (including tiger beetles) of Florida.

Kazmi SI and Ramamurthy VV, 2004. Coleoptera (Insecta) fauna from the Indian Thar Desert. Rajasthan.

Zoos' print journal, 19 (4): 1447-1448.

Sharma RM, Mulganina M and Chakraborty P, 2004. Beetles of Kalotop Khanjjiar Wildlife Sanctuary, Himachal Pradesh. *Zoos' print journal,* 19 (9): 1626.

Scudder, Geoffrey GE, Cannings, Robert A, 2005. Project Report; Beetle Families of British Columbia, Project Number: Y051001). Forest Investment Account (FIA) - Forest Science Program.

 ISBN: 978-93-93259-95-0

Nesting Site and Nest Preparation of Vultures (*Gyps Indicus*) in Telangana State

K. Ravi Kumar[1], Rajender. G[2]*

[1,2]Dept. of Zoology, Kakatiya University, Warangal-506009.

Abstract

Vultures are most important scavenger and play an important role in nature's sanitation process by eating meat from carcasses and municipal dumps. Vultures are large birds carrion eaters and are divi-ded into two groups: The New World Vultures and Old World Vultures. New World vultures are under the order Falconiformes of family Athartidae. The Old World vultures belong to the family Accipitridae. Out of 23 species of vultures in the world, nine are found in India. Among these vultures, four are critically endangered, one endangered, three near threatened and one least concern as per the IUCN status. Vultures were once thought to have vanished and in the Telangana state around 10 vultures were spotted by Bejjur Forest Range in the year 2013. They avoid human disturbances by placing their nests during breeding period at least 100 meters left from human interruption. Long-billed Vultures Gyps indicus nest almost exclusively on cliffs and ruins in colonies, although in areas, where cliffs are absent, nest of Gyps indicus also reported in ruins of historical monuments. Long billed Vulture Gyps indicus starts to construct the nest from September every year. The constructed nests are reused for years or even decades by the same birds and grow up larger up to each breeding season. Nests are made of sticks and lined with green leaves, sometimes with the addition of pieces of rags and other rubbish. During 2013, while conducting the Long-billedvulture study, Long-billed vulture characterized by elevated rock cliff named "Palarapu cliff". In nest construction activities both male and female participate equally and are at the peak during the morning and mid-day hours and one individual guard the nests and other leaving to look for nesting material as Nalla maddi, Tiruman, Bojja, Thuniki, Teak, Ippa, Naripa, Mulla gudesha, Anduga, Bilugu, Igiphasia,, Kora grass, Buruku grass. In many avian species, parasites and pathogens lead to nest desertion, egg spoilage, and reduced growth and survival of nestlings. Birds combat parasites in a variety of ways and adding green vegetation into nests is one way to control nest parasites. Detailed studies need to be conducted on these aspects in order to address any related threats and food availability. Considering the fact that Gyps indicus population declined drastically, there is a need to provide security to the nests from threats and human disturbances.

Introduction

Vultures are most important scavenger and play an important role in nature's sanitation process by eating meat from carcasses and municipal dumps (Houston 1974). While feeding,

ISBN: 978-93-93259-95-0

vultures reduce the potential spread of diseases that could affect other animals and humans (Ogada et al. 2012a,). The Long-billed vulture Gyps indicus is one of the three native, resident Gyps species in India. Long-billed vulture breeds in south-east Pakistan and Peninsular India south of the Gangetic plan, north to Delhi, east through Madhya Pradesh, South to Nilgiris.

Vultures are large birds carrion eaters and are divi-ded into two groups: The New World Vultures and Old World Vultures. New World vultures are under the order Falconiformes of family athartidae. The New World vultures are distributed from Southern Canada to the Falkland Islands. The Old World vultures belong to the family Accipitridae and Old World vultures are widely distributed in Asia, Africa and Europe. The subfamily Aegypinae of Accipitridae contains 15 species of Old World vultures. (Ali and Ripley, 1987, Ramprakash and Purohith-2014).

Out of 23 species of vultures in the world, nine are found in India. These include:

S.No	Common name	Scientific name	Reference
1	Oriental white-backed Or White-rumped vulture	*Gyps bengalensis*	Ansari, 2015. Ali and Ripley, 1983; MoEF. 2006.
2	Slender-billed vulture	*Gyps tenuirostris*	
3	Long-billed vulture Or Indian vulture	*Gyps indicus*	Ali & Repley, 1987.
4	Egyptian vulture	*Neophron percnopterus*	Khatri, 2013a.
5	Red- headed Or King vulture	*Sarcogyps calvus*	Prakash, 1999.
6	Indian griffon vulture	*Gyps fulvus*	Prakash *et al.,* 2003.
7	Himalayan griffon	*Gyps himalayensis*	
8	Cinereous vulture	*Aegypius monachus*	Grimmett *et al.,* 2001.
9	Bearded vulture Or Lammergier	*Gypaetus barbatus*	Samson, A. & B. Ramakrishnan (2018

Among these vultures, four are critically endangered, one endangered, three near threatened and one least concern as per the IUCN status. Five species belonging to genus Gyps, viz. Indian white-backed vulture (Gyps bengalensis), Long-billed vulture (Gyps indicus) and Slender-billed vulture (Gyps tenuirostris) are residents, and the other two, the Eurasian griffon (Gyps fulvus) and Himalayan griffon (Gyps himalayensis) are wintering species (Prakash, 1999; Prakash et al., 2003). In addition, the other four species viz. Lammergeier (Gypaetus barbatus), Egyptian vulture (Neophron percnopterus) and Redheaded vulture (Sarcogyps calvus) are resident while Cinereous vulture (Aegypius monachus) is a wintering species (Grimmett et al., 2001).

The Long-billed vulture Gyps indicus is one of the three native, resident Gyps species in India. Long-billed vulture breeds in south-east Pakistan and Peninsular India south of the Gangetic

ISBN: 978-93-93259-95-0

plan, north to Delhi, east through Madhya Pradesh, South to Nilgiris (Collar et al., 2001; Risebrough 2004; Rasmussen & Anderton 2005; Venkitachalam & Senthilnathan 2015). (Samson, A. & B. Ramakrishnan (2018).

The species is classified as Critically Endangered (BirdLife International, 2017) because of catastrophic decline of 90-98% in the population of Gyps species due to diclofenac poisoning (Gilbert et al., 2006; Green et al., 2004). (Samson, A. & B. Ramakrishnan (2018).

As per a study by Bombay Natural History Society (BNHS), published the number of long-billed vultures in 2015 across India was pegged at a meagre 12,000. As per categorization by International Union for Conservation of Nature (IUCN), Long-billed vultures are listed as 'Critically endangered', the penultimate category to being listed as 'Extinct in the wild' (The New Indian Express Published: 22nd July 2018).

Vultures were once thought to have vanished and in the Telangana state around 10 vultures were spotted by Bejjur Forest Range Officer M Ram Mohan on Palarapu cliffs on the outskirts of Nandigoan village, Penchikalpet mandal, at the confluence of Peddavagu and Pranhita, a tributary of Godavari in 2013.

Authorities will take up initiatives to conserve the vultures, which play an instrumental role in the ecology by feeding on the dead and decomposed. Forest Department officials told Telangana Today that a postal stamp and a special cover of this endangered bird species would be released in Nehru Zoological Park of Hyderabad on October 6 as part of the ongoing Wildlife Week (October 2-8). Activities such as essay-writing, elocution competitions and awareness rallies in villages, among many oters, have been planned, an official said.

The long-billed vulture (Gyps indicus) - the scavenger bird of Bejjur forests - has been chosen as the Unique Bird by Forest department for 2017, fetching the endangered species a bit more importance.

Vultures normally prefer nesting site outside of forest edge, untie grasslands with scattered trees or found in colonies in tree top at 2-10 meter far above the ground (Khatri, 2015). They avoid human disturbances by placing their nests during breeding period at least 100 meters left from human interruption (Chomba et al., 2013)(Donazar et al., 2002). Vultures in Greece preferred old isolated trees on steeper slopes (Poirazidis et al., 2007). Research in Spain and Greece found that human disturbance (Fargallo et al., 1998; Donazar et al., 1993 Poirazidis et al., 2004; Reading, 2005). Batbayar 2004 found Cinereous vulture Aegypius monachus nest on relatively steep slopes in central Mongolia (Reading, 2005, 2010). Gyps fulvus appears to prefer nest site far from humans and on rugged terrain (Sara and Vittoria, 2003; Parra and Telleria, 2004; Reading, 2005). Long-billed Vultures Gyps indicus nest almost exclusively on cliffs and ruins in colonies, although in areas, where cliffs are absent, nest of Gyps indicus also reported in ruins of historical monuments (Kushwaha et al., 2010) and in trees on Delbergia lanceolate (Ramesh and sankar in 2011; Rasmussen and Anderton, 2005; Kushwaha et al., 2013) whereas the Gyps bengalensis

ISBN: 978-93-93259-95-0

and Red-headed vulture Sarcogyps calvus nests on trees Ficus religiosa (Peepal) tree (Mathews, 1918). Gyps tenuirostris nesting in trees, Ficus (Baker 1932-1935, Ali and Ripley, 1968-1998; Brown and Amadon, 1968; Grubh 1978; del Hoyo et al.,1994, Alstrom, 1997, Grimmett et al., 1998).

Selection of nest site and nest materials are considered as the important factors determining the reproductive success of many birds' species [6, 17, 20, 18, 11, 23]. Once a Nest site is selected the interaction between male and female become less frequent and both get involved in the preparation of nest. They carry nesting material from near and far off areas both. (Shivangi Mishra, Adesh Kumar and Amita Kanaujia. 2017).

Nest Building is an essential part of the life cycle and taxonomically prevalent activity among birds, mammals, reptiles, fish and even insects [7]. The design of the nest varied among different taxa. Some build a small cup shaped nest while some prepare a huge complex elliptical nest or platform nest. They may be composed of twigs, green leaves, roots etc. or anthropogenic materials like wool, thread, rubber, rope etc. Though the design and shape of nests vary but the function of every nest is same which is to provide a suitable substrate or base for the laying of eggs and developing young ones [9].

Vultures build large perennial and open nest on extensive assortment of supports (e.g. Large tree, cliffs, ruins, monument) (Cramp and Simmons, 1977; Tryjanowski et al., 2009). The constructed nests are reused for years or even decades by the same birds and grow up larger up to each breeding season. (Kanaujia et al., 2010; Davit, 2009; Vergara et al., 2010; Rasmussen, Anderton; Kushwaha et al., 2009). The vultures are sanitary birds; after each mealtime they obtain bathe, so the vulture colonies are situated in close proximity to water bodies. There is remarkable variation in nest construction by bird species and, within species, variability in nest characteristics can be pronounced, which highlights that nest construction is dependent on individual behaviour and ability (Collias & Collias 1984).

There is huge variability among species of vultures in relation to nest construction, nest maintenance, nesting time of year, nest material, nest location. Long billed Vulture Gyps indicus starts to construct the nest from September every year. Long billed vulture Gyps indicus demotes their nests by the side of the water bodies on cliffs monuments. Their nests are made of strong small and thin sticks at the corner of strong branch lined with green leaves, and with pieces of rags and other rubbish (Khatri, 2015). The size and diameter of the nest are about 2-3 feet and a single nest consists of 2000-4000 sticks (Kanaujia et al., 2013).

If fresh plants containing chemical compounds act as contact toxicants or natural fumigants, then species tending to nest in previously used sites should be more prone to include fresh plant material into their nests.

The addition of fresh green plant material to dry nest material is widespread among birds (Newton 1979, Wimberger 1984, Clark & Mason 1985). The green plant material may serve

ISBN: 978-93-93259-95-0

multiple purposes and depend on what is accessible to the bird (Whittow & Berger 1977, Skowron & Kern 1980). Nests are made of sticks and lined with green leaves, sometimes with the addition of pieces of rags and other rubbish.

Material and Methods:

Study area:

During 2013, while conducting the Long-billedvulture study, Long-billed vulture characterized by elevated rock cliff named "Palarapu cliff ". The height of the cliff ranges from 75 to 108 meter, which lies in Bejjur Reserved Forest adjacent to Nandigaon village at the confluence of PeddaVaagu stream and Pranahita River. This cliff consists about 40 white washed ledges (fecal roppings), which were indirect evidence of the birds' past usage (Rondeau et al., 2006).

Result:

ISBN: 978-93-93259-95-0

ISBN: 978-93-93259-95-0

S.No	Common name	Scientific name	Family	Plant part using by vulture	Uses
1	Nalla maddi	*Terminelia tomentosa*	Combretaceae		
2	Tiruman	*Anogeissus latifolia*	Combretaceae		
3	Bojja	*Xylia xylocarpa*	Fabaceae / Leguminosae		Vomiting, diarrhoea, gonorrhoea and ulcers, rheumatism, piles, leprosy
4	Thuniki	*Diospyros melanoxylon*	Ebenaceae		More Physico-Chemical, Mechanical and Antioxidant Properties in maturity levels to treating urinary, skin and blood diseases, Antioxidant, high moisture, ash, crude protein and fibre, fat, ascorbic acid and, carbohydrate, high minerals (Ca, P, Mg, Fe, Zn, Na, Pb, and Cu)
5	Teak	*Tectona grandis*	Lamiaceae		
6	Ippa	*Madhuca Indica* or *Madhuca longifolia var. latifolia*	Sapotaceae		Anti diabetic, antiulcer, hepato protective, anti pyretic, anti fertility, analgesic, anti oxidant, swelling, inflammation, piles, emetic, dermatological, laxative, tonic, anti burn, anti earth worm, wound healing headache
7	Naripa	*Hardwickia binata*	Fabaceae / Leguminosae		Reinforcement in Natural fiber, hardest and heaviest durable, termite resistant
8	Mulla gudesha				
9	Anduga	*Boswellia serrata*	*Barseraceae*		Cytotoxicity, anti-inflammatory, angiogenic activity
10	Bilugu	*Chloroxylon swietenia*			Anti-oxidants, anti- fungal, anti–microbial, anti-inflammatory
11		*Igiphasia*			
12	Kora grass	*Saccharum spotaneum*	Poaceae		
13	Buruku grass				

Long -billed vulture Gyps indicus in forest of Bejjur, collecting green leafs, twigs, dry sticks and grass from near and far of nest site to build nest and repairing old nest. The above mentioned list of plants materials using in order to construct nest by Gyps indicus in forest of Bejjur region.

Vultures normally prefers nesting site at the edge of forest, open grasslands with scattered trees or found in colonies in tree top at 2-10 meter high (Bird Life International, 2006).

The nest construction is a tedious work and to maintain the appropriate structure of nest a number of sticks and twigs used by vultures. In nest construction activities both male and female participate equally and are at the peak during the morning and mid-day hours and one individual guard the nests and other leaving to look for nesting material (Kanaujia et al., 2010; Kushwah et al., 2009).

ISBN: 978-93-93259-95-0

Discussion:

The bark of the Salai tree Boswellia serrata maintains its green and healthy appearance for several months after it has been felled. During this period, the tree is rarely subject to infestation by insects (Orwa et al.2009). This potentially helps reduce insect colonisation of nests during the breeding season.

In many avian species, parasites and pathogens lead to nest desertion, egg spoilage, and reduced growth and survival of nestlings (Hitchner 1980, Loye & Zuk 1991, Richner et al. 1993, Oppliger et al. 1994). The survival and fecundity of breeding adult birds can also be lower due to nest parasites (Richner et al. 1993, Moller et al. 1990). Birds combat parasites in a variety of ways and adding green vegetation into nests is one way to control nest parasites. Several hypotheses regarding the function of green materials have been proposed. Wimberger (1984) hypothesized that nest greenery use by raptors aids in repelling ectoparasites via secondary compounds with insecticidal properties that are released during drying or decay of the plant material.

Conclusion:

Vultures were once thought to have vanished and in the Telangana state around 10 vultures were spotted by Bejjur Forest Range in the year 2013. During 2013, while conducting the Long-billed vulture study, Long-billed vulture characterized by elevated rock cliff named "Palarapu cliff". Long-billed Vultures Gyps indicus nest almost exclusively on cliffs and ruins in colonies, although in areas, where cliffs are absent, nest of Gyps indicus also reported in ruins of historical monuments. Long billed Vulture Gyps indicus starts to construct the nest from September every year. In nest construction activities both male and female participate equally and are at the peak during the morning and mid-day hours and one individual guard the nests and other leaving to look for nesting material as Nalla maddi, Tiruman, Bojja, Thuniki, Teak, Ippa, Naripa, Mulla gudesha, Anduga, Bilugu, Igiphasia, Kora grass, Buruku grass. Birds combat parasites in a variety of ways and adding green vegetation into nests is one way to control nest parasites.

Recommendations:

There is a need to explore the possibility of the long billed vultures feed on wild animal carcasses in nearest places. Detailed studies need to be conducted on these aspects in order to address any related threats and food availability. Considering the fact that Gyps indicus population declined drastically, there is a need to provide security to the nests from threats and human disturbances.

References:

1. Bharath, M., Tulasi, L.R., Sudhakar, K. & Eswaraiah, M.C 2013. Dalbergia Sissoo DC [De Candolle]. -An Important Medicinal Plant. International Journal of Research in Pharmacy And Chemistry 3(2): 384-388.

ISBN: 978-93-93259-95-0

2. Clark, L. 1991. The nest protection hypothesis: the adaptive use of plant secondary compounds by European starlings. In: Bird-parasite interactions: ecology, evolution, and behaviour (Eds. J. E. Loye and M. Zuk). Oxford University Press, Oxford.

3. Clark, L. & Mason, J. R. 1985. Use of nest material as insecticidal and antipathogenic agents by the European starling. Oecologia 67: 169-176.

4. Clark, L. & Mason, J. R. 1988. Effect of biologically active plants used as nest material and the derived benefit to starling nestlings. Oecologia 77: 174-180.

5. Clayton, D. H. & Wolfe, N. D. 1993. The adaptive significance of self- medication. Trends in Ecology and Evolution 8: 60-63.

6. Collias, N.E & Collias, E.C. 1984. Nest building and bird behaviour.

7. Princeton University Press, Princeton.

8. Hitchner, S. B. 1980. Isolation and Identification of Avian Pathogens.

9. American Association of Avian Pathologists, College Station, Texas.

10. Kanaujia, A., Kushwaha, S., Kumar, A. & Kumar A. 2013. Janghil: Experts In Habitat Utilization. GREEN - A quarterly newsletter (Directorate of Environment, Uttar Pradesh) Vol 7(1).

11. Kota G.C., Kannan, K.M., & Rajasekar M.2012. Flacourtia indica (Burm. f.) Merr.-A Phytopharmacological International Journal of Research in Pharmaceutical and Biomedical Sciences Vol. 3 (1): 78-81.

12. Krishna, M.S & Nair A.J.2010. Antibacterial, Cytotoxic and Antioxidant Potential of Different Extracts from Leaf, Bark and Wood of Tectona grandis. International Journal of Pharmaceutical Sciences and Drug Research 2(2): 155-158.

13. Kushwaha, S. 2014. Parasitological and pathological investigation on vultures (Gyps Species) declining in Bundelkhand Region of India. PhD Thesis, University of Lucknow, Lucknow India.

14. Loye, J. L. & Zuk, M. 1991. Bird Parasite Interactions: Ecology, Evolution and Behaviour. Oxford University Press, Oxford.

15. Margalida, A & Bertran J. 2000. Nest-building behaviour of the Bearded Vulture Gypaetus barbatus. Ardea 88: 259-264.

16. Martin, T.E. 1988. Processes organizing open nesting bird assemblages: competition or nest predation? Evolutionary Ecology 2: 37-50 .

17. Møller, A. P., Allander, K. & Dufva, R. 1990. Fitness effects of parasites on passerine birds: a review. In: Population BIology of Passerine Birds.

18. Utilisation of green plant material in nests of Long- billed Vultures Gyps indicus in Bundelkhand Region, India Sonika Kushwaha vulture-news 2016.

ISBN: 978-93-93259-95-0

Ethnomedicinal Survey of Plants Used by the Sugali Tribe in Madakasira Sri Sathya Sai District, Andhra Pradesh, India

Akkulanna. S[1]*, R.R.Venkata Raju[2]

[1,2]Department of Botany, Sri Krishna Devaraya University, Ananthapuramu-515003
*E-mail:akkulannas@gmail.com

Abstract

An Ethnomedicinal survey was conducted to collect information about medicinal plants used by villagers of madakasira, Sathya Sai district, Andhra Pradesh. Information was presented in this paper were gathered from Sugali tribal and practitioners using an integrated approach of botanical collections and interview schedules. A total of 50 informants within the age group of 30 to 68 were interviewed. The present study identified a total of 30 families highest number of species belongs to Apocynaceae, Caesalpinaceae, Fabaceae and Solanaceae. Total 12 plant parts were invariably preferred for treating 39 human ailments. Richness of leaf parts of 44 species (84.6%) followed by root and stem (7.69%) were practiced. Maximum number of crude drug used for wound healing, stomach pain,3 species for scorpion sting, motions, cold and cough and 2 species were used for white bleeding, snake bite and diabetes. Information reveals that still the peoples of Sugali tribe and practitioners in Madakasira largely depend on medicinal plants to meet their primary healthcare. The ethnomedicinal data of traditional knowledge of tribes and practitioners was also documented. Further research will be carried out on isolation of active ingredient from medicinal plant species for effective treatment of various diseases and also necessary steps may be taken to conserve the rare endangered species for sustainable environment.

Key words: *Ethanomedicinal, Medicinal plants, Sugali Tribe and Madakasira*

Introduction

Sri Sathya Sai district is known for rich plant sources and their traditional practices from long time by herbal practitioners for different diseases. Especially Sugali and Yerukala are predominantly seen and most often mixed with the rural communities are living in the forest of Madakasira in part of Sathya Sai district. Madakasira is located at 13^0.93'69"N77^0.26'94"E. It has average elevation 676mts. Climate is very cool in comparing with other placeshence aptly known as 'Ooty' of Sri Sathya Sai district. This region consists of dry deciduous forests with sparsely distribution trees. Majority of the hills are barren and often covered with thorny bushes,shrubs, grasses and Euphorbiaceae succulents.The accumulated knowledge of the Sugali tribes is extended a little to the benefit and longevity of the poor. The Sugali tribes living in

 ISBN: 978-93-93259-95-0

Madakasira prefer less costing holistic medical care from indigenous natural drugs for treating most of their diseases. For the sake of conservation of tribal knowledge on medicinal plants was essential. The aim of the present study was to record medicinal knowledge of plants used by the tribal communities living of Madakasira.

Material and Methods:

Folklore information as collected from herbalists in Sugalithandas (Villages) andinterior rural villages in and around the forests on the usage of plant crude drugs forvarious diseases. The mode ofadministration purpose and part of the plant used and carefully recorded in audiotaperecorded as well as in field note book. Plants were collected, important crude drugs used for different diseases/ailments. Present paper mainlyexposes the unrealized and unexplored their herbaria were prepared and identified with the help of local floras (Kirikar, K.R and B.D.Basu.1933: Rama Rao, Nand A.N. Henry 1996,Pullaiah T. 2007and2018) confirmed by authenticated specimens in SKU Herbarium. Anantapur, Madras Herbarium (MH), Coimbatore and centralNational herbarium (CAL), Calcutta. Based on the literature the team conducted periodically covering all seasons in a year. The total five visited studies with interaction and interviews whichelder tribal people at 48 medicinally important species. All the species were collected and processes,poisoned and shade dried. The voucher specimens were prepared and deposited in S.K.U Herbarium.The Ethnobotanical field work was carried following the methods adopted by Schultes (1960), Jain (1977),Croom(1983), Lipp (1989) and Martin (1995). Several interviews were conducted in tribal gudems/thandas of representatives were also involved in interviews.

Results and discussion:

The information of crude drugs like Botanical name, family, part used, more of administration and purpose of usage are Heart diseases, Scorpian sting, Cough, Fever, motions, jaundice, wounds, skin diseases, stomach troubles etc. Taxonomic analysis of medicinal plants species among 30 families highest number of species belongs to the families Apocyanaceae, Caesalphinaceae, Fabaceae, Solanaceae. The richness of these plants is 8.33. The family Lamiaceae placed next and this richness is 6.25. Remaining families are equal distributed (Table-1and2). The scientific analysis of crude drugs with regard to disease wise analysis revealed very interesting information on use of drugs for different ailments. The maximum number of crude drugs (5 species) used for wounds followed by stomach pain and scorpion sting, motions and cold and cough with 3 species each,where as 2 species each was reported as crude drug used in the treatment of white bleeding, snake bite and diabetes. Only one species each was reported as crude drug used in the treatment of the remaining ailments(Table-3). The scientific analysis of dry yielding species with part wise like Leaf, Stem and Rootetc., Total 12 plant parts are used. Among that leaf part of 44 species are used and its richness is 84.6%. Next second highest plant part root and stem richnessis 7.69%. Remaining plant parts are having less (Table-4). Interestingly

ISBN: 978-93-93259-95-0

roots and leaves were used by local people forthe remedy of cold, cough, ring worm and vomitingetc.,

Summary and Conclusion:

The present survey concludes that the Sugali tribe of madakasira has good knowledge regarding the utility of plants particularly to poisonous bites and for pains in the post pregnancy period. The information may be useful to improve the pharmaceutical applications in future.The Sugali tribals possessing rich folkloreinformation forms the prime source and exhibits scope to extend scientific research in further isolation and characterization ofactive principle involved in thepharmacological utility. The folklore claims were corroborated with phytochemical evidences of the respective crude drugs. Keeping in view of the fact potential sourceof medicinal plants of folklore origin need tobe preserved and conserved. Attempts arebeing made to carry out isolation,characterization of secondary metaboliccompounds and evaluation of biological activity.

Table: 1 Systematic Enumeration of Crude Drugs Used by Rural People for Different Human and Veterinary Ailments

S.No.	Botanical/Vernacular Name	Family	Purpose	Part Used	Mode of preparation/ Admistration
1	*Abrusprecatorius* L. (Guruvinda)	Fabaceae	Wounds	Root tuber	Paste used for external applications.
			Snake Bites	Root tuber	Paste applied on bitten area.
			Diabetes		Juice given orally 3 times for a day.
			White bleeding		**Diet:** Empty stomach at 6 am for 3 days
2	*Abutilon indicun* (L.) (Thutturabenda)	Malvaceae	Stomach pain	Leaf	Juice mixed with clustered oil applied the pain part
3	*Achyranthus aspera* L. (Uttareni)	Amaranthaceae	Wounds	seed	Boiled with one glass of milk, decoction taken orally.
4	*Aloe vera* (L.) (Kalabanda)	Asphodelaceae	Cough and diabetes	Gel	Fresh gel directly swallowed regularly till the cured.
5	*Anisomelesmalabarica* (L.) (Magabeera)	Lamiaceae	Wounds	Leaf	Paste is given orally
6	*Aristolochia indica* L. (Gadidagadapa)	Aristolochaceae	Snake bite (Cattle)	Creeper	Crushed with the butter applied externally.
7	*Argemone Mexicana* L (Yerrikusuma)	Papaveraceae	Wounds	Leaf Latex	Crushed with butter applied externally
8	*Azadurachta indica*A.Juss. (Vepachettu)	Miliaceae	Fever	Stem bark	Powder and boiled in water decoction given orally.
9	*Bacopa monieri* (L.) (Sambarenu)	Scrophulariaceae	Epilepsy	Leaf	Juice mixed with milk, given orally.
10	*Calotropis gigantean* (L.) (Thella jilledu)	Apocynaceae	Vomiting	leaf	Juice given orally
11	*Crinum viviparum* (Lam.) (Pennerugadda)	Amarellidaceae	Pains	Leaf	Grinded and mixed with Calcium applied externally, after removing extract the 12 part was cleaned with hot water it was continued for two days.
12	*Cissus quadrangularis* L. (Nalleru)	Vitaceae	Arthritis	Young stem	The epidermis was removed and prepared as a curry. It was eaten for every 3 days till it cures.
			Rheumatism		
13	*Citrullus colocynthis* (L.) (Chittipapara)	Cucurbitaceae	Leg swelling	Leaf	Juice with the lime stone is applied externally. Diet: Twice a day 3 days
14	*Cleome gynandara* (L.) (Kukkavaminta)	Cleomaceae	Headache	Leaf	Smashed with the hands juice applied on head.
15	*Coccinia grandis* (L.) (Dondakaya)	Cucurbretaceae	Hand swelling	Leaf	Juice with the turmeric, camphor, incense given orally. Diet: Daily only one time.

ISBN: 978-93-93259-95-0

S.No.	Botanical/Vernacular Name	Family	Purpose	Part Used	Mode of preparation/ Admistration
16	*Cocculus hirsutus* L. (Katla teega)	Combretaceae	Motions	Leaf	Juice with the pinch of sugar given orally.
17	*Combretum albidum*G.Don (Yada theega)	Combretetaceae	Blood motions	Leaf	Mixed with finger millet, decoction given orally. Diet: Four times morning and evening.
18	*Datura stramonium* L. (Ommemetta)	Solanaceae	Fits	Roots	Juice mixed with pepper and garlic of glass water.
19	*Dichrostachy cinerea* (L.) (veluturuchettu)	Fabaceae	Teeth ache	Stem bark	Juice applied externally.
20	*Euphorbia tirucalli* L. (Kalli chettu)	Euphorbiaceae	Motions	Stem bark	Juice is given orally.
21	*Ficus mollis*Vahl (Kaliguvvi)	Moraceae	Vomiting	Stem bark	Grinded, added some *Cuminum ciminum* fruits, boiled filtered by a cloth. Then the extract was given orally.
22	*Gymnemasylvestre* (R.Br.) (Podapathri)	Apocynaceae	Bone fracture	Leaf	Crushed with the Ghee, Applied externally for 20 days.
23	*Heliotropium indicum* L. (Nagadanthi)	Boraginaceae	Influenza, scorpion sting Diabetes	Root	Juice given orally for 3 days
				Leaf	Juice given orally.
24	*Hygrophila auriculata* (Schum.) (Yenugupalleru)	Acanthaceae	Wounds	Leaf	Paste applied externally.
25	*Indigofera cordifollia*Heyne (Paparalumu)	Fabaceae	Red bleeding	Leaf	Powder mixed with, garlic and pepper, given orally for 5 days.
26	*Lantana aculeate* L. (Belikachettu)	Verbinaceae	Wounds	Leaf	Mixed with turmeric and pinch of salt, made into paste applied externally.
27	*Ocimimamericanum* L. (KukkaTulasi)	Lamiaceae	Wounds	Leaf	Powder (100gms) is given orally for 4 days.
28	*Ocimum sanctum* L. (Tulasi)	Lamiaceae	B.P, Sugar, Gas troubles	Leaf	Steeped in the copper bowl containing with water after 3 days taken orally.
29	*Pavetta indica* L. (Rarinjia)	Rubiaceae	Blood filled pursued	Leaf	Mixed with turmeric and pinch of salt made into paste applied externally.
30	*Pedalium murex* L. (Peddapalleru)	Pedaliaceae	White Bleeding	Leaf	Crushing small pills with the coconut water given orally. **Diet:** Empty stomach, 7 days avoid chicken and coffee.
31	*Phyllanthus emblica* L. (Usiri)	Phyllanthaceae	Heart diseases	Fruit	Equal proportions of fruits and cane sugar are mixed and consumed orally.
			Motions	Fruit	Boiled in water and filtrate taken orally two times per day it cures.
32	*Plumbla gozeylanica* L. (Chitramulamu)	Plumbaginaceae	Stomach pain	Stem bark	Mixed with jaggery (100gms) given orally for two days.
33	*Pongamia pinnata* (L.) (Kanuga)	Fabaceae	Dog bite	Stem bark	Paste applied externally
34	*Prosopis cineraria* (L.) (Jammichettu)	Mimosaceae	Jaundice	Root	Mixed with root of *Achyranthus aspera* and grinded as coarse powder, 10 gm. of grinded material was mixed with curd then taken orally.

ISBN: 978-93-93259-95-0

S.No.	Botanical/Vernacular Name	Family	Purpose	Part Used	Mode of preparation/ Admistration
35	*Prosopis juliflora* (Sw.) (Jalichettu)	Mimosaceae	Scorpion sting	Leaf	Crashed with the jiggery, onion, applied the sting **Diet:** Avoid the cool water and butter milk.
36	*Senna auriculata* (L.) (Thangedu)	Caesalpinaceae	Motions	Sprouts	Juice mixed with butter milk given orally.
37	*Senna italic* Mill. (Nelathangedu)	Caesalpinaceae	Rheumatism, gout, inflammation	Whole plant	Dried mixed with sugar and grinded Taken orally for few days.
38	*Senna occidentalis* L.	Caesalpinaceae	Skin diseases	Root bark	Mixed with Honey and applied externally till it curs.
39	*Solanum nigram* L. (Kamanchi)	Solanaceae	Cough	Leaf	Leaves in boiled in water given orally.
					Ripen fruit are taken orally.
40	*Solanum pubescens*Willd. (Kottuvastu)	Solanaceae	Body pains in Children	Leaf	Boiled with water, the water was used for bath.
41	*Solanum virginianum* L. (Ramamulaka)	Solanaceae	Cough, Fever, Bilious	Leaf	Powder or decoction then taken orally for few days.
42	*Syzgyiumcumini* (L.) (Nerudupandu)	Myrtaceae	Antibiotic	Stem bark	Decoction with the lemon juice, honey given orally for two days.
43	*Tamarindus indica* L. (ChintaChettu)	Caesalpinaceae	Scorpion sting	Seed	Pasted with water and applied at the bitten place poison in actives, when paste coming dry.
					Powdered mixed lemon juice and applied externally within 4 to 5 days it will cure.
44	*Terminallachebula* Retz. (Karakkayalu)	Combretaceae	Astma	Fruit	Ground, in fusion mixed with honey given orally/along with that of *Terminalia chebula* and Phyllanthus emblica ground extract given orally.
			Body pains	Fruit	Paste used to massage the body.
			Cough	Fruit	Powder mixed with a tumbler of water given orally
			Diabetes	Fruit	A long with that of *Terminalia bellirica* and Phyllanthus emblica ground, paste given orally.
45	*Tridax procumbens* L (Gaddi Chamanthi)	Asteraceae	Wounds	Leaf	Paste applied externally
46	*Tylophora indica* (Brum.f.) (Mekameyaniaaku)	Apocyanaceae	Dysentery	Root	Decoction taken orally
			Cough	Leaf	Powder taken orally
			Snake bite (Cattle)	Leaf	Crushed with the pepper is applied externally (eyes)
47	*Viex negundo* L. (Vavili)	Verbinaceae	Paralyasis	Leaf	Juice given Orally
					Diet: Avoid the potato, empty stomach twice a day.
48	*Wrightia tinctoria* R.Br. (Anukudu)	Apocynaceae	Pills	Latex	Latex applied externally **Diet:** Daily 2 times

ISBN: 978-93-93259-95-0

Table- 2 Taxonamic Analysis of Medicinal Plants: Species Richness

S.No.	Name of the Family	Number of species	% of Richness
1	Acanthaceae	1	2.08
2	Amaranthaceae	1	2.08
3	Amarellidaceae	1	2.08
4	Apocynaceae	4	8.33
5	Aristolochiaceae	1	2.08
6	Asphodelaceae	1	2.08
7	Asteraceae	1	2.08
8	Boraginaceae	1	2.08
9	Caesalphinaceae	4	8.33
10	Combretaceae	2	4.16
11	Cucurbitaceae	2	4.16
12	Cleomaceae	1	2.08
13	Euphorbiaceae	1	2.08
14	Fabaceae	4	8.33
15	Lamiaceae	3	6.25
16	Malvaceae	1	2.08
17	Meliaceae	1	2.08
18	Menispermaceae	1	2.08
19	Mimosaceae	2	4.16
20	Moraceae	1	2.08
21	Myrtaceae	1	2.08
22	Papavaraceae	1	2.08
23	Pedaliceae	1	2.08
24	Phyllanthaceae	1	2.08
25	Plumbaginaceae	1	2.08
26	Rubiaceae	1	2.08
27	Scrophulariaceae	1	2.08
28	Solanaceae	4	8.33
29	Verbinaceae	2	4.16
30	Vitaceae	1	2.08

ISBN: 978-93-93259-95-0

Table-3 Analysis of Medicinal Plants: Disease -wise

S.No.	Disease	No.of Species used	% of Richness
1	Asthma	1	2.5
2	Antibiotic	1	2.5
3	Back Pain	1	2.5
4	Blod motion	1	2.5
5	Blood Pressure	1	2.5
6	Bone fracture	1	2.5
7	Circling	1	2.5
8	Cold and Cough	3	7.2
9	Diabetes	2	5
10	Dog bite	1	2.5
11	Dysentry	1	2.5
12	Epilepsy	1	2.5
13	Fever/Pyrexia	1	2.5
14	Fits	1	2.5
15	Gas trouble	1	2.5
16	Headache	1	2.5
17	Hands swelling	1	2.5
18	Heart disease	1	2.5
19	Inflammation	1	2.5
20	Influenza	1	2.5
21	Jaundice	1	2.5
22	Joint pains	1	2.5
23	Leg swelling	1	2.5
24	Motions	3	7.2
25	Paralysis	1	2.5
26	Pills	1	2.5
27	Red bleeding	1	2.5
28	Rheumatism	1	2.5
29	Ring warm	1	2.5
30	Scorpion sting	3	7.5
31	Snake Bite	2	5
32	Stomach pain	3	7.5
33	Skin disease	1	2.5
34	Teeth ache	1	2.5
35	Tumors	1	2.5
36	Urinary problems	1	2.5
37	Vomiting	1	2.5
38	Wounds	5	12.5
39	White bleeding	2	5

ISBN: 978-93-93259-95-0

Table-4 Analysis of drug yielding species: Part -wise

S.No.	Part used	Number of Species	% of richness
1	Root	4	7.69
2	Root Bark	1	1.92
3	Stem	4	7.69
4	Stem Bark	3	5.76
5	Leaf	44	84.61
6	Latex	3	5.76
7	Fruit	3	5.76
8	Gel	1	1.92
9	Whole plant	2	3.84
10	Seed	2	3.84
11	Tuber	4	7.69
12	Sprouts	3	5.76

Acknowledgement

Author acknowledges the help provided by herbal practitioners Pavathi bai, Prabhu naik, Ramlanaik, Thippe naik Nanjappa and Somla naik etc., for sharing hidden knowledge on medicinal plants during the field visits.Thanks to the tribal people of Madakasira for their co-operation and help during the medico-botanical studies.

References:

1. Martin, G.J., 1995.Ethnobotany: A conservation manual, Chapman & Hall, London.
2. Jain, S.K. and R.R. Rao., 1977. Field and Herbarium Methods. Today and Tomarrow Publishers. New Delhi.
3. Rama Rao, N. and Henry, A.N., 1996. Ethnobotany of Eastern Ghats in Andhra Pradesh, India.
4. Pullaiah, T., 2007. Taxonomy of angiosperms. Daya Books.
5. Pullaiah, T., Ali Moulali, D. and Sandhya Rani, S.2018. The flora of Andhra Pradesh 2nd revised edition scientific publications Jodhpur. India.
6. Kartikar, K.R and Basu, B.D., 1933. Indian Medicinal plants, India.
7. Croom, E.M., 1983. Documenting and evaluating herbal remedies. Economic Botany.
8. Schultes, R.E., 1960.Tapping our heritage of Ethnobotanical lore. Economic Botany.
9. Martin, G.J., 1995.Ethanobotany. A "People and Plants". Conservation Manual. World fund for nature, Chapman and Hall, London.
10. Lipp, F.J., 1989. Methods for Ethnopharmacological field work. Journal of Ethnopharmacology.

Ethnomedicinal Plants Treatments for Venereal Disease (*Gonorrhoea*) in Nirmal District, Telangana State, India

Dr. Velmala Madhu

Department of Botany, Gopal Rao Patil Governemnt Degree College Bhainsa, Dist: Nirmal, Telangana, India - 504103
Email: madhu.kuc@gmailmail.com

Abstract

In the present work an attempt is made to document the Ethnobotanical remedies forailments of the ethnic tribes inhabiting the Nirmal District of Telangana State, India. We reported 25 Ethnobotanical plants from 19 families used by the tribal people in alleviating human diseases. The paper deals with the survey of some important plants used against Venereal disease (Gonorrhoea), Adhatoda Zeylanica, Basella rubra, Hardwickia binate, Hygrophilaauriculata, Pedalium murex, Pongamia pinnata, Sidacordifolia, Ethnobotanical medicine is the scientific term for the process of health care practices in traditional methods. Nirmal District is one of the rich flora forest, which with strong dependency on traditional ethnomedicine, especially in rural areas where services are situated several kilometers away from villages. This area forest is covered with rich diversity, many plants are traditionally used to prevent various infections, In field visit collected plant specimen kept in department of Botany, Gopal Rao Patil Government degree college, Bhainsa

Key words: *Ethnomedicine, Medicinal plants, Nirmal District, Telangana State*

Introduction

Evolution of human life and culture has directly or indirectly been associated with and influence by the surrounding environments. Primitive man closely associated in the nature and directly depended on it for his survival i.e., for food, fuel medicine, and fodder, Hencehis life and diet system totally depended on plants, made him to acquire the knowledge of economic and medicinal properties of many plants by gradual growth of thinking, later he became enriched with knowledge that hasbeen transferred from one generation to another without any written documents. Medicinal plants from the basis of traditional or indigenous system of health used by the majority of the population of most developing countries Borthakur, S.K.1993. Native phytotherapy for child and women diseases from in recent years, there has been a tremendous range of interest in the medicinal plants, especially those used in Ayurvedas and other traditional systems of medicines. now it is necessary that unwritten folk-lore uses of plants and plant product must be documented and preserved. It is important to document and understand the medical heritage of a changing culture before it is lost entirely to future generations. Hemadri, K., C.R.R. Sarma and S.S.

ISBN: 978-93-93259-95-0

Rao1987a. medicinal plants wealth of Andhra Pradesh. It observes and describes hygienic, account temporal and spatialreferences. Among all the Schedule tribes of Telangana State Gonds, Lambadas, Koyas, Kolams, Manne, Naikpods, Thoties, Yerikalas, are the major communities in the Nirmal district.Several natural forest ecosystems in the district, Surroundings of Swarna, Sadharmat and Kaddam projects are well known for their medicinal flora. Ravi Shanker. and Henry (1992) werepublish a note on the medicinal plant wealth of Nirmal district. Later Pullaiah, Prasanna, and Vand Obulesu(1998) reported Ethanomedicinal plants, the scientific and vernacular names of the District Mubeen, R., Saida Fatima, Atiya Khanum, Irfan Ali Khan and S.Y. Anwar 2004-2005. Medicinally important plants growing in and around Erstwhile Adilabad district of Telangana State, used in the treatment of different ailments. Swamy, NSNS (2008) reported 366 ethnomedicinal plants used by tribes in the Erstwhile Adilabad District, in UGC Minor research project under plan. In the present work, an attempt is made to present some interesting ethnomedicinal observations recorded in Nirmal Forest division, Nirmal district of Telangana,India.

Study Area

The Nirmal District (Figure: 1)issituatedin between 770 58' of the eastern longitudes and 180 48' and 190 24' of northern latitudes and is bounded on east by Manchiryal district, north by Adilabad. and Utnoor divisions. On the south by Jagithyal and Nizamabad districts and on the west by Nanded district of Maharashtra State. The most important river that drains the divisions is the river Godavari, which is the largest river in peninsular India. The Kadam vagu is tributary of the Godavari. Besides these Swarna vagu, and Suddavagu which drain the division. The average annual normal rain fall of the Nirmal District is 1107.2 mm and average number of rainy days in the year is 55 - 63 days, the forest of this district falls under tropical dry deciduous and tropical thorn forest type's consisting of mixed teak and miscellaneous type of corporation. As for the census - 2011 Nirmal District has a population of 7,09,418 in which tribal population is 80,576 (11.36 %) Lambada, Gonds and Naikpods are major tribes of this region and traditional practices for curing ailments using plants and animals. resources are practiced by all these communities data on ethnomedicinal plants.

ISBN: 978-93-93259-95-0

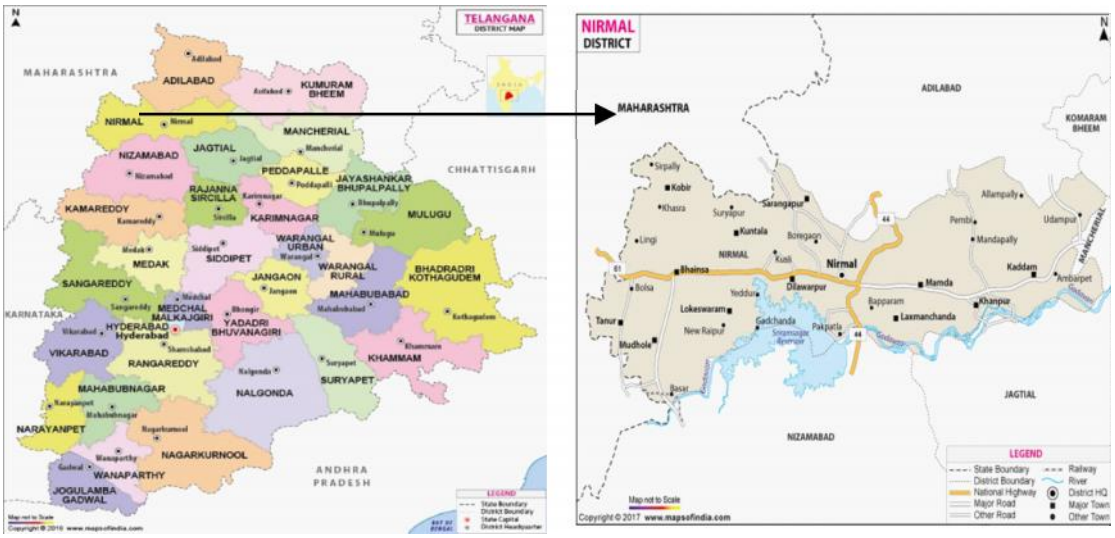


Figure: 1(Nirmal District Map: The Study Area)

Material and Methods

Data collection on ethnomedicinal plants of Venereal disease(Gonorrhoea)were carried out in Tribal dominated villages during June2021 to October 2022. It was collected through frequent interviews with tribes, elders and local ethnomedicinal doctors a place where the informants were most comfortable. The specimens of ethnomedicinal plants were collected and identification of species made with the help of Floras (Gamble & Fischer, 1915-1935; Subbarao & Kumari, 2003), The plant species are enumerated alphabetically, and keptat Department of botany GRP. Government Degree College Bhainsa, District Nirmal for further reference.

Results and Discussion

Data pertaining to 25 Ethnobotanical plantsused in the cure of Venereal disease(Gonorrhoea) belonging to 19 families are reported. They are arranged in alphabetical order according to scientific names for convenience. the following enumeration details on the scientific name, local name, botanical family and use are provided along with the parts harvested for treatment for Venereal disease (Gonorrhoea) by using Whole plant, Leaf pastes, Juices, Root, Root bark, Stem bark, Gum, Fruit, and Seeds (Table-1). The most dominant families of ethnobotanical importance are Acanthaceae, Malvaceae, Leguminacea (Each 3 species), Apoccynaceae (2 species), remaining (1 species) (Figure-2)., frequently utilized plant parts percentage were Roots (32%), followed by the Leaves (32%), Whole plant (8%), Seed (8%) remaining Fruit, Tender branches, Stem bark, Flower, and Gum powereach part (4%), (Figure- 3).

ISBN: 978-93-93259-95-0

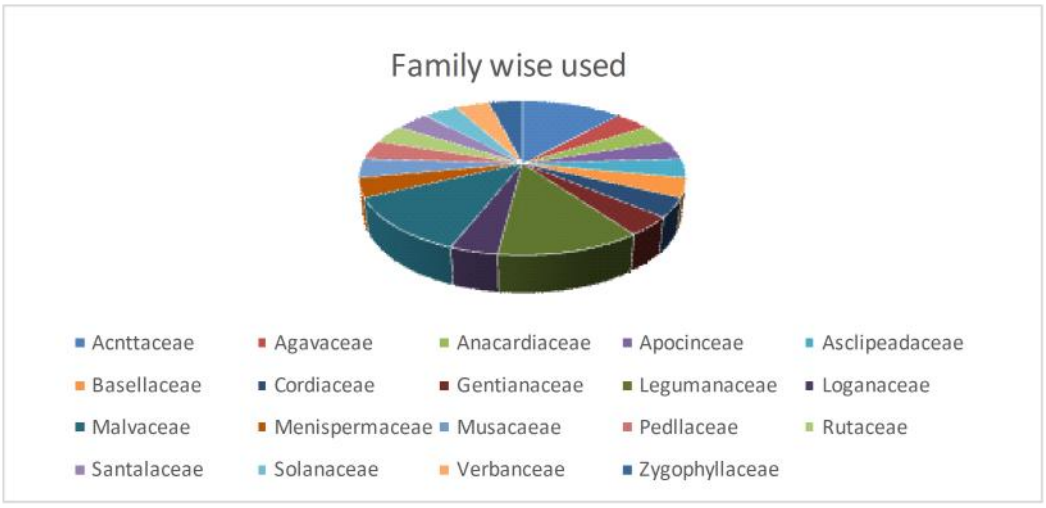


Figure: 2 (Plant Parts Used)

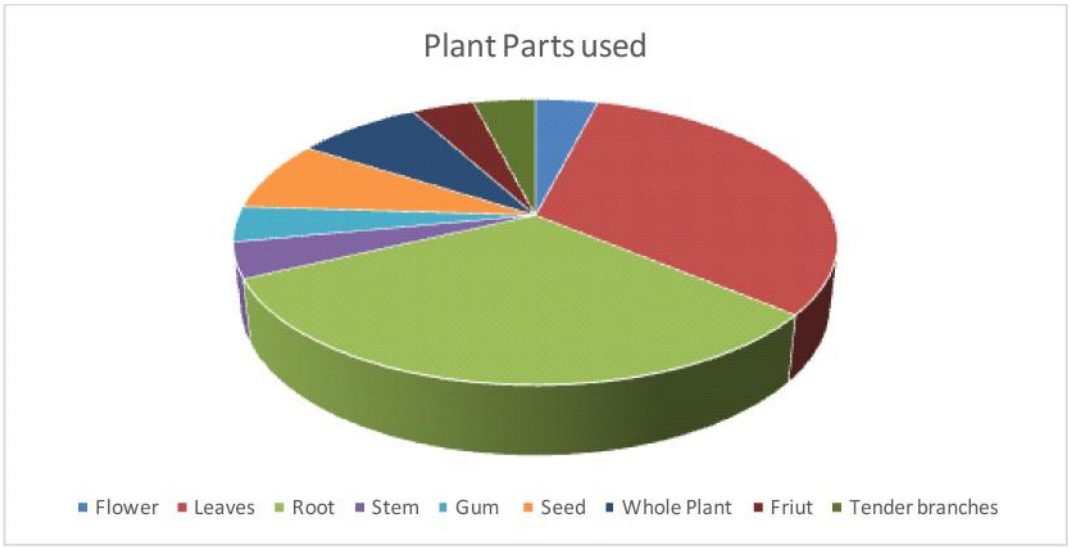


Figure: 3 (Plant Parts Used)

ISBN: 978-93-93259-95-0

Table :1

S.No	Plant Scientific Name	Local Name	Family	Part	Mode of use
1	***Adhatoda Zeylanica*** Medic.	Addasaramu	ACANTHACEAE	Flower	Dried flower powder given in 1 spoonful twice a day for 10days.
2	***Aloe barbadensis***Mill. Syn: ***Aloe vera*** (L) Burm.f.	Kalabanda	AGAVACEAE	Leaves	The inner fleshy portion of leaves thoroughly mixed with sugar and taken orally in 2 spoonfuls thrice a day for 15days.
3	***Basella rubra*** L. .	Bachhali Koora	BASELLACEAE	Leaf	Leaf juice used in external application for the disease
4	***Clerodendrumphlomides***L.f.	Thakkalaku	VERBENACEAE	Root	Root decoction used as demulcent
5	***Cocculdhirsutus***(L.) Diels Syn:***Menispermumhirsutum***L.	Dushtateega	MENISPERMACEAE	Leaf	Leaf juice administered in 2 spoonfuls with a glass of sugar water twice a day for 10-15days.
6	***Ehretialaevis***Roxb.	Pitta pisiniki	CORDIACEAE	Stem bark	Stem bark decoction taken in 2 spoonfuls twice a day to relieve inflammation
7	***Enicostemmaaxillare***(Lam.) A. Raynal	Nela Garugudu	GENTIANACEAE,		Roots ground with branches of ***Sidacordifolia***and seeds of ***Syzygiumcumini***and the extract with sugar is administered in 2 spoonfuls twice a day till cure.
8	***Hardwickiabinata***Roxb.	Yeppa Chettu	LEGUMINOSAE Sf: Caesalpinioideae,	Gum powder	Dried gum powder mixed with jaggery and given in 5g. twice a day for 20days.
9	***Hibiscus surattensis*** L.	Mullagogu	MALVACEAE	Leaf	Leafjuice give in 2-3 spoonfuls for one or two doses for 7days.
10	***Holostemmaada – kodien***Schult. Syn: ***Holostemma annulare*** (Roxb.) Schum.	Yedda Teega	ASCLEPIADACEAE	Root	Root decoction administered in 3 spoonfuls 2-3 times a day for about 15 days.
11	***Hygrophiaauriculata***(Schum) Heine	Neeti Malli	ACANTHACEAE,	Root	Root decoction given in 2 spoonfuls twice a day for about 15days.
12	***Mangifera indica*** L.	Mamidi	ANACARDIACEAE	Leaf	Leafjuice give in 2-3 spoonfuls for one or two doses for 7days.
13	***Musa paradisiaca*** L.	Arati	MUSACEAE	Root powder	Dried root powder given in 2 spoonfuls twice a day for 10days.
14	***Pavoniaodorata***Willd.	Teegabenda	MALVACEAE	Leaf	Leaf juice given in 2 spoonfuls twice a day for about 10days.

ISBN: 978-93-93259-95-0

S.No	Plant Scientific Name	Local Name	Family	Part	Mode of use
15	***Pedalium murex*** L.	Peddapalleru, Yenugupalleru	PEDALIACEAE	Leaf	Leaf decoction with sugar administered in 2 spoonfuls twice a day for about 20days.
16	***Plumeria rubra*** L.	Vada Ganneru	APOCYNACEAE	Root	Root bark ground with ***Zingiber*** rhizomes and administered in 2-3 spoonfuls twice a day for about 10days.
17	***Pongamiapinnata***(L.) Pierre.	Kanuga	LEGUMINOSAE; Sf: Papilionatae	Leaf	Leaf juice mixed with fruit juice of ***Syzygiumcumini***and administered in 2-3 spoonfuls twice a day for 10days.
18	***Santalum album*** L.	Chandanamu	SANTALACEAE	Seed	Seed paste administered in 2 spoonfuls twice a day for about 15days.
19	***Sida cordifolia*** L.	Chiru benda	MALVACEAE	Whole plant	Whole plant ground with roots of ***Enicostemmaaxillare***and seeds of ***Syzygiumcumini***and the extract with suger is administered in 2 spoonfuls twice a day till cure
20	***Solanum nigrum*** L.	Kamanchipandu	SOLANACEAE,	Whole plant	Whole plant extract given in 2 spoonfuls twice a day for 15days.
21	***Strychnospotatorum***L.f.	Chilla	LOGANIACEAE	Seed	Seeds ground with ***Cuminum cyminum*** and the paste administered in 2 spoonfuls twice a day for about 15days.
22	***Toddaliaasiatica***(L.) Lamk.	Konda kasinda, kondamirapa	RUTACEAE	Root	Root bark decoction given in 2 spoonfuls thrice a day for 15days.
23	***Tribulus terrestris***L.	Palleru	ZYGOPHYLLACEAE	Fruit	Fruit and root decoction given in 2 spoonfuls twice a day for 15days.
24	***Wrightiatinctoria***R.Br.	Palakodisha, Palvareni	APOCYNACEAE	Tender branches	Tender branches ground with jaggery and the poultice given in 2 spoonfuls once in the morning about 10days.
25	***Xyliaxylocarpa***(Roxb.) Taub.	BojaChettu	LEGUMINOSAE Sf: Mimosoideae,	Root bark	2 spoonfuls of root bark decoctions given twice a day for about 15days.

Acknowledgements

The authors are thankful to tribal healers, tribal priests, local ethnobotanical doctors and ordinary villagers for given information and Principal & Staff of Gopal Rao Patil. Government Degree College, Bhainsa, District Nirmal, Telangana State, India for encouragement.

References

1. Bakare RA. Sexually transmitted infections in Nigeria. Annals Ibadan Postgrad Med 2005;3:48-51
2. Borthakur,S.K.1993.Native phytotherapy for child and women diseases from Assam.Ethnobotany5:87-91.
3. Chinsembu, K.C., Hedimbi, M., 2010. An ethnobotanical survey of plants used tomanage HIV/AIDS opportunistic infections in Katima Mulilo, Caprivi region, Namibia. J. Ethnobiol. Ethnomed., 6, http://dx.doi.org/10.1186/1746-4269-6-25
4. Desai PD, Ganguly AK, Govindachari TR, Joshi BS, Kamat VN, Manmade AH, et al. Chemical investigation of some Indian plants: Part II. Indian J Chem 1966;4:457-9. 59. El Ansari MA, Rajadurai S, Nayud
5. Hemadri, K., C.R.R. Sarma and S.S. Rao1987a. medicinal plants wealth of Andhra Pradesh, part I. Ancient Sci. Life 6 : 167 - 186.
6. Mallikharjuna, P.B., Seetharam, Y.N., 2009. In vitro antimicrobial screening of alkaloid fractions from Strychnospotatorum. J. Chem. 6, 1200-1204.

7. Mubeen, R., Saida Fatima, Atiya Khanum, Irfan Ali Khan and S.Y. Anwar 2004-2005. Medicinally important plants growing in and around Adilabad district of Andhra Pradesh, used in the treatment of different ailments. In : Ethnomedicine and Human Welfare 3 : 118 - 180.

8. Murthy EN, Pattanaik C, Reddy CS and Raju VS. Piscicidal plants used by Gond Tribe of Kawal Wildlife Sanctuary, Andhra Pradesh, India. Indian Journal of Natural Products and Resources 1.01 (2010): 97-101.

9. Omkar K, Suthari S, Alluri S, Ragan A and Raju VS. Diversity of NTFPs and their utilization in Adilabad district of Andhra Pradesh, India. Journal of Plant Studies 1.01 (2011):33-46.

10. Nadkarni KM. Indian Materia Medica. Popular Prakashan Bombay India. 1976.

11. Natarajan B, Paulsen BS, Pushpangadan P. An Ethnopharmacological Study from the Coimbatore District, Tamil Nadu, India: Traditional Knowledge Compared With Modern Biological Science. Pharmaceutical Biology. 1999;37:378-390.

12. Patel, N.K. (2001) Study of Angiosprmic Plants with Relation to Phytosociological & Ethnobotanical Study of Danta taluka, Dist. Banaskantha", Ph.D. Thesis for North Gujarat University, Patan.

13. Prasad Paindla, Rajendra Chary Vijayagiri and EstariMamidala.Ethnobotanical Survey In Different Mandals Of Adilabad District, Andhra Pradesh, India.International Journal of Sciences (ISSN 2305-3925) Jan-2013.

14. Pullaiah, T. Prasanna, P. VandObulesu, G. 1988 -89. Flora of Adilabad district Andhra Pradehs. CBS Publishers, Shandara, Delhi, India 1 : 1- 284.

15. Swamy,NSNS.2008.Ethnomedicinal plants used by tribes in the Adilabad District.UGC Minor research project under plan.

16. Rastogi RP, Mehrotra BN. Compendium of Indian Medicinal Plants. Central Drug Research Institute Lucknow and National Institute of Science Communication New Delhi India 1990-1994.

17. Ravishankar T. Ethnobotanical Studies in Adilabad and Karimnagar Districts of Andhra Pradesh, India. Ph.D. Thesis, Bharathiar University, Coimbatore, Tamil Nadu (1990).

18. Sekhsaria P. Conservation in India and the need to think beyond tiger vs. tribal. Biotropica 39.05 (2007): 575-577.

19. Suthari S. Biodiversity Characterization and Aboveground Vegetation Carbon Pool Assessment in Northern Telangana at Landscape Level Using Geospatial Technique. Ph.D. thesis, Department of Botany, Kakatiya University, Warangal (2013).

 ISBN: 978-93-93259-95-0

Conservation of Forest Biodiversity in India

R. Krishna

Faculty in Zoology, SRNK Government Degree College, Banswada, Dist. Kamareddy, TS - 503 187
Email: krish6.lucky@gmail.com

Abstract

India has a wide range of climates and landscapes, and it has at least 10 different bio-geographical regions. As a result, it has many different types of forests and three global terrestrial biodiversity hot spots. Most of the species that live on land now live in forests because other habitats have changed from their natural state. There is a large network of protected areas that includes 509 wildlife sanctuaries, 96 national parks (including 14 biosphere reserves), and a few sacred groves that are cared for by indigenous communities. But even though there is a good forest policy and a strong regulatory system, the growing needs of a growing human population, changes in how land is used, and the spread of invasive alien species continue to damage forests and cause biodiversity loss. It's important to keep an eye on the size and loss of biodiversity and to get a lot of people involved in protecting and restoring biodiversity.

Keywords: *climate, landscape, geographical regions, wildlife sanctuaries, indigenous communities, biodiversity loss, protection and restoration of biodiversity.*

Introduction

Diversity is the heterogeneity among living organisms from all sources, including terrestrial, marine, and aquatic ecosystems and ecological complexes; this includes diversity within species, between species, and of ecosystems (CBD 1992). Net biological diversity is a result of the rates of evolution and extinction (Singh 2002). It is a unique and irreplaceable natural resource (Weaver 1994) that is being quickly destroyed (Myers 1983). Loss of biodiversity hinders economic growth (Kim and Weaver 1994). The 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro brought the need to preserving biodiversity to the forefront. Convention 292 International Forestry Review Vol.10(2), 2008 aims to maintain biological variety, promote sustainable use of its components, and encourage appropriate sharing of genetic resource benefits. The CBD requires signatory states (India was one of the first) to inventory their biological diversity to determine its distribution and abundance.

India possesses 8% of the world's biodiversity, with 47 000 plant and fungal species and 89 000 animal species (Khoshoo 1995, 1996, MoEF 1999). As many other terrestrial habitats have lost their natural condition, forest conservation is synonymous with biodiversity conservation. India's 1988 national forest strategy focused on "conserving the country's natural legacy by protecting the surviving natural forests with their enormous variety of flora and animals". The national environment policy of 2006 recognises that "[forests] provide habitat for wildlife and the

ISBN: 978-93-93259-95-0

ecological conditions for maintenance and natural evolution of genetic diversity of flora and fauna" and stresses that "forests of high indigenous genetic diversity should be treated as entities with Incomparable Value"; it also aims to "strengthen the protection of areas of high endemism of genetic resources ("biodiversity hot spots"), while providing a framework for their sustainable use." This study article presents an overview of India's forest biodiversity, focusing on what's being done and what's needed for its conservation.

Why Biological Diversity Matters?

Biodiversity is the foundation for ecological services, which support human life. MEA (2005) recognises four eco-service categories: I provisioning services - food, fresh water, wood, medicines, and bre; (ii) regulating services - disease control, climate regulation, water purification, ood regulation, erosion control, etc.; (iii) cultural services - education, recreation, etc.; (iv) supporting services nutrient cycling, soil formation, primary productivity, etc. Biodiversity has market and ecological or quality-of-life values (Mendelsohn 2001). Biodiversity contributes to agriculture, building, and medicine through market values. Quality-of-life values reflect how biodiversity enriches our lives by boosting our appreciation of life itself. Many components of biodiversity aren't utilised by the economy and have no financial worth, yet if they disappear, nations would suffer a significant loss. The country has many forests. Champion and Seth (1968) categorised Indian forests by physiognomy and climate. Each of the 16 type groups (Figure 2) and 221 forest types has its own biodiversity. 65.6% of Indian forests are tropical moist to dry deciduous, 8% tropical wet evergreen, 4% tropical semi-evergreen, 9.5% sub-tropical, 7% temperate, and 5.8% miscellaneous. (Lal, 1989)

Hotspot

Himalaya, Indo-Burma, and the Western Ghats-Sri Lanka are three of India's 34 terrestrial biodiversity hotspots (Table 1). Indo-Burma (2.37 million km^2) is the greatest, whereas Western Ghats-Sri Lanka (0.19 million km^2) is the smallest (www.biodiversityhotspots.org). Hotspots are species-rich, endemism-rich places. Hotspots provide unique biodiversity and are excellent instances of speciation, yet they're vulnerable. The Himalaya hotspot encompasses all of the world's 8,000-meter peaks and deepest river canyons. The Indo-Burma hotspot spans most of north-eastern India save Arunachal Pradesh and parts of Assam. The Western Ghats-Sri Lanka hotspot, spanning Gujarat to Kanyakumari in India and 400 km up in Sri Lanka, features some of the last remaining rain forests and high biodiversity. The Western Ghats-Sri Lanka hotspot has the most endemics despite its high population density.

Biodiversity Depletion

Depleted biodiversity Global biodiversity loss is frightening. Human-caused habitat loss and climate change accelerate extinction. Forest degradation and biodiversity loss in the country are caused by multiple reasons. Due to the industrial revolution and the increase in human population

ISBN: 978-93-93259-95-0

from 390 million in 1950 to 1 billion in 2001 and domestic animal population from 350 to 520 million in the same period, the gap between demand for and supply of fuelwood, timber, fodder, and non-wood forest products has rapidly increased, resulting in over-harvesting and degradation. The world average per capita forest area is 0.64 hectares. 78% of forest land is susceptible to extensive, unregulated grazing and 10 million acres to shifting agriculture. Large regions are still diverted for infrastructure and construction. These processes cause biodiversity loss and forest fragmentation, which interrupts gene flow across groups, resulting in genetic poverty.

Forest Cover

Quantity and quality of forest cover reflect biodiversity because they reflect environmental conditions and biodiversity-depleting causes. The 1952 national forest policy of independent India called for 33% forest cover of the entire land area, and the 1988 policy called for 66% forest cover in the hills and mountains. FSI (2005) reports 20.6% forest cover in 2003 based on remote sensing. 1.56 percent is very dense, 10.32% moderately dense, and 8.67% open-canopied.

Biodiversity Conservation

Prioritisation

Biodiversity is unevenly located and threatened. Funds and time are limited. Prioritization reduces biodiversity loss and conservation costs. Over the past decade, biodiversity conservation organisations have identified nine worldwide priority templates (Brooks et al. 2006). They all fit into the conservation planning paradigm of "irreplaceability" vs "vulnerability." Through the conservation of actual locations, biodiversity will be conserved or destroyed; therefore, pulling global conservation prioritising lessons down to regional and local scales is now the key issue for conservation planning. Meher-Homji (1997) outlined criteria for prioritising biodiversity conservation: I representativeness of bio-geographic regions, a Rodgers and Panwar (1988) criterion; ii) legal status, threats to and pressures on protected areas; iii) species richness (flora and fauna); iv) biodiversity richness: areas rich not only in the number of species but also in the number of individuals; v) richness in endemics (plants and animals), threatened and/or rare species; vi) richness in medicinal In India, protected zones are designated using many of the aforementioned criteria.

Government Designated Protected Areas

The 1952 national forest policy laid the path for India's national parks and sanctuaries. The Wildlife (Protection) Act 1972 of India recognises protected areas' role to conserving natural resources and ecological diversity. Project Tiger (encompassing 28 tiger reserves, 37,761 km^2 of PAs and some outside) was established in 1973. Project Elephant (covering 25 elephant reserves, 61,200 km^2 of PAs and some outside) was launched in 1992. In addition to the PAs authorised by the Wildlife (Protection) Act, 1972, certain areas have been declared biosphere

ISBN: 978-93-93259-95-0

reserves to protect in situ all forms of life and their support systems, and to function as a referral system for monitoring and evaluating changes in natural ecosystems. Each biosphere reserve has a national park or animal sanctuary. The PA network contains 96 national parks and 509 wildlife sanctuaries (4.78 percent of India). This is an open-ended process; more PAs are expected. Table 2 lists India's national parks and wildlife sanctuaries. Most PAs are tiny and fragmented. This could lead to genetic isolation of tiny populations; fragments must be removed. Protected places are under pressure from a growing human population, overuse, and exploitation, which destroys biological resources. PAs are populated. Clearly, PA boundaries need to be rationalised by avoiding dense human concentrations. Absence of corridors linking PAs within the same biogeographical region and lack of mechanism for transboundary biodiversity conservation, or linking PAs across country boundaries, are major concerns.

Sacred Groves and Protected Areas

Many Indian societies appreciate nature and worship natural objects. Several societies set aside forest sections for ancestral spirits and deities as part of nature worship. These are sacred groves (Ramakrishnan 1998). Malhotra (1998) estimates that India has 5,000 small and big sacred groves, with 100,000 occupying 1-2% of the country's surface. Malhotra et al. (1997) discovered 322 similar groves in Orissa's Semiliguda block. In Maharashtra, Deshmukh et al. record 953 groves (1998). Mount Khangchendzonga in West Sikkim, known as demojong, is revered to local Buddhists. Sacred groves in Meghalaya, Kerala, Maharashtra, Tamil Nadu, Uttarakhand, and Himachal Pradesh have significant oral and faunal biodiversity (Pushpangadan et al. 1998). Sacred grove management differs by location. Gram Panchayats administer Orans in Rajasthan; communities safeguard sacred groves in Meghalaya; clan-based management is common among santhals, munda, kharia, and other central, eastern, and northeast Indian tribes.

Conclusion

Assessment and protection of biodiversity are crucial for India's forests and wildlife. At least in key forest types or ecoregions, a coordinated programme for monitoring biodiversity is needed. In addition to expanding the PA network, optimising its size, and rationalising its limits, conservation programmes at the landscape level are needed to prevent PAs from suffering from island syndrome. Strategies for biodiversity protection beyond PAs should also be developed. Keep the regulatory structure in place, but make active attempts to promote people's participation. Education and capacity-building should help people extract intangible and economic benefits from conservation initiatives to enhance their livelihoods.

ISBN: 978-93-93259-95-0

Works Consulted

1. Arora, R.K., Mehra, K.L. And Nayar, E.R. 1983. Conservation of wild relatives of crop plants in India. NBPGR Scientifi c Monograph 6: 14 pp. Print.
2. Behera, M.D., Kushwaha, S.P.S. And Roy, P.S. 2006. Rapid assessment of biological richness in a part of eastern Himalaya: An integrated three-tier approach. Forest Ecology and Management 207(3): 363-384.Print.
3. Belal, A.E. And Springuel, I. 1996. Economic value of plant diversity in arid environments. Nature & Resources 22(1): 33-39.Print.
4. Brooks, T.M., Mittermeier, R.A., Da Fonseca, A.B., Gerlach, J., Hoffman, M., Lamoreux, J.F., Mittermeier, C.G., Pilgrim, J.D. And Rodrigues, A.S.L. 2006. Global biodiversity conservation priorities. Science 313: 58-61.Print.
5. CBD 1992. Convention on Biological Diversity: text and annexes, see article 2. Secretariat of the Convention on Biological Diversity, Montreal, Canada, pp. 1-34. CHAMPION, H.G. and SETH, S.K. 1968. A revised survey of the forest types of India. Government of India Publications, New Delhi, India, 404 pp. Print.
6. Kushwaha, Satya. (2008). Forest biodiversity and its conservation in India.. International Forestry Review. 10. 292-304.Print.

ISBN: 978-93-93259-95-0

An Occurrence of Rauwolfia Tetraphylla L.(Apocyanaceae) in Wild Habitat from Kinwat Area of Nanded District of Maharashtra, India

Eanguwar Srinivas Reddy[1], S.R. Shinde[1], Suvarna Patil[2]

[1]Deptartment of Botany, Baliram Patil, Arts, Commerce and Science Collage, Kinwat, Dist. Nanded, Maharashtra, India.

[2]Taywade College, Koradi, Nagpur, Maharashtra, India.

Email: eanguwarsrinivas@gmail.com

Abstract

The present paper deals with an occurrence of Rauwolfia tetraphylla L. in wild habitat from Kinwat area of Nanded District of Maharashtra, India. It is first time collected from wild habitat of Marathwada. Rauwolfia tetraphyl,Family - Apocynaceae), holds an important position in the Indian traditional system of medicine. Along with its taxonomic description, occurrence, its updatedreview on ethnobotanical, phytochemical and pharmacological activities of R. tetraphylla L. discussed here.

Key Words: *Rauwolfia tetraphylla L, Apocyanaceae, Kinwat , wild habitat, review*

INTRODUCTION

Since time immemorial plants have been exploited by mankind for various purposes such as timber, medicine, food and source of dyes. In certain kinds of formulations, plants have been extensively used to get rid of several ailments by traditional practitioners all over the world as well as by indigenous medicinal systems such as Ayurveda, Siddha, Unani and Traditional Chinese medicine (TCM). Plant based medicines are the primary source of treatment for people living in remote places and having no access for modern medicine. The knowledge of indigenous medicinal practitioners on plants and their healing properties is passed from generation to generation. Plants produce a great number of secondary metabolites (for e.g. alkaloids, terpenes and polyphenolic compounds), many of which, are known to possess therapeutic applications. Plant derived chemicals have found distinct place in modern therapy as they have been considered very important leads for modern drug discovery. Compounds such as vincristine, vinblastine, digitalin, digoxin, atropine, camptothecine, morphine, codeine, reserpine, quinine and artemisinin are from plant origin. Plants, either singly or in polyherbal formulations, are being used traditionally worldwide to combat several ailments including microbial diseases, snake bite, skin diseases, diabetes, inflammation and cancer. A vast knowledge on the therapeutic role of plants and their bioactive principles is gathered due to many studies being carried out on medicinal and pharmacological properties of plants (1-12).

ISBN: 978-93-93259-95-0

Rauwolfia tetraphylla L. (Family: Apocynaceae), la L. (Syn. R. canescens / R. heterophylla / R. hirsute; is a small,shrub that reaches 6 feet in height. Leaves arewhorled, medium to dark green in colour, occur in groups of4 equally-sized leaves at each node, R. tetraphylla is an economicallyimportant medicinal plant, It is used in various traditional as well as modern medicine.R. tetraphylla L. is rich source of various phytochemical like alkaloids, phenols, saponins flavonoids and tannin. Whole plant is medicinally important but root is essential source of phytochemicals and alternative source of reserpene. Overexploitation of plant for medicine,this plant is become an endangred. Plant root is beneficial source for extraction of phytochemicals. For its high potential values so it is cultivated oncommercial scale in India (13).

MATERIAL AND METHOD

During regular doing up and down by train from Adilabad (Telangana State) to Kinwat travelling on 14 October 2022 at evening time, popularly known as 'Be stilltree" or "Devil-pepper" holds an important position in the Indian traditional system of medicine of this taxon was observed. species was found to have Fruits (drupes) ovoid, deep red or purple have not found in wild habitat species known till date in Nanded District and Marthwada region. The colonies of these plant were seen at left side of Railway track towards Adilabad station near about 500 Meters from Plat form No.1 from Kinwat Railway station of Nanded District, Maharashtra State, India. The plants were collected and identified by pertinent literature (14,15, 16 and 17). After critical investigations the plant is identified as Rauwolfia tetraphylla L. (Voucher No. 290), the specimen is deposited in the herbarium of Deptartment of Botany, Baliram Patil College, Kinwat, Dist. Nanded, Maharashtra, India. Correct and updated citation, a short description along with phenology, G.P.S. and photograph (Plate-1) are presented herewith.

RESULT AND DISCUSSION

Description:

Rauvolfia tetraphyllaL. Sp. Pl. 208. 1753. R. canescens L. Sp.Pl. (ed. 2). 303. 1762; Cooke, Fl. Pres. Bombay 2: 188. 1958 (Repr.).Shrubs, upto 1.5 m tall. Leaves whorled, 3.4, 5.8 x 3.4 cm,elliptic. ovate, densely pubescent beneath, subacute to acute at both apex and base. Flowers cream.coloured, c 0.3 cm across; calyx lobessubacute; corolla lobes ovate. Drupes connate to top, 0.6.0.7 cm across.(18, 19, 20 & 21).

Phenology : More or less throughout the year.

Distribution. : Planted or as an escape.

Ethnobotanical Significance:

The ethnobotanical survey on R. tetraphylla revealed that plant possessed various significant activities and widely Geographical area, Part used, Ailments, Form and Reference is depicted in Table No. 1.

ISBN: 978-93-93259-95-0

Table No.1: Ethnomedicinal uses of R. tetraphylla L.

S.No.	Geographical area	Part used	Ailment	Form	Reference No.
1.	Chittoor district, Andhra Pradesh, India	Root	Head sore	Root paste	**(22)**
2.	Anuppur district, Madhya Pradesh, India	Root	Stomach pain, intestinal worm	Root extract	**(23)**
3.	Vizianagaram district, Andhra Pradesh, India	Root	Blood pressure	Root bark decoction	**(24)**
4.	Paschim Medinipur, West Bengal, India Koraput district, Odisha, India Salem district, Tamilnadu, India	Root Root Whole plant	Loose motion, snake bite Snake bite Snake bite	Root extract Paste Root paste	**(25)** **(26)** **(27)**
5.	Ranga Reddy district, Telangana, India	Whole plant	Skin diseases	Paste	**(28)**
6.	Bhadrak district, Odisha, India	Whole plant	Skin diseases	Juice	**(29)**
7.	South Western Ghats, Kerala, India	Root	Snake bite	Paste	**(30)**
8.	Latehar district, Jharkhand, India	Root	Blood pressure, chronic wound	Powder, paste	**(31)**
9.	Kancheepuram District, Tamil Nadu, India.	Whole plant	Skin diseases	Paste	**(32)**
10.	Kanyakumari wildlife sanctuary, Tamil Nadu, India.	Fruit	Intestinal worms	Roasted fruits	**(33)**
11.	Coimbatore and Ooty District, Tamil Nadu, India.	Root	Skin diseases, snake bites, as antidote for insect bites, to destroy parasites	Powder	**(34)**
12.	Eastern Ghats, Andhra Pradesh, India.	Root bark	Blood pressure	Decoction	**(35)**

ISBN: 978-93-93259-95-0

S.No.	Geographical area	Part used	Ailment	Form	Reference No.
13.	Chittagong, Bangladesh	Root	Diarrhea and dysentery	Water extract	**(36)**
14.	Madumalai wildlife sanctuary, Tamil Nadu, India	Root bark	Snake and other poisonous bite	Decoction	**(37)**
15.	Odisha, India	Root	Malaria	Paste	**(38)**
16.	Salem district, Tamil Nadu, India	Whole plant	Snake and scorpion bite	Paste	**(39)**
17.	West Rarrh region, West Bengal, India	Root	Snake bite, diabetes mellitus	Juice	**(40)**
18.	Sundargarh, Orissa, India	Root	Snake bite	Powder, paste	**(41)**
19.	Birbhum district, West Bengal, India	Root	Snake bite, diabetes	Juice	**(42)**
20.	Eastern Ghats, Tamil Nadu, India	Root, leaf	Piles, sterility	Juice	**(43)**
21.	Sundargarh district, Orissa, India	Root	Snake bite	Paste	**(44)**

Phytochemicals Significance:

Plants produce a range of chemicals that can be divided into two categories viz. primary and secondary metabolites. These chemicals are known as phytochemicals and most of the secondary metabolites for e.g., alkaloids, terpenes and polyphenolic compounds, exert multifold effects on the health of human beings besides conferring resistance to plants that produce them against insects, pathogens and herbivores. Secondary metabolites in plants are restricted in distribution within the plant kingdom i.e. some metabolites are present in only one plant species or in a related group of species. Metabolic pathways such as shikimic acid pathway, malonic acid pathway and mevalonic acid pathway are responsible for synthesis of secondary metabolites in plants (45-53). Phytochemicals identified in parts of R. tetraphylla L. by various methodsis depicted in Table No.2.

ISBN: 978-93-93259-95-0

Table 2: Phytochemicals identified in R. tetraphylla L.

S.No.	Part	Method	Phytochemicals	Reference No.
1.	Callus	TLC, HPLC	Reserpine	**(54)**
2.	Leaf	HPTLC	Yohimbine	**(55)**
3.	Stem	HPTLC, MS	Reserpine	**(56)**
4.	Aerial parts	IR, HPLC, NMR	Rauvotetraphyllines A–E, nortetraphyllicine, raucaffricine, peraksine, alstonine, sarpagine, 3-hydroxysarpagine, dihydroperaksine, 10-hydroxydihydroperaksine	**(57)**
5.	Aerial parts	IR, HPLC, NMR	Rauvotetraphyllines F–H, 17-epi-rauvotetraphylline F and 21-epi-rauvotetraphylline H	**(58)**
6.	Root bark, leaves	UV, IR, NMR, MS	Ajmaline, yohimbine, a-yohimbine, aricine, isoreserpine, corynanthine, deserpidine, reserpiline, isoreserpiline, lankanescine	**(59)**
7.	Root	HPLC–ESI-QToF-MS/MS, HPTLC	Reserpine	**(60)**
8.	Leaf	TLC, HPLC, NMR, IR, GC-MS	18,19-secoyohimban, curan-17-oic acid, reserpiline	**(61)**
9.	Leaf	HPTLC	10-methoxy tetrahydroalstonine, reserpiline, α-yohimbine, isoreserpiline	**(62)**
10.	Leaf	HPTLC-MS	3-Isoreserpine, ajmalicine, ajmaline, yohimbine, reserpine	**(63)**
11.	Leaf	GC-MS	8-Octadecenoic acid, Pentadecanoic acid, 2,(2-Carboxyvinyl)pyridine, Heptadecanoic acid, 3(2H)-Phenanthrenone	**(64)**

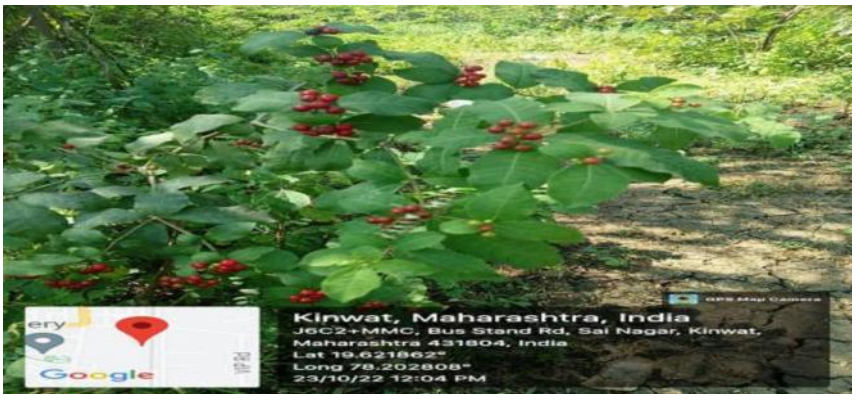


Plate No.-1- Rauwolfia tetraphylla L. In natual habitat.

ISBN: 978-93-93259-95-0

Specimens Examined:

The colonies of these plant were seen at left side of Railway track towards Adilabad station near about 500 Meters from Plat form No. 1 from Kinwat Railway station of Nanded District, Maharashtra State, India.

G. P. S. Location: N "19062?18.62", E 780 20?28.08", Accuracy: 2273.0 m.

Collected by: Eanguwar Srinivas Reddy on dated 10 October 2022, (Voucher No. 290.

Conclusion

Rauwolfia tetraphylla L. an ethnomedicinally highly important plant first time collected from wild habitat from Kinwat, Nanded possesses huge bioprospecting potential in different parts of the country. It have pharmacological activities such as antimicrobial, anxiolytic, antioxidant and anti-inflammatory activities with commercial and therapeutic properties. It possesses phytochemicals such as reserpine, quercetin, and others, particularly alkaloids, might have been responsible for bioactivities of the plant. Presently it is more important to conserve this valuable medicinal plant.

Acknowledgement

The authors express their deep gratitude to Late Dr. Omprakash Rathor, Ex-Principal of Science College, Nanded.

References

1. Fabricant DS, Farnsworth NR. The value of plants used in traditional medicine for drug discovery. Environmental Health Perspectives 2001; 109: 69-75.
2. Pattanaik C, Reddy SC, Das R, Reddy MP. Traditional medicinal practices among the trial people of Malkangiri district, Orissa, India. Natural Product Radiance 2007; 6(5): 430-435.
3. Dey A, De JN. Traditional use of plants against snakebite in Indian subcontinent: a review of the recent literature. Afr J Tradit Complement Altern Med 2012; 9(1):153-174.
4. L, Sala E, Ojeda MJ, Valls C, Bladé C, Mulero M, Blay M, Ardévol A, Garcia-Vallvé S, Pujadas G. Identification of novel human dipeptidyl peptidase-IV inhibitors of natural origin (Part II): in silico prediction in antidiabetic extracts. PloS one 2012; 7(9): e44972.
5. Luizza MW, Young H, Kuroiwa C, Evangelista P, Worede A, Bussmann RW, Weimer A. Local knowledge of plants and their uses among women in the Bale mountains, Ethiopia. Ethnobotany Research & Applications 2013; 11: 315-339.
6. Rout S, Panda SP, Patra HK. Ethnomedicinal studies on Bondo tribe of Malkangiri district, Odisha, India. International Journal of Biodiversity and Conservation 2014; 6(4): 326-332.
7. Tabassum N, Hamdani M. Plants used to treat skin diseases. Pharmacogn Rev 2014; 8(15): 52-60.
8. Hong L, Guo Z, Huang K, Wei S, Liu B, Meng S, Long C. Ethnobotanical study on medicinal plants used by Maonan people in China. J Ethnobiol Ethnomed 2015; 11: 32.
9. Greenwell M, Rahman PKSM. Medicinal plants: Their use in anticancer treatment. Int J Pharm Sci Res 2015; 6(10): 4103-4112.

10. Krishnamurthy SK, Kumar RM, Monisha A. Traditional herbs used for snakebites among hill Tribes of Tamil Nadu - Literature Review. International Journal of Ethnobiology and Ethnomedicine 2017; 4(1): 1-7.

11. Pandey AK, Tripathi YC. Ethnobotany and its relevance in contemporary research. Journal of Medicinal Plants Studies 2017; 5(3): 123-129.

12. Kumar S, Dobos GJ, Rampp T. The significance of ayurvedic medicinal plants. Journal of Evidence-Based Complementary & Alternative Medicine 2017; 22(3): 494-501.

13. Srivastava A, Tripathi AK, Pandey R, Verma RK, Gupta MM. Quantitative determination of reserpine, ajmaline, and ajmalicine in Rauvolfia serpentina by reversed phase high-performance liquid chromatography. Journal of Chromatographic Science 2006; 44: 557-560.

14. Almeida MR. Flora of Maharashtra. Thomas Paul Almeida for Blatter Herbarium, St. Xavier?s College, Mumbai 2001;3B: 317-337.

15. Naik V.N. Flora of Marathwada, Amrut Prakashan, Aurangabad. (1998).

16. Naik MC, Rao BRP, Eight Angiosperm Species, Additions to Flora of Andaman and Nicobar Islands, India. Bioscience Discovery, 2016. 7(1):30-33.

17. A. S. and M. M. Sardesai (2009). "Addition to flora of Marathwada", Bioinfolet 6 (2), P; 165-167.

18. N. P. Singh,P. Lakshminarasimhan,S. Karthikeyan&P. V. Prasanna, Flora of Maharashtra state, Dicotyledones, Volume 2,(Combretaceae to Ceratophyllaceae), Botanical Survey of India, P-8, Brabourne Road, Calcutta - 700 001. (2001). P-333.

19. Bhat GK. Flora of South Kanara, Akriti Prints, Mangalore, India, 2014, Pp 691.

20. Kamble RB, Hate S, Chaturvedi A. New additions to the flora of Nagpur district, Maharashtra. Journal on New Biological Reports 2013; 2(1): 9-13.

21. Patil MB. Ethnomedicines of Nandurbar district, Maharashtra. Laxmi book publication, Solapur, Maharashtra, India, 2015; Pp 149.

22. Ganesh P, Sudarsanam G. Ethnomedicinal plants used by Yanadi tribes in Seshachalam biosphere reserve forest of Chittoor district, Andhra Pradesh India. International Journal of Pharmacy and Life Sciences 2013; 4(11): 3073-3079.

23. Malaiya PS. Medicinal plants used by tribal population of Anuppur district Madhya Pradesh,India. International Journal of Applied Research 2016; 2(1): 418-421.

24. 61. Babu CN, Naidu TM, Venkaiah M. Ethnomedicinal plants used by the tribals of Vizianagaram district, Andhra Pradesh. Ann Pharm Pharm Sci 2011; 2(1&2): 1-4.

25. Manna S, Manna CK. Diversity in the use of phytomedicines by some ethnic people of Paschim Medinipur, West Bengal, India. Journal of Medicinal Plants Studies 2016; 4(3): 81-86.

26. Kumar SS, Padhan B, Palita SK, Panda D. Plants used against snakebite by tribal people of Koraput district of Odisha, India. Journal of Medicinal Plants Studies 2016; 4(6): 38-42.

27. Alagesaboopathi C. Ethnomedicinal plants used for the treatment of snake bites by Malayali tribal's and rural people in Salem district, Tamilnadu, India. Int J Biosci 2013; 3(2): 42-53.

28. Ramakrishna N, Ranjalkar KM, Saidulu C. Medicinal plants biodiversity of Anantagiri hills in Vikarabad, Ranga Reddy district, Telangana state, India. Bull Env Pharmacol Life Sci 2017; 6: 249-258.

29. Panda T, Mishra N, Pradhan BK. Folk knowledge on medicinal plants used for the treatment of skin diseases in Bhadrak district of Odisha, India. Med Aromat Plants 2016; 5: 262.

30. Sulochana AK, Raveendran D, Krishnamma AP, Oommen OV. Ethnomedicinal plants used for snake envenomation by folk traditional practitioners from Kallar forest region of South Western Ghats, Kerala, India. J Intercult Ethnopharmacol 2015; 4(1): 47-51.

 ISBN: 978-93-93259-95-0

31. Marandi RR, Britto JS. Ethnomedicinal plants used by the Oraon tribals of Latehar district of Jharkhand, India. Asian J Pharm Res 2014; 4(3): 126-133.

32. Muthu C, Ayyanar M, Raja N, Ignacimuthu S. Medicinal plants used by traditional healers in Kancheepuram District of Tamil Nadu, India. Journal of Ethnobiology and Ethnomedicine 2006; 2: 43.

33. Rani CPJ, Jeeva S. Ethnomedicinal plants used for gastro-intestinal ailments by Kani tribes of Kanyakumari wildlife sanctuary in Tamil Nadu, India. International Journal of Current Advanced Research 2017; 6(12): 7995-8000.

34. Kumar SA, Sankaranarayanan S, Bama P, Baskar R, Kanagavalli K. An ethnobotanical study of medicinal plants used by local people and tribals in Topslip (Annamalai hills) and Ooty (Chinchona village) of Coimbatore and Ooty district. International Journal of Current Research 2018; 10(5): 69304-69308.

35. Rao SD, Rao NGM, Murthy PP. Diversity and indigenous uses of some ethnomedicinal plants in Papikondalu wild life sanctuary, Eastern Ghats of Andhra Pradesh, India. American Journal of Ethnomedicine 2016; 3(1): 6-25.

36. Morshed AJM, Nandni NC. Indigenous medicinal plants used by the tribal healers of Chittagong hill tracts to treat Diarrhoea and Dysentery. Hamdard Medicus 2012; 55(2): 48-66.

37. Rani JP, Tangavelou AC, Karthikeyan S. Ethnomedicinal plants used by the tribals of Mudumalai wildlife sanctuary for poisonous bites. International Journal of Modern Research and Reviews 2016; 4(8): 1208-1212.

38. Singh H, Dhole PA, Krishna G, Saravanan R, Baske PK. Ethnomedicinal plants used in malaria in tribal areas of Odisha, India. Indian J Nat Prod Resour 2018; 9(2): 160-167.

39. Alagesaboopathi C, Prabakaran G, Subramanian G, Vijayakumar RP. Ethnomedicinal studies of plants growing in the Salem district of Tamilnadu, India. Int J Pharm Biol Sci 2018; 8(3): 503-511.

40. Ghosh A, Ethnomedicinal plants used in West Rarrh region of West Bengal. Natural Product Radiance 2008; 7(5): 461-465.

41. Girach RD, Aminuddin, Ahmad M. Medicinal ethnobotany of Sundargarh, Orissa, India. Pharmaceutical Biology 1998; 36(1): 20-24.

42. Sarkar NR, Mondal S, Mandal S. Phytodiversity of Ganpur forest, Birbhum district, West Bengal, India with reference to their medicinal properties. Int J Curr Microbiol Appl Sci 2016; 5(6): 973-989.

43. Vaidyanathan D, Senthilkumar SMS, Basha GM. Studies on ethnomedicinal plants used by Malayali tribals in Kolli hills of Eastern Ghats, Tamilnadu, India. Asian J Plant Sci Res 2013; 3(6): 29-45.

44. Prusti AB, Behera KK. Ethno-Medico Botanical Study of Sundargarh District, Orissa, India. Ethnobotanical Leaflets 2007; 11: 148-163.

45. Pichersky E, Gang DR. Genetics and biochemistry of secondary metabolites in plants: an evolutionary perspective. Trends in Plant Science Perspective 2000; 5(10): 439-445.

46. Acamovic T, Brooker JD. Biochemistry of plant secondary metabolites and their effects in animals. Proc Nutr Soc 2005; 64: 403-412.

47. Karuppusamy S. A review on trends in production of secondary metabolites from higher plants by in vitro tissue, organ and cell cultures. Journal of Medicinal Plants Research 2009; 3(13): 1222-1239.

48. Kennedy DO, Wightman EL. Herbal extracts and phytochemicals: Plant secondary metabolites and the enhancement of human brain function. Adv Nutr 2011; 2(1): 32-50.

49. Mazid M, Khan TA, Mohammad F. Role of secondary metabolites in defense mechanisms of plants. Biology and Medicine 2011; 3(2): 232-249.

50. Ribera AE, Zuñiga G. Induced plant secondary metabolites for phytopatogenic fungi control: a review. Journal of Soil Science and Plant Nutrition 2012; 12(4): 893-911.

51. Kabera JN, Semana E, Mussa AR, He X. Plant secondary metabolites: biosynthesis, classification, function and pharmacological properties. J Pharm Pharmacol 2014; 2: 377-392.

52. Ahmed E, Arshad M, Khan MZ, Amjad MS, Sadaf HM, Riaz I, Sabir S, Ahmad N, Sabaoon. Secondary metabolites and their multidimensional prospective in plant life. J Pharmacogn Phytochem 2017; 6(2): 205-214.

53. Guerriero G, Berni R, Munoz-Sanchez AJ, Apone F, Abdel-Salam EM, Qahtan AA, Alatar AA, Cantini C, Cai G, Hausman J, Siddiqui KS, Hernandez-Sotomayor TSM, Faisal M. Production of plant secondary metabolites: Examples, tips and suggestions for biotechnologists. Genes 2018; 9: 309.

54. Anitha S, Kumari RBD. In vitro callus culture in Rauvolfia tetraphylla L. Indole alkaloid production. Asian J Plant Sci 2013; 12(1): 28-33.

55. Kumar A, Bhardwaj MK, Upadhyay AK, Tiwari A, Ohdar BD. Quantitative determination of Yohimbine alkaloid in the different part of the Rauvolfia tetraphylla. J Chem Pharm Res 2011; 3(2): 907-910.

56. Paul ET. Ash analysis, HPTLC fingerprint and mass spectroscopic profile of Rauvolfia tetraphylla-stem extract. Vistas 2015; 4(1): 37-43.

57. Gao Y, Zhou D, Kong L, Hai P, Li Y, Wang F, Liu J. Rauvotetraphyllines A-E, new indole alkaloids from Rauvolfia tetraphylla. Nat Prod Bioprospect 2012; 2: 65-69.

58. Gao Y, Zhou D, Hai P, Li Y, Wan F. Hybrid monoterpenoid indole alkaloids obtained as artifacts from Rauvolfia tetraphylla. Nat Prod Bioprospect 2015b; 5: 247-253.

59. Arambewela LSR, Madawela G. Alkaloids from Rauvolfia canescens. Pharm Biol 2001; 39(3): 239-240.

60. Bindu S, Rameshkumar KB, Kumar B, Singh A, Anilkumar C. Distribution of reserpine in Rauvolfia species from India - HPTLC and LC-MS studies. Ind Crops Prod 2014; 62: 430-436.

61. Behera DR, Bhatnagar S. In-vitro and in silico efficacy of isolated alkaloid compounds from Rauvolfia tetraphylla L. against bovine filarial parasite Setaria cervi: a drug discovery approach. J Parasit Dis 2018, https://doi.org/10.1007/s12639-018-1064-1.

62. Gupta S, Shanker K, Srivastava SK. HPTLC method for the simultaneous determination of four indole alkaloids in Rauwolfia tetraphylla: A study of organic/green solvent and continuous/pulse sonication. Journal of Pharmaceutical and Biomedical Analysis 2012; 66: 33-39.

63. Nandhini VS, Bai VG. Secondary metabolites screening from in-vitro cultured Rauvolfia tetraphylla by HPTLC-MS: A special emphasises on their antimicrobial applications. International Journal of Advances in Pharmaceutical Analysis 2014; 4(2): 81-87.

64. Chandra HJ, Vignesh T. In vitro and in silico study of ethanolic leaf extracts of Rauvolfia canescens. Res J Chem Environ 2016; 20(8): 31-37.

 ISBN: 978-93-93259-95-0

Traditional Medicine Used by Chenchu Tribes of Nallamala Forest, Telangana to Regulate Menstrual Disorders

Rajendar Gubba

Assistant Professor of Botany, MVS GDC (A), Mahabubnagar, Telangana State- 509001.
Email: rajangphd@gmail.com

Abstract

Nallamala forest is a biodiversity zone, that comprises of 1521 taxa, based on habit, the flora has 854 taxa (56.15%) under herbs, 190 (12.49%) shrubs. 281 (18.47%) trees, and 196 (12.89%) climbers, conclude that Nallamalais as one of the rich plant diversity area in Deccan Peninsular of India. The range located on south of Krishna River and runs parallel to Coromandal cost on the Bay of Bengal. The present study is related to traditional medicine, that used by chenchu tribe to regulate various disorders in menstrual cycle in reproductive women, who inhabiting in the Amrabad tribal area of Nallamala forest, Telanagana. The beginners of chenchu tribe of Nallamala were lived in the villages of Amrabad mandal and in the villages of Lingal mandal. These villages were deep situated in the forest. Later on, they were migrated to several regions of this forest. Practicing with traditional medicine is more popular in tribal areas, because they have abundant knowledge about medicinal values in plant sources, with no side effects and less toxic. Menstrual cycle is a periodic cycle in reproductive aged women under the regulation of several hormones like GnRH, FSH, LH and estrogens. Imbalance in the physiology of these hormones may leads to several disorders in menstruation. Further this study is providing the details about the presence of secondary metabolites like alkaloids, cardiac glycosides, flavonoids, phenols, tannins, steroids, anthroquenones, and saponins in ethno medicine Sample and its constituent plants by their phyto-chemical screening in various solvent extracts, FTIR and by UV analysis.

Key words: *Traditional medicine, Chenchu tribes, Nallamala forest, menstrual cycle, Phyto-chemical screening, secondary metabolites.*

Introduction

Nallamala forest is a part of Eastern Ghats of India that lies in between 16008'50"to 16037'45" N and 780 48' 30" to 780 58' 50" E. The length of this forest is about 430 Km and covered an area of 7640 sqkm and elevation is ranged in between 2900 to 3600 feet [3]. It is mixed deciduous forest distributed among several districts of Telangana and Andhra Pradesh. Soils of Nallamala are classified in to three types, Red soils, Black soils and mixed soils. The rocks of Nallamala having a thickness about 20,000 feet formed with irregularly salty filled Quartzite and formed due to largest volcanic activity of millions years ago, probably archean.

Among flora the most abundant families are Poaceae with 178 taxa, Pailionaceae with 116 taxa, Euphorbiaceae with 83, Cyparaceae with 79, Astaraceae with 63, Acanthaceae with 49, Rubiaceae with 49 taxa, Malvaceae with 44 taxa, Convalvulaceae with 40 taxa, Caesalpinaceae with 39 taxa. [4, 17]

Chenchu tribal are the major human population belongs to this range. The other tribes are Kondareddlu, Lambaadas, Yandudulu. The pioneers of chenchus prefer to living together in a group is known as Gudem and individual family living in a hut. The beginners of their tribe in the Nallamala were lived at Bhourapur, Appaipally, Appapur, Sarlapally, Dhararam, Earlapenta, Rampur, Medimulkala, Sangadigundala villages of Lingal mandal and Kudichinthalabailu, Kollampenta, Kommanpeta, Molakamamidi villages of Amrabad mandal [17]. These villages were deep situated in the forest. Later on they were migrated to several regions of this forest. The traditional dressing of the Chenchu is that men wear dhoti and women a saree without blouse. They are very much interested in Ornamentals made with shells and especially alloy (panchaloha) made ear tops. Chenchu tribe depended for their economy mainly on forest products like, honey, gums, tamarind, amla, wood apples etc, because they do not know agriculture. Their main activity is hunting. Most recent generations learned about agriculture and forming maize, Cotton, Sorghum, Capsicum and their needy millets[15.16]. They believe on god & goddess i.e Lingamaiah, Malalamma- vana devatha, Muthyalamma, Ellamma. For Lingamaiah they made temples, in which Saleshwaram is one of them that located deep in the forest. For other pilgrimages it opens only on Chaithra pournamy and rest of the year it will be closed, the journey is most adventurous and joyful.

Menstrual Cycle is a periodical cycle that regularly takes place in reproductive women. If egg does not fertilized, then menstruation takes place i.e breakdown of corpus luteum and decreased levels of two hormones that lead to shedding of uterine lining. This is said to be period. It includes three phases-Follicle phase, Ovulation phase and Luteal phase and are regulated by hormones like GnSH, FSH, LH and estrogens. [18]

Materials and Methods:

Periodic field visits were made to the chenchu villages of Amrabad area, Nallamala forest during the years 2016-2020. Healthy interactions were made with the healers of Gudibanda, Chenchugudem, Bilakal, Ambagiri, SriRangapuram, Earlapenta, Macharam, Maddimadugu, Madonipally, Chitlamkuntla tribes of the forest. The interviews were taken in a prescribed manner. Methodology followed in the enumeration of herbal treatment is Jain and Goel. - 1987. The sample medicine was collected from healers and constituent plants from the forest area.

Fresh plant parts were identified, authenticated and well labeled, prior to phyto-chemical analysis. The plant parts were separately cut into small pieces, and dried in shade for 15 days. They were ground to powder and sieved before being subjected to phyto-chemical screening. The present study aims to analyze the chemical components present in plant parts which are used

ISBN: 978-93-93259-95-0

in tribal medicine samples that were found to possess potential of curing menstrual disorders. Preliminary qualitative phyto-chemical screening was carried out for alkaloids, cardiac glycosides, flavonoids, phenols, tannins, steroids, anthraquinones, amino acids, monosaccharides, saponins by following the standard protocols [2, 5, 6, 10, 19, and 21].

The Infrared spectroscopy was employed to study the functional groups and composition of the primary and secondary metabolites present in the prepared powder samples. Before going to the spectral analysis, the individual powder sample was characterized by adding with Potassium bromide pallets separately. These samples were scanned under the Fourier transformed infrared (FT-IR) spectrometer (Shimadzu IR Prestige_21 spectrophotometer) in the region of 4000-400 cm-1. The peaks in the absorption spectra, that reveals the presence of stretching bonds and various functional groups at distinct range of wave-numbers.

For the Preparation of ethanol extraction 10 g of above said individual prepared and moisture free powders were placed in 100 ml of ethanol either 72 hours maceration or boiled for 5- 6 hours and filtered through whatsmann filter paper and condensed in hot water bath and used for UV spectral analysis.

RESULT ANALYSIS:

Traditional medicine used for menstrual disorders i.e. Sample and its constituent plants.

Table 1: Constituents plants of the sample, parts and their medicinal form used by Chenchu tribe

S.No	Name of the plant	Botanical name	Family	Plant part	Medicinal form
1	Tella galijeru	*Ttrianthema portulacastrum*	Aizoaceae	dried leaves	Powder
2	Sri gandham	*Santalum album*	Santalaceae	dried stem	Powder
3	Athimadhuram	*Glycyrrhiza glabra*	Fabaceae	dried stolon	Powder
4	Ashoka	*Saraca asoca*	Caesalpinaceae	dried bark	Powder
5	Shathavari	*Asparagus racemosus*	Asparagaceae	dried roots	Powder

1) Trianthema portulacastrum L. Family: Aizoaceae.

Vernacular names: Tella galijeru in Telugu. Varshabhu in Sanskrit. Horse purslane in English.

Description:

A common prostate weed in tropical and sub tropical regions. A week succulent stem that grows up to 50 cm long. Simple leaf, petiolate, round to obovate, green in color, 1-2 cm long. Flower-Solitary, auxiliary flower, perianth usually petaloid, white colored. Used to prepare medicine that used in amenorrhea. Root works as antipyretic, analgesic, and anti inflammatory and antifungal. [12]

ISBN: 978-93-93259-95-0

2) Santalum album L.

Family: Santalaceae.

Vernacular names: Chandanamu in Telugu. Srichandnam in Sanskrit. Indian sandal wood in English.

Description:

Evergreen tree attains a height about 20 m. A partial root parasite, up to attaining a height about 15-20 inches. Leaves are opposite, dark green at abaxial and pale green at adaxial, lanceolate, acute apex. Paniculate cyme inflorescence. Reddish to purple brown colored flowers, actinomorphic, bisexual complete flower. Useful in menorrhagia. Showing antifungal and antibacterial activity hence used in leucorrhea, urethritis, veginitis. [11]

3) Glycyrrhiza glabra L.

Family: Fabaceae.

Vernacular names: Athimaduram in Telugu. Yastimadu in Sanskrit. Liquorice in English.

Greek- Glycyrrhiza- sweet root.

Description:

Perennial shrub, that grows up to 2 m height. Horizontal rhizome/ stolon grow up to 6 m length and woody in nature. Leaves are pinnate, 15- 20 cm long and have 3-5 pairs on rachis. Spike inflorescence, Actinomorphic, bisexual flower. Pod fruit with reniform seeds. Plant source: Stolon. Drug to be collected after 4 years of the plantation, during autumn only. Carefully trimmed and washed stolon only dried in Sun for the removal of moisture. Purifies blood and useful in bleeding disorders. It works against symptoms of PMS. [20]

4) Saraca asoca (Roxb.) Wild

Family: Caesalpiniaceae.

Vernacular names: Sita Asoka in Telugu. Asoka in Sanskrit. Ashok tree in English.

It is a Sanskrit word, name that indicates no sorrows.

Description:

Ever green mesophyte, with beautiful and fragrant flowers. Areal and erect stem that attains up to 10 m height with dark green to brown bark. Pinnately compound leaves, leaflets are green in color, lanceolate acute apex. Racemose inflorescence with yellowish orange flowers. Corolla is absent, Calyx is petaloid. Pod fruit, leathery or woody. Decoction, prepared from bark powder is useful in bleeding disorders. Useful against heavy periods, menstrual pain. [14]

ISBN: 978-93-93259-95-0

5) Asparagus racemosus Willd.

Family: Asparagaceae.

Vernacular names: Pilli-theega, pilli-pithara in Telugu. Shathamuli, Shathavari in Sanskrit. Buttermilk root, wild asparagus.

Description:

A pine like phylloclade with hooked spines. Plant has adventitious tuberous roots. Leaf less, and branches modified as phylloclade for photosynthetic function. Plant attains a height about 2 m. Fruits are blackish-purple colored berries. Useful to maintain women health particularly genital system. Relieves abdominal pain. Balances the hormonal activities. Regulates Ovulation. [1]

Phytochemical analysis: the presence of secondary metabolites in different solvent extracts.

Alkaloids are present in all the extracts except ether and acetates of sample when compared to other extracts. Alkaloids are also found in all the extracts of Trianthema portulacastrum leaf, except in Petroleum ether extract of Santalum album stem are consisting the alkaloids where as alkaloids are presents in the all extracts except in Ethyl acetate extract of Glycyrrhyza glabra rhyzome which are also found in methanol, chloroform, ethyl alcohol extracts of the Saraca asoca bark and in all the extract except petroleum ether of Asparagus racemosus root which are component parts of the sample.

Cardiac glycosides are found in all extracts except Petroleum ether and ethyl acetate of sample. Cardiac glycosides are present in methanol, chloroform, ethyl alcohol extracts of Trianthema portulacastrum leaf. These are not found in extracts of Santalum album stem. These are also present in Methanol, extracts of Glycyrrhyza glabra rhyzome. Cardiac glycosides are present in methanol, Chloroform, ethyl alcohol extractions of Saraca asoca bark and present in distilled water and chloroform extracts of Asparagus racemosus root.

Flavonoides are found in all extracts of sample, these are present in the methanol, chloroform, petroleum ether, ethyl acetate extracts of Trianthema portulacastrum leaf, flavonoids are found in distilled water, methanol, chloroform, ethyl alcohol extracts of Santalum album stem. Flavonoids are present in all the extracts except in petroleum ether, ethyl acetate extracts of the Glycyrrhyza glabra rhyzome, these are also found in the all extracts except ethyl acetate extracts of Saraca asoca bark. Flavonoids are found methanol, chloroform, ethylalcohol extracts of Asparagus racemosus root.

Phenols are found in all extracts of sample, phenols are present in all extracts of Trianthema portulacastrum leaf, these are present in all extracts except in distilled water and ethyl alcohol extracts of Santalum album stem, phenols are present in all except methanol, ethyl acetate extracts of Glycyrrhyza glabra rhyzome, these are found in distilled water, chloroform, petroleum ether and ethyl acetate extracts of Saraca asoca bark and are not found in any extracts of Asparagus racemosus root.

ISBN: 978-93-93259-95-0

Tannins are found in all extracts except the ethyl acetate extracts of sample, tannins are present in all extracts except in distilled water, ethyl acetate extracts of Trianthema portulacastrum leaf, these are found in all extracts, except in methanol, ethanol, ethyl acetate extracts of Santalum album stem. These are present in all except petroleum ether, ethyl acetate extracts of Glycyrrhyza glabra rhyzome. Tannins are present in all except petroleum ether, ethyl acetate extracts of Saraca asoca bark, finally tannins are found only in methanol, chloroform extracts of Asparagus racemosus root.

Steroids are moderately found in only in the chloroform extract and absent in all the extracts of sample, steroids are present only in chloroform extracts of Trianthema portulacastrum leaf. Steroids are found only in ethanol extract of Santalum album stem, steroids are found only in methanol, chloroform extracts compare to other extracts of Glycyrrhyza glabra rhyzome, these are also found in only distilled water compare to other extracts of Saraca asoca bark and are found only in ethyl acetate extract of Asparagus racemosus root.

Anthraquinones are present in distillied water, methanol and ethyl acetate extracts of Sample. Anthraquinones are also found in the methanol, chloroform extracts of the Trianthema portulacastrum leaf. These are present in the Methanol extract of Santalum album stem, anthraquinones are present only in the methanol extract compared to other extracts of Glycyrrhyza glabra rhyzome, extracts except methanol, petroleum ether anthroquenones are not found in other extracts of Saraca asoca bark, finally anthraquinones are found in methanol, ethyl Acetate extract of the Asparagus racemosus root.

Amino acids are found in methanol, chloroform and ethyl alcohol extracts of Sample. Amino acids are found in distilled water, chloroform extracts of Trianthema portulacastrum leaf. Amino acids are present in petroleum ether and ethyl acetate extracts of Santalum album stem. Amino acids are moderately present the extracts of Glycyrrhyza glabra rhizome. These are present in methanol, chloroform extracts of Saraca asoca bark compared with other extract. finally amino acids are found in chloroform, ethyl acetate extracts of the Asparagus racemosus root.

Monosacharides are found in all the extracts of sample. These are present in methanol, chloroform, ethyl alcohol, ethyl acetate extracts of Trianthema portulacastrum leaf, monosacharides are found in extracts of petroleum ether, ethyl acetate of Santalum album stem. These are present in all extracts except petroleum ether extract of Glycyrrhyza glabra rhizome, monosacharides are found in chloroform, ethyl alcohol, ethyl acetate extracts of Saraca asoca bark fruits. Finally amino acids are found in methanol, chloroform, ethyl alcohol extract of the Asparagus racemosus root.

Saponins are found only in distilled water extract compare to other extracts of sample. saponins are present in distilled water, chloroform compare to other extracts of Trianthema portulacastrum leaf extract. These are present in distilled water, methanol extracts of Santalum album. Saponins are present in distilled water, petroleum ether, ethyl alcohol extracts when

ISBN: 978-93-93259-95-0

compare to other extracts of Glycyrrhyza glabra rhizome. These are found in distilled water and ethyl alcohol extracts compare other extracts of Saraca asoca bark. Finally saponins are found only in distilled water extract of the Asparagus racemosus root.

FTIR Analysis:

The FTIR spectral analysis of Sample and its Constituent plants reveals the presence of various kinds of functional groups in the form of following Stretching's at the following Wave numbers (cm?1).

The absorption peaks at 3784 in Sample, 3787 in Glycyrrhiza glabra, and 3786 in Saraca asoca are indicating the presence of Carbon with halide stretching. The absorption peaks at 3407 in Sample, 3407 in Saraca asoca, 3439 in Asparagus racemosus indicating the presence of C-OH stretching. The absorption peaks at 3337 in Sample, 3349 in Santalum album, 3354 in Glycyrrhiza glabra indicating the presence of N-H stretching. The absorption peaks 2922 in Sample, 2927 in Santalum album, 2924 in Glycyrrhiza glabra, 2947 in Asparagus racemosus are indicating the presence of alkyl stretching. The absorption peaks at 2855 in Sample, 2853 in Trianthema portulacastrum, and 2854 in Saraca asoca are indicating that presence of C-H stretching. The absorption peaks at 1740 in Sample, 1741 in Trianthema portulacastrum, 1741 in Glycyrrhiza glabra, and 1741 in Asparagus racemosus indicating the presence of C=O stretching indicating the presence of aldehyde functional group. The absorption peaks at 1627 in Sample, 1635 in Trianthema portulacastrum, 1647 in Santalum album, 1626 in Glycyrrhiza glabra, 1613 in Saraca asoca, 1631 in Asparagus racemosus indicating the presence of C=C stretching. The absorption peaks at 1369 in Sample, 1320 in Santalum album, 1369 in Glycyrrhiza glabra, and 1369 in Asparagus racemosus indicating the presence of N-C bonding indicating the presence of amine group. The absorption peaks at 1028 in Sample-2, 1024 in Trianthema portulacastrum, 1032 in Santalum album, 1028 in Glycyrrhiza glabra, 1030 in Saraca asoca, and 1025 in Asparagus racemosus indicating the presence of anhydride functional group.

UV Analysis:

This UV absorption spectral peaks indicates, 1) from 300 nm to 500 nm, π -π* bonding, 2)500 nm to700nm, N -π*bonding.

π -π* stretching in Sample at 395 nm, 362 nm, 349 nm, in Trianthema portulacastrum at 423 nm, 400 nm, 358 nm, in Santalum album at 373 nm, 349 nm, 303 nm, in Glycyrrhiza glabra at 415 nm, 401 nm, 347 nm, in Saraca asoca at 428 nm, 355 nm, and in Asparagus racemosus at 341 nm. N -π* in Sample at 658 nm, in Trianthema portulacastrum at 665 nm, 608 nm, 535 nm, in Saraca asoca at 532 nm, and in Asparagus racemosus at 659 nm.

ISBN: 978-93-93259-95-0

Pics.1 Constituent plant parts of Sample

Trianthema portulacastrum. dried leaves *Santalum album stem.* *Glycyrrhiza glabra stem.*



Saraca asoca bark. *Asparagus racemosus roots.*


Pics.2- Powder forms of constituent plant parts of Sample

Trianthema portulacastrum. Dried leaves *Santalum album stem.* *Glycyrrhiza glabra stem.*



Saraca asoca bark. *Asparagus racemosus roots.*


ISBN: 978-93-93259-95-0

Table 2. Phytochemical analysis of traditional medicine (sample) extracts from various solvents.

Phytochemical constituents	Distilled water	Methanol	Chloroform	Petroleum ether	Ethyl alcohol	Ethyl acetate
Alkaloids	+	+	+	-	+	+
Cardiac glycosides	+	+	+	-	+	-
Flavonoids	+	+	+	+	+	+
Phenols	+	+	+	+	+	+
Tannins	+	+	+	+	+	-
Steroids	-	-	++	-	-	-
Anthro quinines	+	+	-	-	-	+
Amino acids	-	+	+	-	+	-
Monosaccharides	+	+	+	+	+	+
Saponins	+	-	-	-	-	-

- = indicates absence of phytochemicals.

+ = indicates presence of phytochemicals and

++ = shows moderate concentration.

Table: 3 FTIR Absorption frequencies of Samples and their constituent plants.

Plant material	C-X	C-OH	N-H	Alkyl	C-H	C=O	C=C	N-O	CHO
Trianthema portulacastrum	-	-	-	-	2853	1741	1635	-	1024
Santalum album	-	-	3349	2927	-	-	1647	1320	1032
Glycyrrhiza glabra	3787	-	3354	2924	-	1741	1626	1369	1028
Saraca asoca	3786	3407	-	-	2854	-	1613	-	1030
Asparagus racemosus	-	3439	-	2947	-	1741	1631	1369	1025
Sample	3784	3407	3337	2922	2855	1740	1627	1369	1028

Table: 4. UV spectral analysis of Sample and its constituent plants.

Stretching/ Peaks	*Trianthema portulacastrum*	*Santalum album*	*Glycyrrhiza glabra*	*Saraca asoca*	*Asparagus racemosus*	*Sample*
π –π *	423	373	415	428	341	395
	400	349	401	355	-	362
	358	303	347	-	-	349
N –π *	665	-	-	532	659	658
	608	-	-	-	-	-
	535	-	-	-	-	-

DISCUSSION AND CONCLUSION:

The practice of traditional medicine is considered to be more effective in regulating the disorders of menstrual cycle in reproductive woman and they are lesser in toxic and free from

ISBN: 978-93-93259-95-0

side effects. The sample medicine given by healers consisting of Trianthema portulacastrum dried leaves, Santalum album dried stem, Glycyrrhiza glabra dried stolon, Saraca asoca dried bark, and Asparagus recemosus dried roots. For the chemical analysis, plant extracts were prepared by following the standard protocols. These extracts when tested with various reagents revealed the presence of various active principles in constituent plant parts, those act against Menstrual disorders. Further FTIR, and UV spectral analysis strengthen the investigation of active principles in the crude drug. The analysis of FTIR spectra, peaks in the graphs indicates C=O, C=C, C-H, C-N bonding at distinct wavelengths in the powder forms of the Constituent plants. In the UV spectral analysis the transmittance peaks indicated C=C, C-N/ C=O bonds at distinct wave numbers in the ethanol extracted powder forms. All these investigations indicates the presence of various type of Alkaloids, Glycosides, Saponins, Phenolic compounds, Tannins, Amino acids, Steroids, and Anthraquinones which are very active to regulate menstrual disorders and stabilizes the hormonal imbalance.

Aknowledgements:

1. I am very much grateful to all the CHENCHU HEALERS, Amrabad area of Nallamala forest for providing the data and Sample medicine.
2. I am very much thankful to the Director, CFRD, OU for the results of FTIR and UV spectral analysis.
3. I am thankful to Dr. ABDUL ANSARI, Principal (Retd), MALD, GDC, Gadwal for encouragement during the course.

References:

1. Alok, S., Jain, S. K., Verma, A., Kumar, M., Mahor, A., & Sabharwal, M. (2013). Plant profile, phytochemistry and pharmacology of Asparagus racemosus (Shatavari): A review. Asian Pacific Journal of Tropical Disease, 3(3), 242-251.
2. Dhandapani R and Sabna B, 2008,Phytochemical constituents of some Indian medicinal plants, Ancient Science Of Life,XXXVII(4),, 1-7.
3. Dinakar Y,(2018) "Ethnobotanical Study of Medicinal Plants Used by the Tribes of Nalamalai Forests", International Journal of Medicinal Plants and Natural Products (IJMPNP), vol. 4, no. 1, pp. 19 -21, http://dx.doi.org/10.20431/2454-7999.0401004.
4. Ellis, J.L. (1987). Flora of Nallamalais, Vol. 1 and II. Botanical Survey of India, Calcutta.
5. Harborne JB 1973, Phytochemicalmethods, London. Chapman and Hall, Ltd. pp. 49-188.
6. Harbourne JB. 1998, Phytochemical methods of Analysis, Jackmann and Hall,London;64-90.
7. Jain S K. 1981, Glimpses of Indian Ethnobotany, (Oxford IBH Publishing Co, New Delhi).
8. Kokate C.K. 1998 Qualitative Chemical Examination of Plant Constituents,Vallabh Prakashan,Mumbai. p. 92-93.
9. Kokate CK, Purhohit AP, Gokhale SB 2006. Text book of Pharmacognosy, Nirali Prakashan, Mumbai;p. 35-37.
10. Krishnaiah D, Sarbatly R, Bono A (2007) Phytochemical antioxidants for healthand medicine: A move towards nature. Biotechnol Mol Biol Rev 1: 97-104.

 ISBN: 978-93-93259-95-0

11. Misra B.B. Dey, S. (2012). "Comparative phytochemical analysis and antibacterial efficacy of in vitro and in vivo extracts from East Indian sandalwood tree (Santalum albumL.)". Letters in Applied Microbiology. 55 (6): 476-486.

12. Nawaz HR, Malik A, Ali MS(2001). Trianthenol: An antifungal tetrapenoid from Trianthema portulacastrum (Aizoaceae) Phytochemistry. 56, p99-102.

13. Nostro A, Germanò MP, D'angelo V, Marino A, Cannatelli MA (2000) Extraction methods and bio-autography for evaluation of medicinal plant antimicrobialactivity. Lett Appl Microbiol 30: 379-384.

14. Pradhan P, Joseph L, George M, Kaushik N, Chulet R.(2010) Pharmacognostic, Phytochemical & Quantitative Investigation of Saraca asoca leaves. Journal of Pharmacy Research. 3(1): 776-780.

15. Ramana naidu .BV.,Haribabu Rao.D, Subramanyam.P, Prabhakar raju.C, Jayasimha Rayalu.D, (2012).Ethnobotanical study of medicinal plants used by the tribes in nallamala forest area of Kurnool district,Andhra Pradesh ,int. j. plant ,animal and env sci 2(4), 72

16. Rao, K Mallikharjuna et al. (2015) "Diet & nutrition profile of Chenchu population - A vulnerable tribe in Telangana & Andhra Pradesh, India." The Indian journal of medical research vol. 141,5. 688-96. doi:10.4103/0971-5916.159588

17. Rajendar G, Bagyanarayana G, Khajamoinuddin Mohammad, 2020, Phytochemical Screening of Treditional Medicine And Its Constituent Plants Used for Regulating Menstrual Disorders. joics.org/VOL-10-ISSUE-10-2020.

18. Reed BG, Carr BR. (2018). The Normal Menstrual Cycle and the Control of Ovulation. [Updated 2018 Aug 5]. In: Feingold KR, Anawalt B, Boyce A, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com.

19. Sofowara A 1993, Medicinal plants and Traditional medicine in Africa. Spectrum Books Ltd, Ibadan, Nigeria. pp 49-188.

20. Souri, Mohammad & Mohammad, Ahmadi. (2014). Evaluation of morphological diversity and root dry extract content of different Licorice (Glycyrrhiza glabra L.) ecotype collected from five provinces in Iran. Iranian J of Regeland, 8 (1): 1-12.

21. Trease G. E , Evans W. C 1989. Pharmacognsy. 11th edn. Brailliar Tiridel Can. Macmillian publishers.

ISBN: 978-93-93259-95-0

A Systematic Review on Traditional Ethnomedicinal Uses of *Heliotropium indicum L.* (Boraginaceae)

Umakant B. Deshmukh[1], Eanguwar Srinivas Reddy[2], Karunakar M. Ranjalkar[3], Vinayak B. Chavan[4]

[1]Institution of Higher Learning, Research & Specialized Studies Centre, Department of Botany, Janata Mahavidyalaya, Chandrapur. 442401, Maharashtra, India.
[2]Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, District Nanded, Maharashtra, India.
[3]Department of Botany, Late Pushpadevi Patil Arts & Science College, Risod, Dist. Washim. Maharashtra, India.
[4]Department of Botany, N.E.S.Science College, Nanded, Maharashtra, India.
Author Correspondence: drdeshmukhumakant979@gmail.com[1]

Abstract

This study aimed to summarize the available data on the traditional ethnomedicinal uses of Heliotropium indicum L. (Family: Heliotropiaceae, Subfamily: Boraginaceae) based on available database reports. Heliotropium indicum Linn., commonly known as 'Indian heliotrope' is very common in India with a long history of traditional ethnomedicinal uses in many countries in the world. In present survey its traditional ethnomedicinal uses enlisted from four different continents namely Asia, Africa, and North and South America. Currently, no one traditional ethnomedicinal uses from three continents viz. Europe, Australia and Antartica reported. The comprehensive account of the traditional ethnomedicinal uses are presented in this review such that the potential use of this plant in various traditional medicines can be systematically evaluated.

Keywords: *Heliotropium indicum, Boraginaceae, review, traditional, ethnomedicinal*

Introduction

Heliotropium indicum Linn. is an extensive plant that evolves like a weed and is usually dubbed as 'Hatisund' in Marathi. *Helitropium Indicum* is a plant identified from the Family Heliotropiaceae & Subfamily Boraginaceae , the borage or "forget-me-not" family that is usually shrubs, includes different shrubs, trees, and herbs, making-up about 2,000 species in 146 genera found worldwide. The name "heliotrope" is derived from the idea that plants of this species turn their leaves to the sun, however, this is not the habit of this species (Selvi & Bigazzi,2001; Oluwatoyin, et.al.2011; Zihad et.al.2019). It is native to Southern America and has happened naturalized in North America, Africa, Asia and Australia. (Pahuja et.al.,2022).

It is also known as *Heliophytum indicum* (L.) DC., *Tiaridium indicum* (L.) Lehm., *Eliopia riparia* Raf., *Eliopia serrata* Raf., *Heliophytum foetidum* DC., *Heliophytum velutinum* DC., *Heliotropium africanum* Schumach. & Thonn., C.F.Schumacher, Beskr. *Heliotropium*

ISBN: 978-93-93259-95-0

anisophyllum P.Beauv., *Heliotropium cordifolium* Moench, *Heliotropium foetidum* Salisb., *Heliotropium horminifolium* Mill., *Heliotropium lanceolatum* Noronha, *Heliotropium parviflorum* Blanco, *Tiaridium anisophyllum* G.Don, *Tiaridium indicum var. mexicanum* M.Martens & Galeotti, and *Tiaridium velutinum* Lehm..(POWO,2022) .

Heliotropium indicum Linn. contains many important phytochemicals such as tannins, saponins, steroids, oils, and glycosides (Nawaz et.al.2009, & Kugelman et.al. 2015). It also possesses many important pharmacological activities, including anti-inflammatory, wound-healing, anticancer and anticataract activities (Srinivas et.al.2000, Reddy et.al.2002, Kugelman et.al. 2015, Veda, et.al. 2016).

Plant Morphology and Description

Heliotropium indicum Linn. Sp. Pl. 130. 1753; C. B. Cl. in Hook. f. Fl. Brit. India 4: 152. 1883; Cooke, Fl. Pres. Bombay 2: 273. 1958 (Repr.). "Hathisund", 'Bhurundi'. (Photo Plate 01).

Description: Erect or sometimes decumbent ascending, annual herbs; branches hirsute. Leaves 38 x 24 cm, ovate elliptic or ovateoblong, sparsely hairy on both sides, apex acute, base sometimes contracted into partially winged petiole. Flowers white or bluish white, sessile in 2 ranked, dense, scorpioid cymes; corolla salver shaped. Fruits deeply bifid, nutlets beaked, angled. (Singh et.al, 2001).

Methodology:

Literature search was performed using the both offline and online databases like Scopus, Google Scholar, Springer Link, Bio Med Central, Science Direct, Research Gate, Web of Science, PubMed and Elsevier etc. scientific databases were chosen based on the topic covered (i.e., ethnomedicinal uses & ethnobotany of *Heliotropium indicum* Linn.) and geographical coverage of plant. Common keyword used for to search published materials as "*Heliotropium indicum* Linn.", which was then paired with "Folklore medicinal uses" "ethnomedicinal uses" "traditional uses,". Other offline literature sources included papers published in Related Books, National & International Conference papers, National & International Journals & reports published from Regional, International and National organizations.

ISBN: 978-93-93259-95-0

Photo Plate 01.Heliotropium indicum Linn. in natural Habitat.

Result and Conclusion

Traditional Ethnomedicinal Uses of Heliotropium indicum Linn.

Heliotropium indicum Linn. has been traditionally used in different folklore systems as whole plant of to cure several diseases in different countries over the world. Its ethnomedicinal and beneficial effects have been shown by various researchers, from four different continents of the world viz. Asia (India, Bangladesh, Burma (Myanmar), Thailand, Taiwan, Philippines, Ghana, Indonesia), Africa (Nigeria, Gabon, Tanzania, Madagascar, Mauritius, Togo, Sierra Leone, Sao Tome, Senegal, Seychelles, Siby, Rodrigues Island, Mali, Ivory Coast, Guinea, Benin, Congo, Conakry), North America (Jamaica, West Indies, Eastern Nicaragua, Mexico) and South America(Amazon, South America, Brazil, Colombia) given in Table.No. 1.

Conclusion

Heliotropium indicum Linn. has been used as a crucial phytomedicinal source for many diseases in various parts of the world viz. Asia, Africa, Norht and South America as it is briefly discussed in the review article. Traditional ethnomedicinal uses of *Heliotropium indicum* Linn. were not reported from three continents viz. Europe, Australia and Antarctica.

The review showed the different ethnomedicinal uses and taxonomical aspects of *Heliotropium indicum* Linn. The widespread literature studies reveal that the plant possesses varied traditional medicinal uses. Its wild occurrence of this species worldwide provides an opportunity to utilize this plant to paramount levels in treating diverse ailments. This review attempts to provide a systematic account of traditional ethnomedicinal in the different parts of the worlds. This plant having the bioprospecting potential are in turn responsible for its therapeutic potential for the future use.

ISBN: 978-93-93259-95-0

Table No. 1. Reported traditional ethnomedicinal uses of *Heliotropium indicum* L.

Country	Traditional uses	Plant part Used	Mode of use	References
India	Wounds and skin infections	whole plant	paste	Muthu et al., 2016
	Snake bite, scorpion sting, skin rashes	Leaf	leaf juice mixed with hot water	Alagesaboopathi, 2009
	Rheumatism	Leaf	paste	Nagaraju & Rao,1990
	Ophthalmia	Root	Juice	Das et.al.2008
	stomachache , nervous disorders , skin diseases & poison bites,			Dash & Abdullah ,2013.
Bangaldesh	Joint pain, Knee swelling & itching in leg	Root	Decoction	Kamal et. al. 2014
	Chicken pox ; allergy	Leaf	Juice	Shahnaj et. al. 2015
	Antidote to poisoning	Leaf and stem	Decoction	Nawaz et al. 2009
Gabon	Gum infection (Gingivitis)	Leaves	Powder	Walker,1986; Schmelzer & Gurib-Fakim,2008
Tanzania	Yaws (A chronic bacterial infection that affects the skin, bone and cartilage)	Root	Extract	Schmelzer & Gurib-Fakim,2008
Madagascar	Diuretic	Whole plant	Infusion	Schmelzer & Gurib-Fakim,2008
Jamaica	Ulcers, Sore throat, Intractable fever and venerable diseases	Whole plant	Decoction	Asprey & Thornton,1955
	Menorrhagia	Flower	Mixer of flower	Dash & Abdullah, 2013
	For abortion	Whole plant	Decoction	Asprey & Thornton,1955
	Rectal sores	Whole plant	Decoction	Asprey & Thornton,1955
	Cleansing and dressing of wounds and ulcers	Whole plant	Paste	Asprey & Thornton,1955
Mauritius	Renal colic	Leaves	Infusion	Daruty,2018; Suroowan et.al.,2019.
	Ophthalmia, ulcers, diuretic, and anthrax	Leaves	Poultice	
West Indies	Head Lice	Whole plant	Paste	Ayensu,1978
Eastern Nicaragua	Whooping cough in childrens	Leaves, Root	Decoction	Anderson & Coee ,1996
Amazon	Scorpion stings and bug bites	Leaves, Root	Paste	Duke & Vasquez ,1994
Malaysia	Putrefaction, pyoderma and ringworm infection	Whole plant	Paste	Wiart,2006
Burma	Gonorrhea	Whole plant	Decoction	Wiart,2006
Thailand	Sterilization in females	Inflorescence	Powder mixed with milk or water	Berhaut, ,1988.
Taiwan	Hepatitis	Leaves and root	Paste externally used	Lin & Kan,1990
Togo	Dermatosis	Leaves	Juice	Adjanohoun,2014
	Liver diseases	Whole plant	Decoction	Kpodar et.al.,2015
South America	Insect bites and scorpion stings	Leaves & root	Paste externally used	Duke & Vasquez ,1994
Sierra Leone	Newborn baby washing	Leaves	Decoction	Togola et.al.,2005

ISBN: 978-93-93259-95-0

Country	Traditional uses	Plant part Used	Mode of use	References
Sao Tome	Ulcers	Leaves	Leaves paste with palm oil externally used	Sequeira,1994
Senegal	Child skin problems like eczema, impetigo, and dermatitis	Leaves	powder	Kerharo & Adam , 1974
	Kidney stone & Diuretic	Whole plant	Decoction	Quisumbing,1951; Berhault,1974.
Seychelles	Chirurgical pain	Leaves	Decoction	Adjanohoun et.al. 1989.
Siby	Vomiting	Leaves	-	Togola,et.al.2005.
Rodrigues Island	Calculus	Whole plant	Decoction	Gurib-Fakim, et.al.2008.
	Bloating and loss of appetite	Leaves	Decoction	Samoisy & Mahomoodally, 2015
Philippines	Diuretic and kidney stone	Whole plant	Decoction	Quisumbing,1951
Nigeria	Malaria	Leaves	Decoction	Adjanohoun,2014
	Hepatitis and fever	Leaves	Decoction	Adjanohoun,2014
	Gonorrhea	Leaves	Leaf juice with castor oil	Ainslie, 1937
	Ulcers and to cure eye infections	Leaves,Whole plant	Paste, Infusion	Kerharo & Adam , 1974; Schmelzer & Gurib-Fakim, 2008
Ghana	Ulcers and to cure eye infections	Leaves	Paste	Kerharo & Adam , 1974
Mexico	Asthma	Root	Decoction	Togola,et.al.2005.
Mali	Nausea and vomiting	Whole plant	Decoction	Nordeng et. al.,2013
	Baby thinness	Leaves	Decoction	Togola,et.al.2005
	Ocular (Eye)infection	Leaves	Decoction	Togola,et.al.2005
	Amenorrhea (The absence of monthly menstrual periods)	Root	Decoction	Togola,et.al.2005
	High blood pressure	Leaves	Decoction	Togola,et.al.2005
Ivory Coast	Colds and sinusitis	Leaves	Powder	Burkill,1985
Indonesia	Thrush and in poultices for herpes	Leaves	Decoction	Burkill,1985
Guinea	Febrifuge	Whole plant	Decoction	Kerharo & Adam , 1974
	Antiseptic	Leaves	Decoction	Magassouba et.al.,2007
Brazil	Skin ulcers and burns	Leaves	-	Reddy et.al.,2002; Dash & Murthy,2011
Benin	Dystocia	Leaves	Trituration with water and drops in eyes	Adjanohoun,2014
	Femal (a herbal remedy made from pollen extracts, reduces hot flushes and improves quality of life in menopausal women)	Leaves	Extract	Adjanohoun,2014
	Splenomegalia	Leaves	--	Adjanohoun,2014
	Psychosis	Root	-	Adjanohoun,2014
	Internal infection and hypertension	Stem & leaves	Decoction	Apema et.al.,2011
Congo	Stomach, fever, and eye lotion	Leaves	Decoction	Kalanda & Omasombo, 2019
Colombia	Internal parasites	Leaves	Decoction	Agudelo-Lopez et.al.,2008
Conakry	Fever	Whole plant	Decoction	Togola,et.al.2005

ISBN: 978-93-93259-95-0

Acknowledgement

Authors are thankful to Management authorities and Dr. M.Subhas, Principal of Janata Mahavidyalaya, Chandrapur for facilities and support. The authors are also thankful to Late Dr. O.S.Rathor, Professor and Ex Principal of Science College, Nanded for his constant encouragement.

References

1. Adjanohoun, E. (2014). Le processus de renovation de la pharmacopee africaine. Bulletin de la Société Botanique de France. Actualités Botaniques.vol. 136, no. 3-4, pp. 35-39.
2. Adjanohoun, E., V. Adjakidje, M.R.A. Ahyi, L. Ake Assi, A. Akoegninou, J. d'Almeida, F. Apovo, K. Boukef, M. Chadare, G. Gusset, K. Dramane, J. Eyme, J. - N. Gassita, N. Gbaguidi, E. Goudote, S. Guinko, P. Houngnon, Issa Lo, A. Keita, H. V. Kiniffo, D. Kone - Bamba, A. Musampa Nseyya, M. Saadou, Th. Sodogandji, S. de Souza, A. Tchabi, C. Zinsou Dossa, TH. Zohoun ,(1989). Contribution aux études ethnobotaniques et floristiques en République populaire du Bénin. Agence de coopération culturelle et technique, (A.C.C.T.), Paris, p.895.
3. Agudelo-Lopez, S. & L. Gomez-Rodriguez, X. Coronado et al.(2008) [Prevalence of intestinal parasitism and associated factors in a village on the Colombian Atlantic Coast]. Revista de Salud Publica . vol. 10, no. 4, pp. 633-642.
4. Ainslie, J.R. (1937) A List of Plants used in Native Medicine in Nigeria. Imperial Forestry Institute, Paper 1937 No. 7.
5. Alagesaboopathi C (2009) Ethnomedicinal plants and their utilization by villagers in Kumaragiri Hills of Salem District of Tamilnadu, India. Afr. J. Tradit. Complement. Altern. Med. 6(3): 222-227.
6. Anderson G. & Coee F. (1996) Ethanobotany of the garifuna of East Nicaragua. Econ Bot 50, 71-107.
7. Apema R, Mozouloua D, Abeye J, Salamate F.M.L. (2011) Les plantes médicinales utilisées dans le traitement du diabète par les tradipraticiens à Bangui. Geneva Foundation for Medical Education and Research.
8. Asprey G. F. & P. Tornton (1955) Medicinal plants of Jamaica. Parts III. West Indian Medical Journal, vol. 4, no. 4, pp. 69-82.
9. Ayensu E.S. (1978) Medicinal plants of West Africa. Reference Publications Inc., U.S.A.
10. Barrett, B. (1996) Medicinal plants of Nicaragua's Atlantic coast. Economic Botany, vol. 48, no. 1, pp. 8-20.
11. Berhault, J. (1974) Floore Illustree du Senegal. Govt. Senegal, Min Rural Development, Water and Forest Division, Dakar, Senegal.
12. Berhaut, J. (1988). Flore illustrée du Sénégal. Vol. 9. Ministère du développement rural, Dakar.
13. Burkill H.M. (1985) The useful plants of West Tropical Africa. Volume 1. 2nd edition. Royal Botanic Gardens, Kew.
14. Coe F. G. & G. J. Anderson (1996) Ethnobotany of the gar?funa of Eastern Nicaragua. Economic Botany, vol. 50, no. 1, pp. 71-107.
15. Daruty, C. (2018) Plantes medicinales de I'lle Maurice et des pays intertropicaux, Mauritius Stationery and Printing Establishment, Mauritius.
16. Das A. K., B. K. Dutta & G. D. Sharma (2008) "Medicinal plants used by different tribes of Cachar district, Assam," Indian Journal of Traditional Knowledge, vol. 7, no. 3, pp. 446-454.
17. Dash G. K. & P. N. Murthy. (2011) Studies on wound healing activity of Heliotropium indicum Linn. leaves on rats. ISRN Pharmacology, vol. 2011, Article ID 847980, 2011.

18. Dash K.G. & Abdullah S.M. A. (2013) A Review on Heliotropium Indicum L. (Boraginaceae). International Journal of Pharmaceutical Sciences and Research. 4(4):1253- 1258.
19. Dattagupta S.& Datta P. (1977) Pharmacognostic study of the leaf of Heliotropium indicum Linn.(Boraginaceae). Pharm Biol 15(3), 141-151.
20. Duke J. A. & Vasquez R.(1994) Amazonian ethnobotanical dictionary. CRC press, Boca Raton, Florida,
21. Gurib-Fakim, A., J. Gueho, and M. Sewraj-Bissoondoyal (2008) The medicinal plants of Mauritius-part 1. International Journal of Pharmacognosy, vol. 35, no. 4, pp. 237-254.
22. Kalanda K. & W. D. Omasombo (2019) Contribution a la ` connaissance des plantes medicinales du Haut Za?re: plantes utilis´ees dans le traitement des maux d'estomac dans la ville de Kisangani. Revue de M´edecine et de Pharmacie, vol. 9, no. 1, pp. 59-69.
23. Kamal, Z., J. Bairage, Moniruzzaman et al., (2014) Ethnomedicinal practices of a folk medicinal practitioner in Pabna district, Bangladesh," World Journal of Pharmacy and Pharmaceutical Sciences, vol. 3, no. 12, pp. 73-85.
24. Kerharo J. & Adams J. (1985) La Pharmacopée Senegalaise Traditionnelle. Plantes médicales et Toxiques. Edition Vigot et Frères, Paris.
25. Kerharo, J. and Adam J.G. (1974) La pharmacopée Sénégalaise Traditionnelle: Plantes médicinales et toxiques. Ed. Vigot frères, 1011 p.
26. Kpodar, M. S., S. D. Karou, G. Katawa et al. (2015). An ethnobotanical study of plants used to treat liver diseases in the maritime region of Togo. Journal of Ethnopharmacology, vol. 181, pp. 263-273.
27. Kugelman M., W. C. Liu, M. Axelrod, T. J. McBride, and K. V. Rao (2015) Indicine-N-oxide: the antitumor principle of Heliotropium indicum. Lloydia, vol. 39, no. 2-3, pp. 125-128.
28. Lin C. C. & W. S. Kan(1990). Medicinal plants used for the treatment of hepatitis in Taiwan. American Journal of Chinese Medicine, vol. 18, no. 1-2, pp. 35-43.
29. Magassouba, F. B., A. Diallo, M. Kouyate et al.(2007) Ethnobotanical survey and antibacterial activity of some plants used in Guinean traditional medicine. Journal of Ethnopharmacology, vol. 114, no. 1, pp. 44-53.
30. Muthu C, Ayyanar M, Raja N, Ignacimuthu S (2006) Medicinal plants used by traditional healers in Kancheepuram district of Tamil Nadu, India. J. Ethnobiol. Ethnomed. 2: 43.
31. Nagaraju N.& Rao K. A.(1990) survey of plant crude drugs of Rayalaseema, Andhra Pradesh, India. J Ethnopharmacol 29(2), 137-58.
32. Nawaz A. H, M. Hossain, M. Karim, M. Khan, R. Jahan, and M. Rahmatullah (2009) An ethnobotanical survey of Rajshahi district in Rajshahi division, Bangladesh. American-Eurasian Journal of Sustainable Agriculture, vol. 3, no. 2, pp. 143-150.
33. Nordeng, H., W. Al-Zayadi, D. Diallo, N. Ballo, and B. S. Paulsen(2013). Traditional medicine practitioners' knowledge and views on treatment of pregnant women in three regions of Mali.Journal of Ethnobiology and Ethnomedicine, vol. 9, no. 1, p. 67.
34. Oluwatoyin M. S., Illeogbulam G.N., & Joseph Amupitan (2011) Phytochemical and antimicrobial studies on the aerial parts of Heliotropium indicum Linn. Annals of Biological Research. 2(2):129-136.
35. Pahuja, S., Garg, M., Kumari, T., Bhatia S.& Sarup, P.(2022) Compendious Review on Bioactive Constituents and Pharmacotherapeutic Profile of Heliotropium indicum Linn The Natural Products Journal, 12, (1) pp. 38-53.DOI: https://doi.org/10.2174/2210315510999201210143445.
36. POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; http://www.plantsoftheworldonline.org [Retrieved on 25 Oct.. 2022].
37. Quisumbing, E. (1951). Medicinal plants of the Philippines. Tech Bull, vol. 16, p. 126.
38. Reddy J. S., P. R. Rao, and M. S. Reddy (2002) Wound healing effects of Heliotropium indicum, Plumbago zeylanicum and Acalypha indica in rats. Journal of Ethnopharmacology, vol. 79, no. 2, pp. 249-251.

 ISBN: 978-93-93259-95-0

39. Samoisy A. K. &M. F. Mahomoodally (2015) Ethnopharmacological analysis of medicinal plants used against non-communicable diseases in Rodrigues Island, Indian Evidence-Based Complementary and Alternative Medicine 17 Ocean. Journal of Ethnopharmacology, vol. 173, pp. 20-38.

40. Schmelzer G.H & Gurib-Fakim A. (2008) Plant Resources of Tropical Africa. Medicinal Plants 1, PROTA Foundation.

41. Selvi, F.& Bigazzi, M.(2001) Leaf surface and anatomy in Boraginaceae tribe Boragineae with respect to ecology and taxonomy. Flora, 196, 269-285, https://doi.org/10.1016/S0367-2530(17)30056-7.

42. Sequeira, V. (1994). Medicinal plants and conservation in São Tome.Biodiversity & Conservation, vol. 3, no. 9, pp. 910-926.

43. Shahnaj, S., U. Asha, T. Mim et al., (2015) A survey on the ethnomedicinal practices of a folk medicinal practitioner in Manikganj district, Bangladesh. Journal of Chemical and Pharmaceutical Research, vol. 7, no. 8, pp. 690-696.

44. Singh, N.P., Lakshminarasimhan, P, Karthikeyan, S.& Prasanna P.V. (2001) Flora of Maharashtra State: Dicotyledones, Vol. 2: (Combretaceae to Ceratophyllaceae), Botanical Survey of India.

45. Srinivas K., M. E. B. Rao, and S. Rao (2000) Anti-inflammatory activity of Heliotropium indicum Linn. and Leucas aspera Spreng. in albino rats. Indian Journal of Pharmacology, vol. 32, no. 1, pp. 37-38.

46. Suroowan, S. , K. B. Pynee, and M. F. Mahomoodally (2019) A comprehensive review of ethnopharmacologically important medicinal plant species from Mauritius. South African Journal of Botany, vol. 122, pp. 189-213.

47. Togola, A., D. Diallo, S. Demb´el´e, H. Barsett, and B. S. Paulsen, (2005). Ethnopharmacological survey of different uses of seven medicinal plants from Mali, (West Africa) in the regions Doila, Kolokani and Siby. Journal of Ethnobiology and Ethnomedicine, vol. 1, p. 7.

48. Veda V. T., K. S. Sasi, B. R. Asokan, S. Sengottuvelu, and S. Jaikumar (2016) Anticataract activity of ethanolic extract of Heliotropium indicum leaves on galactose induced cataract in rats. International Journal of Pharmacology & Toxicology, vol. 5, pp. 18-20.

49. Walker, R. (1986) Usages pharmaceutiques des plantes spontanees ´ du Gabon. Institut d'Etudes Centrafricaines´, vol. 4, no. 6, pp. 232-262.

50. Wiart C. (2006) Medicinal plants of Asia and the Pacific. CRC Press, U.S.A.

51. Zihad, S.M.N.K., Gupt, Y., Uddin, S.J., Islam, M.T., Alam, M.R., Aziz, S.,Hossain, M.,Shilpi, J.A.,Nahar, L., & Sarker, S.D.(2019) Nutritional value, micronutrient and antioxidant capacity of some green leafy vegetables commonly used by southern coastal people of Bangladesh. Heliyon, 5, https://doi.org/10.1016/j.heliyon.2019.e02768.

ISBN: 978-93-93259-95-0

Conservation and Tribal Life - A Struggle for Existence

Dr. M. Saraswathi
Asst. Professor Dept.of Economics GRP GDC Bhainsa
Email: saraswathiseerla@gmail.com

Abstract

Tribes are known for their close proximity with the nature all over the world. They use natural resources as part of their survival while protecting these as part of their duties and obligations. The concepts of nature and man are very ancient as both biological diversity and cultural diversity are directly related to the origin of many tribes in India, who personify their origin from nature and protecting them as sacred grooves.

The Constitution of India provides special protection to the adivasi/tribal/indigenous people, who constitute more than 8 percent of the total population of India and who inhabit the remaining vestiges of forests in the country. Tribal people have their own system of living with nature, without harming and destroying the forest. They have their own method of conservation of soil as they are honestly concerned about preserving the forests and exemplifying the age-old pattern of co-existence between man and nature.

The development process will have far reaching consequences on the biodiversity and ecology of the region, and in turn on the tribal communities whose sustenance and survival is connected to the forests and the land.

The lives of the tribal communities are intrinsically linked to the forests, lands and natural resources and have been the basis of their survival. While on the surface their life seems like a simple existence, one of tilling the land, working on the commons and collecting from the forests what is not evident is the complex knowledge systems passed on over generations that has enabled them to make the best use of resources available around them in a sustainable manner. While this is no means an idyllic existence, with illiteracy, ill-health, mortality and malnutrition stalking them throughout their lives in the absence of any external support structures they have yet managed to survive. However, today the tribal communities in the country and even in the State are being exposed to external influences often beyond their control or complete understanding. Often these are imposed on them without their consent or even any form of consultation.

Introduction

In India, 68 million people belonging to 227 ethnic group and comprising of 573 tribal communities derived from six racial stocks namely - Negroid, Proto- Australoid, Mongoloid, Mediterranean, West Breachy and Nordic exists in different part of the country.

ISBN: 978-93-93259-95-0

These ethnic people mostly the indigenous tribes live close to the forests and have managed and conserved the biodiversity of their localities since long time.

It is imperative to focus ecological protection on enhancing tribal communities as they are key stakeholders of indigenous knowledge. Their sustainable lifestyle makes them extremely capable of protecting and conserving the environment around them. In terms of wildlife protection, tribal communities often employ themselves and believe that the killing of animals and cutting of plants is sin.

Objectives of the Study

1. To know the Socio-Economic conditions of the tribes which are closely linked with the forest.
2. To understand the emotions and feelings of tribes when the conservation acts came into implication.
3. To observe the conservation of biodiversity methods adopted by the tribes as part of their livelihood.
4. To understand the cultural and emotional sentiments of the tribes which are attached with the forest.

Hypothesis

Tribal communities are paying the brutal price for conservation in the form of Eviction. It leads negative impact on tribal people.

Methodology

Methodology used in this paper with help of data Collected from secondary sources.

Tribes and Eco-System

A conservationist firmly believes that the presence of tribal communities in the forest is deleterious for the wildlife and ecosystem.

Tribal people have their own system of living with nature, without harming and destroying the forest. They have their own method of conservation of soil because they are honestly concerned about preserving the forests and exemplifying the age-old pattern of co-existence between man and nature.

In terms of agricultural practices, they pluck fruits and vegetables only from the mature stems of the plant, which are then cut and replanted for future harvest. The farming follows a mixed cropping system wherein several types of crops are grown simultaneously in tribal areas.

This prevents overexploitation of the water table and soil nutrients as different crops have different requirements and in addition, prevents soil erosion.

ISBN: 978-93-93259-95-0

Tribes are conventional and natural protectors of Eco- System.

They thought cutting of trees, killing of animals is a sin. They always utilize forest products for their livelihood and employment.

Conservation Vs Tribal Communities

The aim of the Conservation Acts is to recognize and respect the historically denied fundamental constitutional rights and responsibilities to use, manage, govern and conserve forests. In respecting these rights and recognizing their contribution towards the conservation of forests, these laws intended to change the prevalent narrative of forest dwellers as necessarily "forest offenders and encroachers", to them being forest rights and responsibility holders, governing, managing and conserving their forests. It is imperative to focus ecological protection on enhancing tribal communities as they are key stakeholders of indigenous knowledge. Their sustainable lifestyle makes them extremely capable of protecting and conserving the environment around them. They are conventional and natural protectors of Eco-system.

Some of their practices have helped formulate policies on conservation.

Tribal people have their own system of living with nature, without harming and destroying the forest. They have their own method of conservation of soil because they are honestly concerned about preserving the forests and exemplifying the age-old pattern of co-existence between man and nature.

Eviction is immediate impact, which creates fear in the tribal people. They thought that, eviction will disconnect their lives from the environment. Imposing limits in the form of Forest Law, tribal people think that the Govt. dislocating them forcefully from the forest.

They thought that they are the children of nature, they would like to enjoy the forest without restrictions as the forest acts are restricting the tribes freedom.

The tribal culture and heritage is closely linked with the forest. The Conservation Acts may destruct their traditions, sentiments and attachments about Nature.

Podu is the major problem which arises because of ignorance of Tribal's about Forest Laws. Imposing conservation laws on tribes forcefully leads to lot of problems.

Consequences

In 2017 the government destroyed around 8,000 homes and forcefully evicted nearly 40,000 people from protected areas. For instance, in April 2017 more than 148 houses were demolished and 156 families were evicted from Thatkola and Sargodu Forest Reserve in Karnataka, as per the Supreeme Court orders. Also in Assam, more than 1,000 people from Bodo Rabha and Mishing tribal communities were forcefully evicted from the Orange National Park in the same year.

ISBN: 978-93-93259-95-0

The conservation-versus-tribal people approach to protect wildlife has worsened the lives of thousands of native people Many evicted tribal households were not even considered eligible for the compensation plan because their ancestral claim to the land is abruptly rejected by the government.

Even Forest Conservation Act 2006 emancipated to the laws should be framed with the involvement of tribal community or tribal leaders.

The policy also emancipated to rehabilitate the tribes rehabilitates the Tribes whose lives are disturbed due to conservation policies.

If Govt. imposed Conservation Rule on tribal people they may react aggressively, and they may go on strikes and dharnas to protest forest policies. They may loss their peaceful atmosphere, security of living and livelihood.

Suggestions

It is high time the respective governments and conservation-based organizations began duly acknowledging the critical role tribal people play in conservation, preservation and safeguarding the richness of local biodiversity.

The low-carbon-footprint lifestyle of the tribal people has conserved the global environment for millennia and their wisdom and sustainable methods should be recognized, adopted and promoted to effectively mitigate climate change.

When traditional communities are given full legal rights to their land, they protect the environment efficiently and cheaply.

The policy makers should contact and take the opinion or consent of Tribal Communities in framing of Conservation Rules. The Govt. should take initiative measures to convince the tribes to understand the benefits of the conservation policy with the help of Grama Sabha, NGOs etc.

Conclusion

In India there are many instances where tribal communities have played pioneering role in protecting wildlife and forest. Radical transformation is imperative since the present conservation model is counterproductive. The present approach is neither helping the local communities nor protecting the wildlife. There is a need to protect tribal culture and heritage which is going to destruct due to displacement in the form of eviction.

References

1. The Forest Rights Act (FRA), 2006- Ministry of Tribal Affairs Govt. of India.
2. Anthwal A, Sharma RC, Sharma A: Sacred groves: Traditional way to conserving plant diversity in Garhwal Himalaya, Uttaranchal.

ISBN: 978-93-93259-95-0

3. Bhagwat SA: Ecosystem services and sacred natural sites: reconciling material and non-material values in nature conservation. Environ Values 2009,

4. Deb D, Malhotra KC: Interface between biodiversity and tribal cultural heritage: an exploratory study.

5. Deshmukh S, Gogate MG, Gupta AK: Sacred groves and biological diversity: providing new dimensions to conservation issue. In Conserving the Sacred for Biodiversity Management. Edited by: Ramakrishnan PS, Saxena KG, Chandrashekhara UM. Oxford and IBH, New Delhi.

6. Sinha B, Maikhuri RK: Conservation through socio-cultural- religious practices in Garhwal Himalayas: A case study of Hariyali sacred forest. In Edited by: Ramakrishnan PS, Saxena KG, Chandrashekara UM. Conserving the Sacred for Biodiversity Management; 1998.

 ISBN: 978-93-93259-95-0

Allergenic Pollen Taxa from Manchippa Reserve Forest, Nizamabad District, Telangana State, India

P. Ravi Raj[1], A.Vijaya Bhasker Reddy[2]

[1]Girraj Government College (A), Nizamabad - 503003.
[2]Applied Palynology Research Laboratory, Nizam College (A), Osmania University, Hyderabad - 500001.
Email : pottavathri@gmail.com

Abstract

Present paper deals with the findings of allergenic pollen taxa from Manchippa Reserve Forest, Nizamabad district, Telangana state. A total of 202 plant species, which belongs to 56 families and 152 genera were collected. Out of 202 species, 16 species (7.9 %) of 7 families are to be found as allergenic. Family Caesalpinaceae dominated with 7 species, followed by Mimosoideae with 3 species and Poaceae with 2 species, families Sapindaceae, Myrtaceae, Arecaceae and Typhaceae with single species. Present study reveals that mainly Caesalpinaceae, Mimosoideae and Poaceae taxa are prone to be allergenic in the study area.

Key words : *Allergenic pollen, Manchippa Reserve Forest, Nizamabad*

Introduction

Allergy is a specific reaction of human's body immune system to normally harmless substance. Human beings who have allergies often are sensitive to more than one substance. Apart from the pollen, other air borne allergens that cause allergic reactions are fungal spores, dust mites, insect debris and pollutants that may cause severe effects on nose (sneezing, cold, mucosal swellings and running nose), eyes (itching, redness, watering and swelling), air passages (cough, bronchitis and asthma), skin (itching, skin rash, eczema) and gastrointestinal tract (flatulence, nausea, diarrhoea).

As per Cookson, (1999), and Sharma et.al., (2009), allergenic diseases are a severe problem for national economy. About 20 % of the world's population are estimated to suffer from one or other allergic disease as noticed by Smith, 1978; Smith and Slavin, 1988. Indian Coordinated project on Aeroallergens (ICPA), conducted a survey in India and noticed that about 20 - 30 % of the population are suffering from allergic rhinitis and 15% from asthma (IPCA.2000., Chhabra et al., 1998). The causes for allergenic diseases are increased exposure to sensitizing allergens and lesser stimulation of our immune system during the critical periods of its development (Holgate, 1999).

The first report of a comprehensive aerobiological work in India was published by Dr, D.D. Cunningham (1973), dealing with the atmosphere of Calcutta. Indian Aerobiological Society

ISBN: 978-93-93259-95-0

(IAS) was formed in 1980. After this, significance of aerobiological studies and importance of aeroallergens were realized and such investigations were undertaken by scientists throughout India. In this regard, an attempt was made to identify the allergenic taxa from Manchippa Reserve Forest, Nizamabad district, Telangana state.

Materials and Methods :

Study area :

Nizamabad district situated in northern part of the Telangana state, lies between 18^0 05' and 19^0 of northern latitudes and 77^0 40' and 78^0 37' of the eastern longitudes. Nizamabad district is situated in the table land of Deccan plateau. Godavari river flows through the district makes Godavari basin the northern boundary. The type of forest is Tropical dry deciduous (Champion and Seth). Nizamabad district have two forest divisions, Nizamabad Division and Armoor division. Nizamabad division is divided into four forest ranges i.e Nizamabad north, Nizamabad south, Varni range and Indalwai ranges. Manchippa Reserve forest comes under Nizamabad south range of Nizamabad Forest Division. This Reserve Forest is distributed in 16,213.96 hectares of area covers more than 23 villages.

Methodology :

Present work was carried out during the period of 2017 - 2018, pollen material was collected from 16 plants of Manchippa reserve forest and identified the diversity of pollen morphology. The pollen material was processed and permanent pollen slides were prepared by Erdtman's method (1960). The pollen material was studied under a binocular research microscope LABOMED Lx 500, and noted the pollen characters (plate 1). The methodology followed for the preparation of Herbarium, as described by Jain and Rao (1977), and the Herbarium specimens were identified with the help Floras like 'Flora of the Presedency of Madras (Gamble and Fischer, 1915 - 1935), Flora of Nizamabad District, (T.Pullaiah et al, 1995). Herbarium specimens with Voucher numbers were deposited at Department of Botany, Nizam college (A),Osmania University. Hyderabad. Table 1.

Results and Discussion :

Work on pollen allergy was initiated in 1950's by Shivpuri in Delhi. Later Kasliwal et al in 1958 reported important pollen allergens of Jaipur. Acharya, 1980., Agashe and Anand, 1982., reported that Cassia, Ageratum, Salvadora, Ricinus, Albizia lebbeck and Artemisia scoparia are reported as an important aeroallergens from South india. Allergenicity to Parthenium hysterophorus pollen extracts in 34 % of allergenic rhinitis and 12 % bronchial asthma patients from Bangalore as reported by Subbarao et al in 1985. Singh and Kumar (2004)., Chauhan and Goyal (2006) noticed that plants growing in the surroundings causes respiratory problems or allergy in human beings. As per the reports of Singh (2012), pollen of the plants growing in the surroundings of

ISBN: 978-93-93259-95-0

musturd, coconut, rice and grasses etc., are responsible for allergy. Pollen grains of the plant taxa of Cassia species, Delonix regia and Peltophorum pterocarpum are important allergenically (Mandal et al., 2009; Hussain, 2012). It was found that more number of patients from different parts of Hoogly district, West Bengal are suffering from bronchial asthma and other respiratiry troubles. Apart from several causes one of the most important reason of these diseases is pollen allergy.

The present study revealed that 16 allergenic plant taxa belonging to 13 genera and 7 families. The family Caesalpinaceae dominated with 7 species, followed by Mimosoideae with 3 species and Poaceae with 2 species, families Sapindaceae, Myrtaceae, Arecaceae and Typhaceae with single species. (Table - 1). The 16 allergenic pollen grains are depicted in Plate - 1.

The main feature of pollen allergy is its seasonal nature. People get the symptoms only when the grains to which they are allergic are in the air. Common allergenic floral species of different seasons (Singh, 2014) are mentioned.(Table - 2).

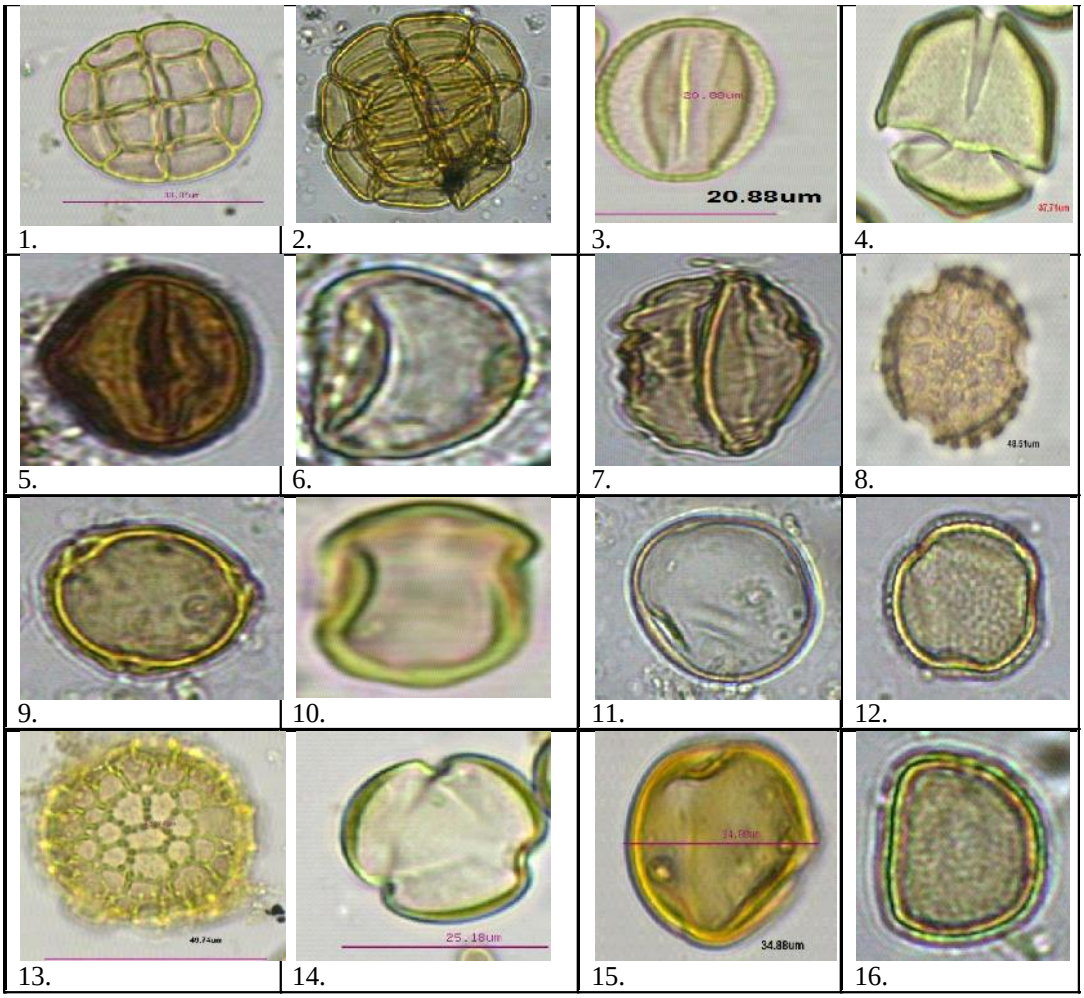
Table 1:

16 allergenic taxa from Manchippa Reserve Forest, Nizamabad district, Telangana.

S.No.	Plant species	Family	Habit	Allergy type
1	Acacia auriculiformis	Mimosoideae	Tree	Aeroallergen
2	Albizia lebbeck	Mimosoideae	Tree	Aeroallergen
3	Cassia fistula	Caesalpinaceae	Tree	Bronchial asthma
4	Cassia siamea	Caesalpinaceae	Tree	Asthma
5	Cassia tora	Caesalpinaceae	Herb	Bronchial asthma
6	Chloris barbata	Poaceae	Herb	Skin allergy
7	Cocos nucifera	Arecaceae	Tree	Asthma
8	Delonix regia	Caesalpinaceae	Tree	Bronchial asthma
9	Dodonea viscosa	Sapindaceae	Shrub	Atopic allergy
10	Eucalyptus tereticornis	Myrtaceae	Tree	Asthma
11	Heteropogon contortus	Poaceae	Herb	Asthma
12	Parkinsonia aculeata	Caesalpinaceae	Tree	Skin allergy
13	Peltophorum pterocarpum	Caesalpinaceae	Tree	Respiratory allergy
14	Prosopis juliflora	Mimosoideae	Tree	Pollinosis
15	Senna occidentalis	Caesalpinaceae	Shrub	Bronchial asthma
16	Typha angustata	Typhaceae	herb	asthma

ISBN: 978-93-93259-95-0

Plate - 1, Pollen photomicrographs from Manchippa Reserve Forest, Nizamabad district.



1. Acacia auriculiformis
2. Albizia lebbeck
3. Cassia fistula
4. Cassia siamea
5. Cassia tora
6. Chloris barbata
7. Cocos nucifera
8. Delonix regia
9. Dodonea viscosa
10. Eucalyptus tereticornis
11. Heteropogon contortus
12. Parkinsonia aculeata
13. Peltophorum pterocarpum
14. Prosopis juliflora
15. Senna occidentalis
16. Typha angustata

Acknowledgement:

The authors are thankful to the Principal, Nizam College (A), Hyderabad for providing laboratory facilities. The authors also acknowledge to Dr. Kaleem Ahmed Jaleeli, Assistant

ISBN: 978-93-93259-95-0

professor in Physics, Bio Physics laboratory, Nizam college (A), O.U., for assistance in photomicrographs.

References

1. Acharya P.J., 1980 Skin test response to some inhalant allergens in patients of nasobronchial allergy from Andhra Pradesh. Asp Allergy App Immunol. 13 - 14.
2. Agashe SN and Anand P., 1982., Immediate type hypersensitivity to common pollen and molds in Bangalore city. Asp allergy App Immunol. 49 - 52.
3. Chauhan SVS and Goyal R, 2006., Pollen calender of Agra city with special reference toallergenic significance, Journal of Environmental Biology, 27(2): 275 - 281.
4. Chhabra SK, Gupta CK, Chhabra P, Rajpal S., 1998, Prevalence of bronchial asthma in school children in Delhi. J Asthma 35 (3): 291 - 6.
5. Cookson W. The alliance of genes and environment in asthma and allergy. Nature 1999; 402(6760 Suppl):B 5 - 11.
6. Erdtman G., Pollen Morphology and Plant Taxonomy, Angiosperms. Almavist and wiskell, Stackholm (1952).
7. Holgate ST, 1999. The Epidemic of allergy and asthma, Nature, 402 suppl:B 2 - 4.
8. Hussain MM,
9. Mandal J and Bhattacharya K,2012. Air borne load of Cassia pollen in West Bengal, eastern India: its atmospheric variation and Health impact. Environmental Monitoring and assessment, 19: 22810379.
10. Mandal J, Manna P, Chakraborty P, Roy I and Gupta Bhattachrya S, 2009., Clinical and immune biochemical characterization of airborne Delonix regia pollen and cross reactivity studies with Peltophorum pterocarpum pollen : 2 dominant avenue trees from eastern India. Annals of Allery Asthma and Immunology, 103(6):515 - 524.
11. Ravi Raj P and Vijaya Bhasker Reddy A. 2019. Pollen diversity of Arborescent taxa from Manchippa Reserve Forest,Nizamabad District, Telangana state, India. IJRAR, Vol 6, issue 1, pg 577 - 583.
12. Ravi Raj P and Vijaya Bhasker Reddy A . 2019. Pollen morphology study of Leguminosae family from Manchippa Reserve Forest, Nizamabad district, Telangana. Journal of Tree Sciences, Vol 38, issue 2, pg 70 - 84.
13. Sharma D, Dutta B.K. and Singh A.B. 2009., Biochemical and Immunological studies on eight pollen types from South Assam, India. Iran J Allergy Asthma Immunol, December 8 (4): 185 - 192.
14. Shivpuri D.N. and Prakash D.A. 1967. A Study in allergy to Prosopis juliflora, Annl Allergy 25: 643 - 648.
15. Singh AB, 2012. Pollen allergy a national health problem . Proc 17th National conference of Indian aerobiological society on impact of airborne microbes, pp.5.
16. Singh AB and Kumar P, 2004., Aerial pollen diversity in India and their clinical significance in allergic diseases. Indian Journal of clinical Biochemistry. 19(2): 190 - 201.
17. Smith J.M. 1978., Epidemiology and natural history of Asthma, allergenic rhinitis and atopic dermatitis (eczema). In:Middleton EJR., Reed CE, Ellis EF,editors Allergy principles and practice. St. Louis: CV Mosby Co. 633 - 58.
18. Smith L J, Slavin RG. 1988 Epidemiologic considerations in atopic disease. In Bierman CW, Pearlman DS, editors. Allergic diseases from infancy to adulthood. London: Sourders Company 121 - 9.
19. Subbaroa M., Prakash O., Subbarao PV, 1985., Reaginic allergy to Parthenium pollen : evaluation by skin test and RAST. Clin & Exp Allergy, 15 : 449 - 454.
20. Vijaya Bhasker reddy A. and P.Ravi Raj., Pollen morphology of Medicinal plants from Manchippa Reserve Forest, Nizamabad district, Telangana state, India, JETIR, Vol 6, issue 2, pg 198 - 205, Feb 2019.

"Binomial Nomenclature; A Rich and Valid Source of Enrichment of English Vocabulary" A Study on the Naming of Plants and Animals (Linguistic Ethnobiology)

Ravi Kumar. U

B.Sc., M.A., M.Ed., M.Phil., (Ph.D.), Assistant Professor of English, Government Degree College, Nirmal, Telangana state.
Email: drurk3344@gmail.com

Abstract

This paper aims at providing an overview of the naming of plants and animals. The study of the naming of plants and animals is called linguistic ethnobiology. It also focuses on how people use language to name the culturally important biological elements of the world they inhabit. There are some 6000 languages spoken across the globe. Language is a complex code integrating sounds, words, and meanings so that perception, memory, intention, and imagination can be communicated among the people. The scientific naming system i.e.,"Binomial Nomenclature" is developed in the eighteenth century by Carl Linnaeus. He is known as the "father of modern taxonomy". Ideally, all plant andanimal species around the world have scientific names. While not perfect, Linnaean names constitute the best available system for accurately referring to species of plants and animals regardless of how these are named in individual human languages. We use many words for biological organisms inan unfamiliar language. This approach is problematic and the people from all over the world with the knowledge of their native language will not understand what organism we are speaking of so it has become an important need to refer an organism with a name accepted and understood by all the people around the world i.e., the Scientific Name. In theory, words are arbitrary signs, which mean what they mean by virtue of social consensus (Saussure 1983). The meanings of words, unlike sentences, cannot be inferred from the meanings of their constituent elements. However, some words, typically compound ones, may exhibit descriptive force, hinting at the nature of the thing named, without being entirely semantically transparent. This paper also provides a detailed account of how the Binomial Nomenclatureis a rich and valid source of enrichment of English language vocabulary.

Key words: *Linguistic Ethnobiology, Binomial Nomenclature, Scientific Name, Taxonomy Semantics, Onomastics, Etymology, Onomatopoetic*

 ISBN: 978-93-93259-95-0

Introduction:

Language is a complex code integrating sounds, words, and meanings so that perception, memory, intention, and imagination can be communicated among the people. There are some 6000 languages spoken across the globe. Language is a vital part of human connection. Although all species have their ways of communicating, humans are the only ones that have mastered cognitive language communication. Language allows us to share our ideas, thoughts, and feelings with others. Language is what makes us human. By learning a language, it means you have mastered a complex system of words, structure, and grammar to effectively communicate with others.To most people, language comes naturally. We learn how to communicate even before we can talk and as we grow older, we find ways to manipulate language to truly convey what we want to say with words and complex sentences. Of course, not all communication is through language, but mastering a language certainly helps speed up the process. This is one of the many reasons why language is important.

The study of the naming of plants and animals is called linguistic ethnobiology.We use many words for biological organisms in an unfamiliar language. This approach is problematic and the people from all over the world with the knowledge of their native language will not understand what organism we are speaking of so it has become an important need to refer an organism with a name accepted and understood by all the people around the world i.e., the Scientific Name.

Nomenclature: Nomenclature is a system ofnames or terms, or the rules for forming these terms in a particular field of arts or sciences. The principles of naming vary from the relatively informal conventions of everyday speech to the internationally agreed principles, rules and recommendations.

Naming "things" is a part of general human communication using words and language, it is an aspect of everyday taxonomy as people distinguish the objects of their experience, together with their similarities and differences.The use of names, as the many different kinds of nouns embedded in different languages, connects nomenclature to theoretical linguistics while the way humans mentally structure the world in relation to word meanings and experience relates to the philosophy of language.

The study of proper names is known as onomastics, which has a wide-ranging scope that encompasses all names, languages, and geographical regions, as well as cultural areas.The distinction between onomastics and nomenclature is not readily clear. Onomastics is an unfamiliar discipline to most people, and the use of nomenclature in an academic sense is also not commonly known. Although the two fields integrate, nomenclature concerns itself more with the rules and conventions that are used for the formation of names.

Binomial nomenclature: Binomial nomenclature is a formal system of naming species of living things by giving each a name composed of two parts, both of which use Latin grammatical

ISBN: 978-93-93259-95-0

forms, although they can be based on words from other languages. Such a name is called a binomial name. The first part of the name is the generic name that identifies the genus to which the species belongs, whereas the second part is the specific name that distinguishes the species within the genus. For example, Telangana state tree Jammibelongs to the genus Prosopis and within this genus to the species cineraria and Telangana state bird Palapitta (Indian roller) belongs to the genus Coracias and within this genus to the species benghlensis. The formal introduction of this system of naming species is credited to Carl Linnaeus, effectively beginning with his work Species Plantarum in 1753.He is known as the "father of modern taxonomy".

A complete binomial name is always treated grammatically as if it were a phrase in the Latin language. However, the two parts of a binomial name can each be derived from a number of sources, of which Latin is only one. These include, Latin, either classical or medieval, classical Greek and other languages. Sometimes names of people, names of places and other sources. The second part of a binomial may be an adjective. The adjective must agree with the genus name in gender. The second part of a binomial may be a noun in the nominative case or may be a noun in the genitive (possessive) case.

As the binomial nomenclature is fallowing the grammar rules of the language, it created many new words in languages especially in English.

Linguistic ethnobiology: The study of the naming of plants and animals is called linguistic ethnobiology words are arbitrary signs, which mean what they mean by virtue of social consensus(Saussure 1983). The meanings of words, unlike sentences, cannot be inferred from themeanings of their constituent elements.Harold Conklin (1962) and Brent Berlin (Berlin et al. 1974: 28-29) suggest typologiesof biological names as useful starting points for understanding details of nomenclatureapplied to plants and animals.Harold Conklin (1962) distinguishes unitary and composite biological lexemes. A Lexeme is a basic unit of meaning. Lexemes are the headwords in dictionaries. "Cobra" is a simple unitary lexeme. Copperhead is a compound unitary lexeme. A Copperhead(snake) is not a kind of head;thus, the name is compound but not composite where as White Oak is a composite lexeme.Even the simplest names may have descriptive force. Many bird names, for example, areonomatopoetic, that is, they imitate a characteristic sound of the bird named. Owl is anexample, although this name is so familiar, we may not think of it as descriptive.

Etymology: Etymology is the study of the history of the form of wordsand, by extension, the origin and evolution of their semantic meaning across time. It is a subfield of historical linguistics, and draws upon comparative semantics, morphology, semiotics, and phonetics.For languages with a long written history, etymologists make use of texts, and texts about the language, to gather knowledge about how words were used during earlier periods, how they developed in meaning and form, or when and how they entered the language. Etymologists also apply the methods of comparative linguistics to reconstruct information about forms that are too old for any direct information to be available.

ISBN: 978-93-93259-95-0

International scientific vocabulary (ISV): International scientific vocabulary (ISV) comprises scientific and specialized words whose language of origin may or may not be certain, but which are in current use in several modern languages (that is, trans lingually, whether in naturalized, loanword, or calque forms).The name "international scientific vocabulary" was first used by Philip Gove in Webster's Third New International Dictionary (1961).As noted by David Crystal, science is an especially productive field for new coinages. It is also especially predisposed to immediate translingual sharing of words owing to its very nature: scientists working in many countries and languages, reading each other's latest articles in scientific journals (via foreign language skills, translation help, or both), and eager to apply any reported advances to their own context.

Conclusion

The study of the naming of plants and animals is called linguistic ethnobiology. It also focuses on how people use language to name the culturally important biological elements of the world they inhabit. There are some 6000 languages spoken across the globe. Language is a complex code integrating sounds, words, and meanings so that perception, memory, intention, and imagination can be communicated among the people. Any language, especially English is corrupted i.e., it has to accept the words from other languages, in this context English is considered as the most corrupted language. English language is not only enriched with the loan words but also the scientific terminology.

Bibliography

1. Eugene S. Hunn., Cecil H. Brown., Linguistic Ethnobiology
2. A. Roseline., Botanical Nomenclature
3. The Oxford Dictionary of English Etymology
4. Terry O Brien., A2Z Book of Word Origins - English
5. W Skeat Walter.,The science of etymology
6. David Crystal., How Language Works
7. George Yule., The Study of Language

Webliography:-

1. https://en.wikipedia.org/wiki/Ethnobiology
2. https://en.wikipedia.org/wiki/Binomial_nomenclature#:~:text=A%20binomial%20name%20is%20also,is%20a%20%22specific%20epithet%22.
3. https://en.wikipedia.org/wiki/Etymology
4. https://archive.org/details/wikipedia-international-scientific-vocabulary

A Review on Climate Change Impact on Biological Diversity, Ecosystem and its Associated Key Services in India

Dr. Kurmeti Sudhakar

Lecturer, Department of Zoology, Government Degree College, Tiruvuru, Krishna District, Andhra Pradesh - 521 235.

Abstract

Biodiversity is defined in terms of genetic, species and individual organisms within a given species, and also included the biological communities within a defined geographic area, ranging from the smallest ecosystem to the global biosphere.Loss of biodiversity meansa decrease in the number and/or extinction of species richness, genetic variability, or biological communities in a given geographic area, or Earth as a whole. Climate change is the most-significant global environmental issue and it is mainly associated with raising levels of greenhouse gases, global warming and ozone depletion. Climate change isan inescapable and mounting global threat to biodiversity and it is affecting the ecosystems in many ways.India is a unique country in their physiographic, land scape, climatic regime and biodiversity and havingtwelve mega biodiversity (Hot-spot) centers of the world. As India covers an area of 3,287,263 square km, has diverse climatic conditions from place to place and season to season.The climatic variation in the country provides a wide range of biological resources in their natural habitat. Climate change is likely to affect a wide range of temperatures and trigger more extreme rainfall events and storms. Any living organisms show response to changes in the climate through modifications in their morphology, behavior, phenology, and geographic range shifts, and these changes are mediated by plastic and evolutionary responses. Climate change directly effects the species and populations of ecosystems.The most obvious impacts are changes in productivity, species interactions, vulnerability to biological invasions, and other emergent properties. Collectively, these impacts alter the benefits and services that natural ecosystems can provide to society.Sometimes these changes lead to positive changes but they can require costly societal adjustments. The ever increasing demand for the resources of the population put the pressure on the biological resources of the world. Industrialization, urbanization, transportation and deforestation are main anthropogenic activities that change the environment and influence climate.Climate change is likely to have a number of impacts on biodiversity from ecosystem to species level.

Key words:*Biodiversity, Climate change, Ecosystem, Greenhouse gases and Global warming.*

 ISBN: 978-93-93259-95-0

Introduction

The term biodiversity is given to the variety of life on Earthin terms of genetic, species and individual organisms, provides, through its expression as ecosystems, goods and services that sustain our lives. In recent years climate change is the most-significant global environmental issue and it is mainly associated with raising levels of greenhouse gases, global warming and ozone depletion.The association between biodiversity and climate change run in both ways: climate change threatened the biodiversity, but proper management of biodiversity can reduce the impacts of climate change.

India is immensely rich in biodiversity and it placed in the world as 8th most biodiversity region with a 0.46 BioD score on diversity index (The Hindu, 27 Aug 2021).Out of 36 Biodiversity Hotspots are present in the world, four are present in India: the Himalayas, the Western Ghats, the Indo-Burma region and the Sundaland .India only 2.4% of the land area, accounting for 7-8% of species of the world including 7.6% of all mammalian, 12.6% of all avian, 6.2% of all reptilian, 4.4% of all amphibian, 11.7% of all fish, and 6.0% of all flowering plant species and it is in one of the seventeen megadiverse countries list (Puri 2011). The content's species compose the world's most diverse and biologically important ecosystems such as tropical and temperate forests, tropical forests, marine and freshwater habitats, high mountains, highlands, swamplands, wetlands, plains, grasslands and desertecosystems. These regionally important ecosystems provide benefits that many Indianpeople and communities obtain, collectively known as ecosystem services. The ecosystem supplies manifold ecosystem services required to meet human needs for example, livelihood services including feed, fuel-wood, food, timber; regulating services including disease and climate regulation; supporting services includingsoil formation, nutrient retention; and cultural services including recreation, ecotourism (Wangai et al., 2016).

Temperature impact on climate change:

Climate changes mainly happening in two ways, natural and anthropogenic. The natural levels of greenhouse gases are being supplemented by human activities, such as the burning of fossil fuels, farming activities and land-use changes, lead to increase in theEarth's surface and lower atmosphere temperature thus resulted in global warming. Even small increases in temperature are go along with by many other changes. Rising levels of greenhouse gases are already changing the climate. According to the Millennium Ecosystem Assessment, a comprehensive assessment of the links between ecosystem health and human well-being, climate change is likely to become the prevailing direct driver of biodiversity loss by the end of the century. The principal reason for anthropogenic activities is rapid growth of human population. The expansive growth in human population leads to increased utilization of natural resources as a result deforestation, expansion of urbanization, a change in the agricultural system from traditional to extensive method are happening.

ISBN: 978-93-93259-95-0

Alterations in temperature can result in behavioral and morphological changes in population and species level, such as distribution changes or population declines (Beever et al., 2017). According to Beever et al., 2017 and Bradshaw and Holzapfel, 2007 the behavioral responses are seeking shade or refuge, altering in the feeding times, changing site use, and shifting circadian or circ-annual rhythms (e.g., hibernation, migration).The common morphological changes include changes in body size (Weiskopfet al., 2020; Cheung et al., 2013). Metabolic rate in exothermic organism is sensitive to temperature (Gardner et al., 2011), in this organisms warmer temperatures can lead to faster growth rates but can ultimately lead to smaller body size (Atkinson, 1994).

Changing climate affects ecosystems in a several ways. For instance, increasing temperature may force species to migrate to higher latitudes or higher elevations where temperatures are more advantageous to their survival. Similarly, as sea level rises, saltwater intrusion into a freshwater system may force some key species to relocate or die, thus removing predators or prey that are critical in the existing food chain.Climate change not only affects ecosystems and species directly, it also interacts with other human stressors such as development.

Water and rainfalls as stress factors:

Water and rainfall are also the main factors in climate change and is a limiting factor particularly in dry lands.Changes in water availability can have disproportionate effects on biodiversity. For aquatic animal species, for example Pisces, amphibians, and mollusks, such as clams and oysters water is limiting factor for their survival. Millions of other species, including humans, depend on fresh water to drink. When an area loses a large percentage of its fresh water, many animals die off. In some cases, species go entirely extinct. This leads to a decrease in the region's biodiversity (Read Works 2014). Hence, fresh water is essential to balancing human and wildlife and life needs to adaptation to climate. Dry lands are particularly vulnerable to climate change becausesmall changes in temperature and rainfall patterns can have serious impacts on the biodiversity of dry and sub-humid lands. Dry lands are already under stress from various activities, including conversion to agriculture, the introduction of invasive species, alterations to fire regimes, and pollution. The impacts of climate change on dry lands may have significant repercussions on populations and economies. Many people are highly dependent on dry lands biodiversity.Changes in water supply, along with other climate change impacts, can alter agricultural production which can lead to starvation. For instance, when a region loses its biodiversity, it disrupts the food chain in many ways. For example, if a species goes extinct, all the species used to feeding on it must find another source of food. Say a particular species of freshwater frog dies because its habitat has been depleted in a drought. This means the population of birds that feeds on this frog may decline as well, as it lacks sufficient food. Conversely, the insects that the frogs fed on may increase in number, as the frogs are no longer around to keep their population in check (Read Works 2014). Droughts and other extreme events can decrease crop yield and quality and thus effects the ecosystem productivity.

ISBN: 978-93-93259-95-0

Food web disruptions:

The impact of climate change also affects the food chains and food webs. If a particular species eliminate through a food web and it may affect a wide range of other organisms. For example, the food web for polar bears is discussed here. The decline of sea ice is impairing polar bear populations by reducing the extent of their primary habitat. It is also negatively impacting them via food web effects. Declines in the duration and extent of sea ice in the Arctic leads to falloffs in the abundance of ice algae, which thrive in nutrient-rich pockets in the ice. These algae are main food source for zooplankton, which are in turn eaten by Arctic cod, an important food source for many marine mammals, including seals. Polar bears eats Seals. Hence, declines in ice algae can contribute to declines in polar bear populations(Chapin et al., 2014; Backlund et al., 2008; ACIA 2004).

Conclusion

The present review article focused that the various components of climate change are projected to affect all levels of biodiversity, from genes over species to biome level. Loss of biodiversity at any level as a result of climate change can alter the structures and functions of ecological systems. As a result, the provision of biodiversity-based ecosystem services and the well-being of people that rely on these services are being changed. As biodiversity underlies all goods and services provided by ecosystems that are essential for human survival and well-being, and livelihoods, and what approaches might be employed to reduce current and future risks on the well-being of human.

References

1. ACIA (2004). Impacts of a Warming Arctic: Arctic Climate Impact Assessment. Arctic Climate Impact Assessment. Cambridge University Press, Cambridge, United Kingdom.
2. Atkinson, D., 1994. Temperature and organism size - a biological law for ectotherms. Adv.Ecol. Res. 25, 1-58.
3. Backlund, P., A. Janetos, D. Schimel, J. Hatfield, K. Boote, P. Fay, L. Hahn, C. Izaurralde, B.A. Kimball, T. Mader, J. Morgan, D. Ort, W. Polley, A. Thomson, D. Wolfe, M. Ryan, S. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, W. Schlesinger, D. Lettenmaier, D. Major, L. Poff, S. Running, L. Hansen, D. Inouye, B.P. Kelly, L Meyerson, B. Peterson, and R. Shaw. U.S. Environmental Protection Agency, Washington, DC, USA. CCSP. The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research 2008.
4. Beever, E.A., Hall, L.E., Varner, J., Loosen, A.E., Dunham, J.B., Gahl, M.K., Smith, F.A., Lawler,J.J., 2017. Behavioral flexibility as a mechanism for coping with climate change. Front. Ecol. Environ. 15, 299-308.
5. Bradshaw, W.E., Holzapfel, C.M., 2007. Evolution of animal photoperiodism. Annu. Rev.
6. Chapin, F. S., III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze, 2014: Ch. 22: Alaska. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, USGCRP 2014; 514-536.

ISBN: 978-93-93259-95-0

7. Cheung, W.W.L., Sarmiento, J.L., Dunne, J., Frölicher, T.L., Lam, V.W.Y., Palomares, M.L.D.,Watson, R., Pauly, D., 2013. Shrinking of fishes exacerbates impacts of global oceanchanges on marine ecosystems. Nat. Clim. Chang. 3, 254-258.

8. DrS.K.Puri. "Biodiversity Profile of India. Archived from the original on 21 November 2011. Retrieved 20 June 2007. Ecol. Evol. Syst. 38, 1-25. https://doi.org/10.1146/annurev.ecolsys.37.091305.110115.

9. Gardner, J.L., Peters, A., Kearney, M.R., Joseph, L., Heinsohn, R., 2011. Declining body size: athird universal response to warming? Trends Ecol. Evol. 26, 285-291.

10. India adds 557 new species to its fauna: Zoological Survey of India, The Hindu, 27th Aug 2021.

11. ReadWorks.org@2014How Water Loss Affects Biodiversity.

12. S.R. Weiskopf, Madeleine A. Rubenstein, Lisa G. Crozier, Sarah Gaichas, Roger Griffis, Jessica E. Halofsky, Kimberly J.W. Hyde, Toni Lyn Morelli, Jeffrey T. Morisette, Roldan C. Muñoz, Andrew J. Pershing, David L. Peterson, RajendraPoudel, Michelle D. Staudinger, Ariana E. Sutton-Grier, Laura Thompson, James Vose, Jake F. Weltzin, Kyle Powys Whyte,Climate change effects on biodiversity, ecosystems, ecosystem services, and natural resource management in the United States,Science of The Total Environment,733 (2020) 137782.

13. Wangai, P., B. Burkhard, and F. Muller. 2016. "A Review of Studies on Ecosystem Services in Africa." International Journal of Sustainable Built Environment 5: 225-245. doi:10.1016/j.ijsbe.2016.08.005.

 ISBN: 978-93-93259-95-0

Checklist of Plant Diversity from Baliram Patil Arts, Commerce and Science College , Kinwat, District Nanded (M. S.), India

Eanguwar Srinivas Reddy[1], S.R. Shinde[2]

[1,2]Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, District Nanded, Maharashtra, India.
Email: eanguwarsrinivas@gmail.com[1]

Abstract

This paper deals with the plant diversity of Baliram Patil Arts, Commerce and Science College, Kinwat, Nanded District, location is bounded between latitude 19.5969321 and longitude 78.2068503. 175 plants were representing in 142 genera, belonging to 70 families were collected and the most dominated families are Fabaceae, Malvaceae, Amaranthaceae, Asteraceae, Lamiaceae, Apocynaceae, Solanaceae and Convolvulaceae are recorded. These plants were distinguished on their habit wise namely herbs (59), shrubs (34), climbers (18) and trees (64) and their respective percentages were also mentioned, the trees attained the highest position (37%). Most plant species of the campus are of substantial ecological and economic value, useful as bio resources to wild fauna and human beings. The outcome of the study can be used constructively in planning sustainability of campus environment.

Key words *- Checklist, diversity, Baliram Patil College and Maharashtra.*

Introduction

From the very beginning of ancient time of human beings on the universe man has relied on plants to fulfill his basic needs for his survival [1]. The plant kingdom is directly connected with to provide food, shelter and health. Plants play important role not only in maintaining life system on the earth but also as a source of economically important products. Based on geographical region and edapo-climatic condition plants survive to their specific habitat. It has been estimated that approximately ten million species of plants inhabit the planet earth of which, among that only 1.7 million species are known to science [2]. In India rich plant diversity which has been estimated 45,000 species of which about 8000 are known for their medicinal plants. Nearly 75% of the remedially important plant species grows in almost wild conditions [3]. A huge number of flora are available in various bio-geographical zones of India [4], [5]. According to WHO, 20,000 plant species are medicinal uses out of 2,50,000 all over the world, out of these 800 species are being used commercially. In India, the rural population uses about 8000 herbal plants for medicine.

India is unique due to its vast geographical expanse and amazing diversity in climate, soil and topography that supports all types of ecosystems found anywhere in the world [6]. In India

ISBN: 978-93-93259-95-0

about 7300 plant species are used in traditional health care systems such as Ayurveda, Siddha, Unani and folk healing practices. The booming of traditional medicine industry results in an increasing demand on medicinal plant products. It is observed that 90% of the medicinal plants come from natural habitats.

The declining availability of such plants and the fading of local traditional knowledge make the sustainable management of natural habitats a crucial environmental issue in South India, concerning bio-diversity conservation and welfare of local communities. In Marathwada near about 1600 plants species has been observed out of which up to 400 plants are reported to be medicinally important. Due to low urbanization it is observed that in Marathwada, people from rural area are relying on herbs, shrubs and different parts of the trees as the source of medicine as primary health care. General survey of 302 angiospermic plants was done from Nanded District [7, 8].

Traditional medicine is currently the fastest growing medical field with herbal therapies becoming increasingly popular. Traditional medicine is considered more holistic, acceptable, accessible and low cost and proven to be safe & that is why preferred by local people [9, 10). The tribal's live and rely on plants and plant products and using traditional medicine system for centuries. The traditional medicinal practices are an important part of the primary health care system in developing world [11].

The study of the distribution of plants helps us to determine the abundance of plant and its ability of any given area. Floristic studies have been used to explain the specialization, isolation, endemism and evolution. Each and every area was not fixed for specific flora, which has been change from time to time. In basically most of the ecosystems have support with the plant diversity fundamentally. The present survey deals with the floristic diversity of college campus in the former sense.

Area of study

Baliram Patil Arts, Commerce and Science College was established in the year 1972, the college has clean 20 acres of total land with green carpet with total of 175 plants.

Field survey

The college campus was surveyed randomly form November 2017 to August 2021. The representative specimens of every plant were collected in quadruplicates, repeated collections were avoided of plants once collected in the campus, field numbers were given for every specimen in the field notebook. The photographs of the plants were taken with the help of Sony Digital Camera (Plate 1).

Specimens were made into herbarium described [12]. Species were identified by using different floras [13] [14] [15] [16] [17] [18][19] and [20]. The collected specimens with voucher

ISBN: 978-93-93259-95-0

numbers were deposited in the herbarium in the Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, Nanded District.

Results and Discussion

The various plant types found in the campus provided with many ecosystem services ranging from aesthetic value which is a visual treat for eyes and provide peace to the mind of students and teachers (Figure 1). During the survey of the college campus from 2017-2021, the Campus has a great wealth of plants, their scientific names, local names, family and habit are depicted in Table No. 1.

The 175 plants were representing in 142 genera, belonging to 70 families were collected. The most dominated families are Fabaceae, Malvaceae, Amaranthaceae, Asteraceae, Lamiaceae, Apocynaceae, Solanaceae, Convolvulaceae are other families recorded. These plants were distinguished on their habit wise namely herbs (59), shrubs (34), climbers (18) and trees (64), their respective percentages were shown in Figure No.2.

Figure No.1. Botanical garden of campus

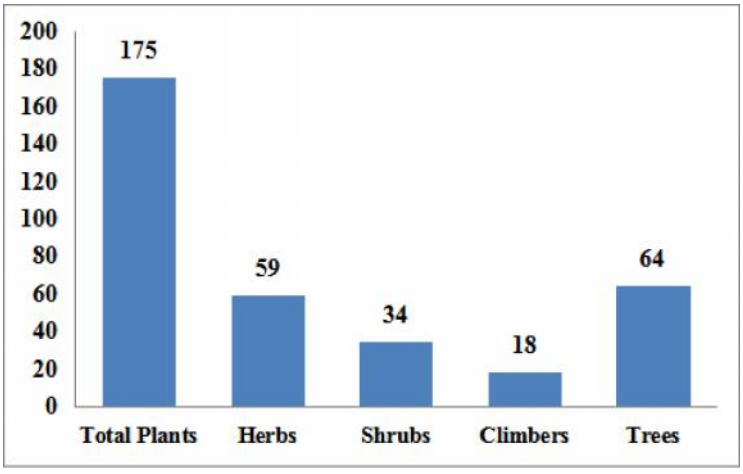


Figure No.2. Analysis of campus flora

ISBN: 978-93-93259-95-0

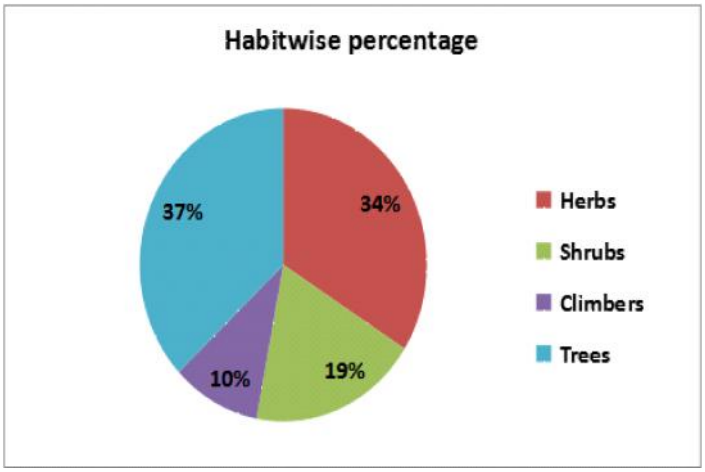


Figure No.3. Campus flora in percentage

In every year plantation is going on in various occasions in the campus, which gives royal look, so added one more feather to the cap of our college, by the by some part of the campus like playground, boys, girls hostel and open space were covered with wild flora which includes medicinal value plants.

Biodiversity survey has been done by many researchers in different places but college campus still now not yet studied. Current study was aimed for identification of different plants like medicinal exotic and ornamental plants in college campus. Comparison of campus flora of BP college with that of different institutional campuses in Maharashtra. Such a comparison places the campus flora of BP college is rich number and moderately diverse. The plant diversity of this campus is greater than those of the other colleges. The main reason behind this was may be due to many anthropomorphic activities made in the campus such as construction of new buildings and undisturbed area of the campus was converted in to the new renovations. So this is the right time to the floristic studies in the campus are considered as the backbone of the assessment of phytodiversity, conservation, management and sustainable utilization [18]. The campus flora of an institution is a unique opportunity for outdoor botanical and ecological learning for the campus community.

ISBN: 978-93-93259-95-0

Table No. 1. List of plants in collage campus

S.No.	Botanical Name	Local Name	Family	Habit
1.	*Abelmoschus crinitus* Wall.	Bana	Malvaceae	S
2.	*Abelmoschus ficulneus (L.)* Wight& Arn.exwt.	Ran Bhendi	Malvaceae	H
3.	*Abrus precatorius L.*	Gunj	Fabaceae	C
4.	*Abutilon indicum* (Link) Sweet.	Kanghi	Malvaceae	S
5.	*Acacia catechu* (L.f.) Willd.	Khair	Fabaceae	T
6.	*Acacia leucophloea* (Roxb.)Willd.	Himvar	Fabaceae	T
7.	*Acacia nilotica* (L.) Willd. Ex Del. ssp indica (Benth.) Brenan.	Babhul	Fabaceae	T
8.	*Acalypha indica* L.	Khokli	Euphorbiaceae	H
9.	*Achyranthus aspera L.*	Aghada	Amaranthaceae	H
10.	*Adhatoda zeylanica* (L)	Adulsa	Acanthaceae	S
11.	*Aegle marmelos* (L.) Corr.	Bel	Rutaceae	T
12.	*Aerva lanata (L.)* Juss. ex Schult	Tandhada	Amaranthaceae	H
13.	*Ageratum conyzoides L.*	Sahadeveli	Asteraceae	H
14.	*Ailanthus excelsa* Roxb.	Maharuk	Simaroubarceae	T
15.	*Aloe vera* (L.) Burm.f.	Korphad	Liliaceae	H
16.	*Albizia lebbeck* (L.) Benth.	Siris	Mimoseaceae	T
17.	*Alocasia macrorrhizos* (L.) G.Don	*Kaasaalu*	Araceae	H
18.	*Alternanthera sessilis* (L.) R.Br.ex DC.	Kanchari	Amaranthaceae	H
19.	*Amaranthus spinosus* L.	*Kantemath*	Amaranthaceae	H
20.	*Andrographis paniculata* (Burm.f.) Wall ex Nees.	Bhui-neem	Acanthaceae	H
21.	*Anisomeles indica* (L.) Kuntre	Mahaibat	Lamiaceae	H
22.	*Anisomeles malabarica* (L.) R. Br. Ex.Simg.	Bhutganja	Lamiaceae	H
23.	*Annona reticulata* L.	Ramphal	Annonaceae	S
24.	*Annona squamosa* L.	Sitaphal	Annonaceae	S
25.	*Argemone mexicana* L.	Pivala-Dhotara	Papaveraceae	H
26.	*Asparagus racemosus* Wild.	Shatavari	Asparagaceae	C
27.	*Azadirachta indica* A. Juss.	Neem	Meliaceae	T
28.	*Bambusa arundinacea* (Retz.) Willd.	Bambu	Poaceae	T
29.	*Barleria prinites*	Nili koranti	Acanthaceae	H
30.	*Bauhinia racemosa* Lamkark.	Apta	Caesalpiniaceae	T
31.	*Biophytum reinwardtii* (Zucc.) Klotzsch.	Lajalu	Oxalidaceae	H
32.	*Biophytum sensitivum* (L.) DC.	Lajalu	Oxalidaceae	H
33.	*Blepharis repens* (Vahl.) Roth.	Hadsan	Acanthaceae	H
34.	*Blumea lacera* (Burm.f.) DC.	Bhamurda	Asteraceae	H
35.	*Boerhavia diffusa* L.	Punarnarva	Nyctaginaceae	H
36.	*Boerhavia erecta* L.	Punarnarva	Nyctaginaceae	H
37.	*Bombax ceiba* L.	Katesawar	Malvaceae	T
38.	*Bougainvillea spectabilis* Willd.	Bougainvel	Nyctaginaceae	C
39.	*Borassus flabellifer* L.	Tad	Arecaceae	T
40.	*Brassica nigra*	Rai	Brassicaceae	H
41.	*Bryophyllum diagremontiannum* (Raym-Hamet & H-Perreir) A. Berger.	Panphuti	Crassulaceae	H
42.	*Bryophyllum pinnatum*(Lam.) Oken	Panphuti	Crassulaceae	H
43.	*Buchnania cochinchinensis* (Lour.) Almeida	Char	Anacardiaceae	T
44.	*Butea monosperma Lamk.* Taub.	Palas	Fabaceae	T
45.	*Cajanus platycarpus* (Benth.) Raizada	Pitapushpa	Leguminosae	H
46.	*Calotropis gigantea* (L.) R.Br.ex.Schult.	Ruchaki	Asclepiadaceae	S
47.	*Canna indica* L.	Kardal	Cannaceae	H
48.	*Calotropis procera* (Ait.) W.T.Aiton	Pandhari Ruchaki	Asclepiadaceae	S
49.	*Capparis zeylanica* L.	Waghati	Capparidaceae	S

ISBN: 978-93-93259-95-0

S.No.	Botanical Name	Local Name	Family	Habit
50.	*Cardiospermum halicacabum* L.	Kanphoddi	Sapinadaceae	H
51.	*Careya arborea Roxb.*	Kumbhi	Lecythidaceae	T
52.	*Caryota urens* L.	Fishtail Palm	Arecaceae	T
53.	*Casuarina equisetifolia* L.	Saru	Casuarinaceae	T
54.	*Ceratozamia miqueliana* H.Wendl.		Zamiaceae	T
55.	*Catharanthus roseus* (L.) G. Don.	Sadaphuli	Apocynaceae	S
56.	*Cayratia trifolia* (L.) Domin	Ambatwel	Vitaceae	C
57.	*Ceiba pentandra* (L.) Gaertn.	Safeta Savara	Malvaceae	T
58.	*Celastrus paniculatus* Willd.	Jyotishmati	Celastraceae	T
59.	*Celosia argentea* L.	Kurdu	Amaranthaceae	H
60.	*Cocos nucifera* L.	Naral	Arecaceae	T
61.	*Chrysanthemum indicum* L.	Shevanti	Asteraceae	H
62.	*Citrus aurantifolia* (Christm& Panz.)Swing.	Limbu	Rutaceae	T
63.	*Citrus limon* (L.) Burm.f.	Id-limbu	Rutaceae	T
64.	*Citrus medica* L.	Mahalembu	Rutaceae	T
65.	*Cleome gynandra* L.	Pandhari Tilwan	Capparidaceae	H
66.	*Cleome viscosa L.*	Pivli Tilwan	Capparidaceae	H
67.	*Clitora ternatea* L.	Gokarna	Fabaceae	H
68.	*Cocculus hirsutus* (L.) Theob.	Wasanwel	Menispermaceae	C
69.	*Cocos nucifera* L.	Narial	Arecaceae	T
70.	*Commelina benghalensis* L.Vahl.	Kena	Commelinaceae	H
71.	*Cordia dichotoma* Forst.f. (G. Forst).	Bhokar	Boraginaceae	T
72.	*Crotalaria hirta* Willd	*Godhadi*	Fabaceae	H
73.	*Cycas revoluta* Thunb.	Cycas	Cycadaceae	T
74.	*Cynodon dactylon (L.)Pers.*	Hariyali	Poaceae	H
75.	*Cyperus rotundus* L.	Nagarmotha	Cyperaceae	H
76.	*Dalbergia sissoo* Roxb.	Sheesham	Fabaceae	T
77.	*Datura metal L.*	Kala Dhotra	Solanaceae	S
78.	*Datura stramonium* L.	Dhatura	Solanaceae	S
79.	*Dioscorea bulbifera* L.	Dukkar Kand	Dioscoreaceae	C
80.	*Dioscorea pentaphylla* L. Hook.	Kadakand	Dioscoreaceae	C
81.	*Diospyros melanoxylon* Roxb.	Tendu	Ebenaceae	T
82.	*Diplocyclos palmatus* (L) Jeffrey	Shivlingi	Cucurbitaceae	C
83.	*Eclipta prostrata* (L.) L.	Maka	Asteraceae	H
84.	*Enicostema axillare* (Lam.) Raynal	Nay	Gentianaceae	H
85.	*Eucalyptus globulus* Labill.	Nilgiri	Myrtaceae	T
86.	*Euphorbia hirta* L.	Dudhanali	Euphorbiaceae	H
87.	*Evolvulus alsinoides* (L.) L.	Vishanukranta	Convolvulaceae	H
88.	*Ficus benghalensis* L.	Vad	Moraceae	T
89.	*Ficus hispida* L.	Auadumber	Moraceae	T
90.	*Ficus racemosa* L.	Umbar	Moraceae	T
91.	*Ficus religiosa* L.	Pimpal	Moraceae	T
92.	*Gardenia resinifera* Roth.	Dikemali	Rubiaceae	S
93.	*Gloriosa superba* L.	Kal-lavi	Colchicaceae	C
94.	*Grevillea robusta* A.Cunn. ex R.Br	Silver oak	Proteaceae	T
95.	*Goniogyna hirta (Willd.)*	*Godhadi*	Fabaceae	H
96.	*Helecteris isora* L.	Murud-shang	Sterculiaceae	T

ISBN: 978-93-93259-95-0

S.No.	Botanical Name	Local Name	Family	Habit
97.	*Hemidesmus indicus* (L.) R.Br.	Khobarvel	Apocynaceae	C
98.	*Hibiscus rosa-sinensis* L.	Jaswand	Malvaceae	S
99.	*Holoptelea integrifolia (Roxb.)Planch.*	Wavli	Ulmaceae	T
100.	*Hybanthus enneaspermus* (L.) F. v. Muell.	Ratanpurush	Violaceae	H
101.	*Hydrilla verticillata* (L.f.) Royle	Sheval	Hydrocaritaceae	H
102.	*Hyptis suaveolens* (L.) Poit.	Rantulsi	Lamiaceae	H
103.	*Indigofera tigtora*	Godhadi	Fabaceae	H
104.	*Ipomoea fistulosa* Mart. ex Choisy	Beshram	Convolvulaceae	S
105.	*Ipomoea hederifolia* L.	Kasiratnalu	Convolvulaceae	H
106.	*Ipomoea pes-tigridis* L.	Belukaja	Convolvulaceae	H
107.	*Ipomoea quamoclit* L.	Ganeshpushpa	Convolvulaceae	C
108.	*Ixora pavetta* Andrews	Torch tree	Rubiaceae	T
109.	*Jasminum sambac* (L.) Ait.	Mogra	Oleaceae	S
110.	*Jatropha curcus* L.	Ratanjoti	Euphorbiaceae	S
111.	*Lablab purpureus* (L.) Sweet.	Wall Pawada	Leguminaceae	C
112.	*Lantana camara* (L.)	Ghaneri	Verbenaceae	S
113.	*Lawsonia inermis* L.	Mehandi	Lythraceae	S
114.	*Lepidagathes cristata* Willd.	Bhui gend	Acanthaceae	S
115.	*Leucas aspera* (Willd.) Link.	Kumbha	Lamiaceae	H
116.	*Limonia acidissima* L.	Kavt	Rutaceae	T
117.	*Madhuca longifolia* (J.Konig) J.F.Macbr. (J. Konia) Maebr.	Moha	Sapotaceae	T
118.	*Mangifera indica* L.	Amba	Anacardiaceae	T
119.	*Manilkara zapota* (L.) Dub.	Chikku	Sapotaceae	T
120.	*Martynia annua* L.	Waghnakhi	Martyniaceae	S
121.	*Maytenus emarginata* (Willd.)	Hekal	Celastraceae	S
122.	*Merremia gangetica* (L.) Cuford.	Undirkani	Convolvulaceae	H
123.	*Morus alba* L.	Tuti	Moraceae	S
124.	*Mucuna pruriens* (L.) DC.	Khaj Khori	Fabaceae	C
125.	*Nelumbo nucifera* Gaertn.	Kamal	Nelumbonaceae	C
126.	*Nerium indicum* Mill.	Kanher	Apocynaceae	T
127.	*Nyctanthus arbor-tristis* L.	Parijatak	Oleaceae	T
128.	*Opuntia elatior* Mill.	Nagfani	Cactaceae	S
129.	*Ocimum americanum* L.	Ashta	Lamiaceae	S
130.	*Ocimum tenuifolariun* L.	Tulas	Lamiaceae	S
131.	*Olax psittacorum* (Willd.)	*Kukurbit*	Oleaceae	S
132.	*Parthenium hysterophorus* L.	Congress grass	Asteraceae	H
133.	*Passiflora edulis* Sims.	Krishnakamal	Passifloraceae	C
134.	*Pergularia daemia* (Forssk.) Chiov.	Utaranvel	Apocynaceae	C
135.	*Phyllanthus amarus* Schumach. & Thonn.	Bhuiawala	Phyllanthaceae	H
136.	*Phyllanthus emblica* L.	Awla	Phyllanthaceae	T
137.	*Phyllanthus urinaria* L.	Yetausri	Phyllanthaceae	H
138.	*Phyllanthus virgatus* Forst. F.	Thokausri	Phyllanthaceae	H
139.	*Plumeria alba* L.	Pandhara chafa	Apocynaceae	T
140.	*Plumeria rubra* L.	Lalchapha	Apocynaceae	T

ISBN: 978-93-93259-95-0

S.No.	Botanical Name	Local Name	Family	Habit
141.	*Polianthes tuberosa* L.	Nishigandha	Asparagaceae	H
142.	*Polyalthia longifolia* (Sonner.) Thw.	Ashok	Annonaceae	T
143.	*Pongamia pinnata* (L.) Pierre.	Karanj	Fabaceae	T
144.	*Pterocarpus marsupium* Roxburgh	Bijasal	Fabaceae	T
145.	*Pupalia leppacea* (L.) Juss.	Erra uttareni	Amaranthaceae	H
146.	*Ricinus communis L.*	Aerand	Euphorbiaceae	S
147.	*Roystonea regia* (Kunth) O.F.Cook	Royal palm	Arecaceae	T
148.	*Semecarpus anacardium* L.f.	Bibba	Anacardiaceae	T
149.	*Senna fistula* L.	Amaltas	Fabaceae	T
150.	*Senna occidentalis* L.	Rantarota	Fabaceae	S
151.	*Senna tora* L.	Takla	Fabaceae	S
152.	*Sida acuta Burm.*f.	Chikana	Malvaceae	S
153.	*Sida cordata* L.	Bhuibala	Malvaceae	H
154.	*Sida rhombifolia* L.	Bala	Malvaceae	H
155.	*Solanum nigrum* L.	Kamanchi	Solanaceae	S
156.	*Solanum virginianum* L.	Bhui Ringani	Solanaceae	H
157.	*Soymida febrifuga* (Roxb.) Juss.	Rohan	Meliaceae	T
158.	*Syzygium cumini(L.)*	Jambhul	Myrtaceae	T
159.	*Tamarindus indica* L.	Chinch	Caesalpiniaceae	T
160.	*Tecomella undulata* (Sm.)	Rakta Rohida	Bignoniaceae	T
161.	*Tectona grandis* L.f.	Sag	Lamiaceae	T
162.	*Tephrosia purpurea* (L.) Pers.	Unhali	Fabaceae	H
163.	*Terminalia bellirica* (Gaertn.) Roxb.	Behda	Combretaceae	T
164.	*Terminalia chebula* Retz.	Hirda	Combretaceae	T
165.	*Terminalia cuneata* Roth.	Arjuna	Combretaceae	T
166.	*Terminalia tomentosa* Wt. & Arn.	Ain	Combretaceae	T
167.	*Thuja occidentalis* L.	Morpanki	Cupressaceae	T
168.	*Tinospora cordifolia (Thunb)* Miers	Gul-vel	Menispermaceae	C
169.	*Tridax procumbens* L.	Kambarmodi	Asteraceae	H
170.	*Vitex negundo* L.	Nirgudi	Lamiaceae	S
171.	*Withania somnifera* (L.) Dunal	Ashwagandha	Solanaceae	S
172.	*Wrightia tinctoria* (Roxb)R.Br.	Kala kuda	Apocynaceae	T
173.	*Xanthium strumarium* L.	Gokharu	Asteraceae	S
174.	*Ziziphus mauritiana* Lamk.	Bor	Rhamnaceae	T
175.	*Ziziphus oenoplia* (L.) Mill.	Burge	Rhamnaceae	C

Abbreviations: H=Herb, S=Shrub, C=Climber and T=Tree.

Summary and Conclusion

The present study was mainly concentrated on an overall floristic survey of the campus like walkway playground, hostels and botanical garden. The resulted 175 species of angiosperms 142 genera are belonging to 70 families. In conclusion the natural beauty of college campus is with its native plant diversity, introduced ornamental and cultivated plant species with great aesthetic value, ecological uniqueness and resource importance. Thus, taking a walk around the campus

ISBN: 978-93-93259-95-0

would enrich the botanical knowledge, ecological consciousness and conservation values, not only of the academia but also the common people. The BP college campus environment, with its diversity of native plant species and the beautiful, cultivated ornamental plants, provides a unique opportunity for learning as an outdoor classroom exercise.

The college has clean 20 acres of total land with green carpet with total of 175 plants.They are distributed habit wise that herbs 59, shrubs 34, trees 64 and climbers 18.

The BP college campus stands as a source of giving excellent education services to students and staff related to plant sciences, but at the same time provided them with natural asset of green cover which helps them to have a healthy and stress free environment.

Acknowledgement

The authors are thankful to Late Dr. O.S.Rathor, Professor and Ex Principal of Science College, Nanded to buildup in the research venture.

References

1. Elizabeth, M., Dowdes well, D., 1995. Global Biodiversity Assessment. UNEP, Cambridge University Press, UK, 80-89.
2. Wagay N.A., Deshmukh V.R., Rothe, S.P., 2015. A floristic survey of flowering plants from Vidyabharati Mahavidyalya Campus, Amravati (Maharashtra) India International Journal of Life Sciences, 3(3): 249-254.
3. Laloo, R.C., Kharlukhi, L., Jeeva, S. and Mishra, B.P., 2006. Status of Medicinal Plants in the Disturbed and the Undisturbed Sacred Forests of Meghalaya, Northeast India: Population Structure and Regeneration Efficacy of Some Important Tree Species. Current Science. (90) 225-232.
4. Gharpure, Y.H., Chemical News, June 2011, 22
5. Ravikumar, S., Gnanadesigan, M., Jacob Inbaneson, S., Kalaiarasi, A., 2011. Hepatoprotective and antioxidant properties of Suaeda maritima (L.) Dumort ethanolic extract on concanavalin-A induced hepato toxicity in rats Indian journal of experimental biology 49(6):455-60.
6. G.S. Rawat (Editor), Special Habitats and Threatened Plants of India. ENVIS Bulletin:Wildlife and Protected Areas, Wildlife Institute of India, Dehradun,2008, Vol. 11(1).
7. Eanguwar Srinivas Reddy, (2017)."Diversity of Medicinal plants in Mahur Forest Range of Nanded District. (Maharashtra State)", Ph.D Thesis to RTM Nagpur University, Nagpur.
8. S. R. Shine (2008). Studies on ethnobotanical and bio efficiency of some medicinal plants common in kinwat forest. Ph. D Thesis submitted to SRTMU, Nanded.
9. Gessler M. The antimalerial potential of medicinal plants traditionally used in Tanzania and their uses in the treatment of malaria by traditional healers.Inaugural dissertation, Baseler- Schelldruck, Basel, 1995.
10. Malunga NP, Ohilander LE, Smith M. Current perspective on an emerging floral natural products sector in South Africa. Journal of Ethnopharmacology.2008, 119:365-375.
11. Ghosh A. Herbal folk remedies of Bankura and Medinipur Dist. West Bengal. Indian Journal of Traditional Knowledge. 2003; 2(4):393-396.
12. Jain, S.K., Rao, R.R., 1977. A handbook of field and herbarium methods. New Delhi: Today & Tomorrow's Printers and Publishers.157.
13. Almeida M.R. (1996) 'Flora of Maharashtra, Blatter herbarium', St. Xavier College, Mumbai.

14. Almeida S.M. & Almeida M.R. (2010) Hand book of diseases and their herbal remedies in Maharashtra, Part 1 & 2. Orient Press Ltd. Bombay.

15. Dhore M.M., Lachure P.S. and Gawande P.D. (2011). Trees of Vidarbha, Paygun prakashan,Amravati. 6.

16. Kirtikar K.R. and Basu B.D (2005). Indian medicinal plants Vol.1, 2, 3, & 4.Publication by,International book distributors, Dheradun, India.

17. Madhava Chetty K, K. Shivaji & K. Tulsirao (2015). Flowering plants of Chittor district, Andhra Pradesh, India, Students offsets printers, Tirupati.

18. Naik V.N. (1998). Flora of Marathwada, Amrut Prakashan, Aurangabad.

19. Parrota J.A. (2001). Healing Plants of Peninsular India. C.A.S.I. Publication, USA.

20. Yadav S. R. and M. M. Sardesai (2002). Flora of Kolhapur District, Shivaji University,Kolhapur (India) Published by Shivaji University Kolhapur-416004.

 ISBN: 978-93-93259-95-0

Telangana Forestry and Environmental Sustainability

Dr. D. Adeppa

Asst.Professor of Economics, Girraj Govt.College (A), Nizamabad, Telangana

Abstract

The government of Telangana is led by a constitutional vision to protect its natural environment. It has also aligned its forest, environment, biodiversity, and climate change programmes with four interconnected Sustainable Development Goals (SDG) Agenda goals: clean water and sanitation (SDG 6), responsible production and consumption (SDG 12), climate action (SDG 13), and life on land (SDG 15). Healthy forests are the foundation of sustainable development. Forests cover 30% of the Earth's surface and play an important role in providing food security and shelter, fighting climate change, supporting indigenous populations, and protecting biodiversity. The core objective of the forest sector's development strategy is to enhance green cover by integrating it with livelihood opportunities. The objective of the Telangana government is to conserve this biodiversity as well as the state's forest eco-systems. This is an important step in ensuring the water and food security of the state. Wildlife and wildlife habitats should be conserved and sustainably managed to meet the social, economic, ecological, cultural, recreational, and spiritual needs of the present and future generations of the people in the state. This paper focuses on the implementation of the Telanganaku Haritha Haram (TKHH) programme and forest and environmental progress in Telangana.

Key Words: *Forests, Haritha Haram, plants, sustainable development*

Introduction

Forest resources are an important natural resource. The conservation and development of forest resources has implications not only for the economy of a country but also for the environment worldwide. While conservation of forests implies protection and management of the resource, development of forests implies expansion of the resource. The conservation and development of forest resources is intricately related to the livelihoods of local communities in view of their co-existence for centuries. Thus, it is clear that any effort aimed at conservation and development of forest resources cannot be viewed in isolation with the livelihood concerns of the local communities. Therefore, the governments in several countries realized the importance of involving the local communities in the conservation of forest resources. In this context, it becomes pertinent to discuss the nature and scope of the concepts such as forest resources, community, and community involvement in order to have a clear understanding about the role of local communities in conserving forest resources.

ISBN: 978-93-93259-95-0

Forests are one of the most important renewable natural resources of the country. They have multifarious uses and as such are considered to be of immense help to human beings. Forests meet the recreational needs of human beings and also capable of absorbing noise, and thus help in noise abatement. They certainly provide relief from the unpleasantness caused by unplanned urbanization. Forests also act as homes for rich and varied wildlife and promote the aesthetic beauty of the nation. Even from the defense point of view they are very useful.

In the tropics, protection of the forestry serves five closely related purposes: i) soil stabilization, ii) prevention of erosion, iii) watershed management, iv) provision of shelter and shade, and v) reclamation of sites and arresting desertification. It needs to be noted that forestry is highly labour intensive primary activity. The Forestry provides not only employment, but by raising fuel and fodder supply, it enhances the productivity of land and livestock.

Thus, forests play an important role in environmental and economic sustainability. They provide several goods and services and maintain the life support systems. The important functions of forests include:

- Supply of timber, fuel wood, fodder and wide range of non-wood products.
- Natural habitat for bio-diversity and repository of genetic wealth;
- Provision of recreation and opportunity for eco-tourism;
- An integral part of watershed to regulate the water regime, conserve soil and control floods; and
- Carbon sequestration and carbon sink.

Objectives of the Study

1. To understand the importance of Forestry and environment in Telangana state
2. To assess the role of the programme of massive plantation through Telanganaku Haritha Haram (TKHH)programme in for addressing the Forestry and Biodiversity.

Methodology

The study is basically descriptive in nature. The data for the present study is collected from secondary sources like the annual reports of various governmental departments at centre and Telangana state level.

The State of Telangana is endowed with rich diversity of flora and fauna with over 2939 plant species, 365 bird species, 103 mammal species, 28 reptile species, in addition to large number of invertebrate species. Important endangered species found in the state are tiger, panther, indian gaur, four horned antelope, black buck, marsh crocodile etc. The state is also bestowed with dense Teak forest along the banks of river Godavari right from Nizamabad through Adilabad,

ISBN: 978-93-93259-95-0

Karimnagar, Warangal up to Khammam district. Forest types in Telangana, include tropical moist deciduous forests, southern dry deciduous forests and northern mixed dry deciduous forests. These forests are home for several deciduous species like Nallamaddi, Yegisa, Rose Rood, Narepa, Bamboo in addition to Teak.

The objective of the Telangana Government is to conserve this biodiversity as well as the State's forest eco-systems. This is an important step in ensuring water security and food security of the State. Wildlife and wildlife habitats should be conserved and sustainably managed to meet the social, economic, ecological, cultural, recreational and spiritual needs of the present and future generations of the people in the State.

Natural resources, viz. forest, wildlife, biodiversity and environment, play an important role in the survival and well-being of people, livelihoods of the poor and economic prosperity and aesthetics of the state. Usually, the poor and the vulnerable groups are more directly dependent on natural resources and are therefore most affected by the status and quality of the natural resources. With accelerating climate change, the protection and sustainable development of natural resources is now considered a key anti-poverty strategy.

At the national level, India's forest cover is now at 21% and protected areas cover around 5% of the country's total land area. India is one of the 17 'mega - bio-diverse' countries in the world. Though India has only 2.4% of the earth's land area, 7-8% of the world's recorded species can be found here. As India is home to many species found nowhere else in the world, the country is committed to achieving the Aichi Biodiversity targets of the Convention on Biological Diversity.

After formation of the State, the government has initiated several measures geared towards restoration and sustainable development of the natural resources. In this endeavor, the government has initiated an ambitious programme -"TelanganaKu HarithaHaram (TKHH)", to plant about 230 crore seedlings and to increase the green cover from the present 24 percent to 33 percent of the total geographical area of the State in a phased manner. The Forest Department was entrusted the task of attaining the above goal and other state institutions namely, the Telangana State Biodiversity Board and Pollution Control Board have been mobilized to protect the biodiversity and environment in the state. This paper highlights Telangana's efforts to increase forest cover and promote biodiversity in the State.

Forests

Forests play a major role in supporting the livelihood activities of rural poor and in specific private and other tribal communities in their thickly populated areas. Further, they contribute to the economy of State, mitigate the threat of global warming, and help in conserving the fertile soil and vulnerable wildlife. State Forest Administration is solely responsible for management of forests with due interventions of the Government of India to undertake the national policy mandates

ISBN: 978-93-93259-95-0

towards conservation and sustainable use of resources. The core objective of forest sector's development strategy is to enhance green cover by integrating it with livelihood opportunities.

Telangana has a total forest cover (TFC) of 26,969.54 square kilometers (sq.km) that accounts for 24.05% of the total geographical area of the state. Nearly one-third of TFC is open forests extending to 8,484 sq.km and 7,896 sq.km of moderately dense forests hold another one-third of TFC. 286 sq.km are very dense forests holding a share of 1.1% of TFC. Scrub forests that hold a share of 16.4% of TFC extends to 4,420 sq.km whereas 157 sq.km of water bodies hold 0.6% of TFC .

The forests in Telangana belong to three forest groups: Tropical Dry Deciduous Forests, Tropical Thorn Forests and Tropical Moist Deciduous Forests .According to the India State of Forest Report 2021, Mango Tree (Mangifera indica) is the most abundant tree species in the rural areas of the state with a relative abundance of 38.93%. In urban areas, this is Neem Tree (Azadirachta indica) with a relative abundance of 18.35%. With a forest cover of 15.98%, 10.89%, and 9.25%, Bhadradri Kothagudem, Mulugu and Nagarkurnool districts respectively are the top contributors in the total forest cover of the State. At the district level Mulugu, at 71.81%, has the highest percentage share of forest area to the district's total geographical area, followed by Bhadradri Kothagudem and Komaram Bheem with their percentage share at 60.95% and 54.41% respectively .

Forest Types in Telangana

Forests Group Tropical Dry Deciduous Forests

1. Southern Dry Mixed Deciduous Forests
2. Dry Deciduous Scrubs
3. Dry Teak Forests
4. Secondary Dry Deciduous Forests
5. Dry Bamboo Brakes
6. Hardwickia Forests
7. Boswellia Forests
8. Dry Savannah Forests
9. Dry Grass Lands Forests Group

The Department of Forest has been implementing various development schemes to protect and develop existing forests, to improve their productivity and economic value. The two major activities include enriching existing low-density forest sandal leviating rural and forest dwellers' poverty. The latter is done through the several programmes which includes oil & moisture

ISBN: 978-93-93259-95-0

conservation, percolation tanks etc., in forest areas, in addition to social forestry, wildlife management and human resource development activities. The resulting increase in tree cover will help in recharging of ground water, and in turn improve forest vegetation.

Extraction of Forest Produce

Beedi Leaf: The Abnus leaves trade in Telangana was nationalized in 1971 Beedi leaf season, eliminating the contractors' agency. In April, 2006 the government have decided to distribute the net revenue to the Beedi leaf collectors in proportion to the quantity of beedi leaf collected by them as per wage cards from 2006 beedi leaf season. The total quantity of beedi leaf collected during 2019 Beedi Leaf Season is 1,01,009 standard bags. The total anticipated revenue from all the 130 units sold during 2019 B.L. Season is Rs.24.38 Crores, as per the tender rates offered by the purchasers.

Departmental Extraction of Timber (DET): During the financial year 2019-20, the Forest Department has taken up extraction of various forest species such as Long Bamboo, Matured Teak Plantation, Thinning in Teak Plantation, Salvaging of Timber etc; The income accrued from forestry sector in the Telangana State was Rs.39.05 crore (upto November 2019) in the year 2019-20.

TelanganaKu Haritha Haram (TKHH)

Telanganaku Haritha Haaram (TKHH), a flagship programme of the State Government envisages to increase the tree cover of the State from present 24 % to 33% of the total geographical area of the State. This objective is sought to be achieved by a three-pronged approach of: (i) rejuvenating degraded forests; (ii) ensuring more effective protection of forests against smuggling, encroachment, fire, grazing; (iii) intensive soil and moisture conservation measures following the watershed approach. As evident in Figure 1, there is significant variation in forest cover within the 33 districts of Telangana. While some districts have been naturally endowed with dense forests, the government is undertaking a coordinated effort to increase the forest cover across the state.

Strategy

The strategies to achieve the goal of achieving 33% of tree cover in the State are:

- Taking up extensive plantation outside the notified forest like roadside, barren hills, tank foreshore and bund, canal bunds, institutional premises, housing colonies, farm bunds, community land and homesteads.
- Increasing the canopy density, and productivity, inside the notified forests, especially in the degraded ones, by taking up large-scale plantations and assisting the natural regeneration coupled with intensive water harvesting structures in the forests.
- Plantation efforts that will be taken up by involving a variety of stakeholders.

ISBN: 978-93-93259-95-0

Telangana Ku Haritha Haram (TKHH)

National Forest Policy of India envisages a minimum of 33% of the total geographical area under forest tree cover to maintain environmental stability and ecological balance; that are vital for sustenance of all life-forms, human, animal and plants.

Rapid industrialization and other anthropogenic emissions have led to rapid climate change leading to low and erratic rains, high diurnal temperatures,reduced water flow in the forest streams, fre-quent droughts and floods. To ameliorate these adverse impacts of climate change, the Government of Telangana has launched a flagship pro-gramme 'Telanganaku Haritha Haram' (THH) during 2015-16 which envisages to increase the present 24% tree cover in the State to 33% of the total geographical area of the State.

The thrust areas to achieve the above are two-fold; one, initiatives in notified forest areas, and the other, initiatives in areas outside the notified forest areas. The first objective is sought to be achieved by a multi-pronged approach of rejuvenating degraded forests, ensuring more effective protection of forests against smuggling, encroachment, fire, grazing and intensive soil and moisture conservation measures following the watershed approach.

Major fillip is sought to be given to Social Forestry for achieving the second objective. In the areas outside the notified forest, massive planting activities will be taken up in areas such as; road-side avenues, river and canal bank, barren hill, tank bunds and foreshore areas, institutional premises, religious places, housing colonies, community lands, municipalities, industrial parks, etc. Legend District Boundary Vegetation Class Dense Forest Open Forest Scrub Non Forest Water Body 230 Crore seedlings are proposed to be planted in the State during the next three years. Out of this, 130 crores seedlings are proposed to be planted out-side the notified forest areas (10 crore within HMDA limits, and the remaining 120 Crores in rest of the State). It is also proposed to plant, and rejuvenate the viable rootstock to achieve 100 crore plants inside the forest areas by way of intensive protection of the forests

Achievements under TKHH Programme

The planting was taken up by the various implementing departments like Forest, Rural Development, Irrigation, Roads and Buildings Department, Panchayat Raj, Municipal Administration, Excise, GHMC, HMDA etc. Planting 31.98 Crores of seedlings has been done during 2018 and out of which 27.98 Crores have been geo-tagged.

The field functionaries of various line Departments have undertaken identification of sites for planting and prepared village Action Plans. The Village Action Plans will be consolidated at Mandal level and finally at the District level to form District Action Plan. At State level, two committees; the State Level Coordi-nation and Monitoring Committee, and the State Level Steering Committee oversee the progress of the TKHH programme.

ISBN: 978-93-93259-95-0

The objective of the Telangana Government is to conserve and improve the State's forest eco-system as well as its biodiversity.

Forestry

- At the national level, India's forest cover is at 21%.
- The Telangana government has initiated an ambitious programme - "Telangana Ku Haritha Haram (TKHH)", to plant about 230 crore seedlings and to increase the green cover from the present 24 percent to 33 percent of the total geographical area of the State in a phased manner. 38.18 crore seedlings have been planted during 2019 ,out of which 31.79 crore seedlings have been geo-tagged.
- The government is also promoting urban forestry. 32 urban forest parks have been completed and are open to public, work is in progress at 46 locations.

Biodiversity

- India is a 'mega-diverse country' with only 2.4% of the world's land area and yet about 7-8% of all recorded species.
- In order to protect and conserve the rich biodiversity of Telangana, the government has declared a network of 12 protected areas which include 9 wildlife sanctuaries and 3 national parks covering an area of 5692.48 sq. kms.
- Creating awareness among the people about nature conservation has been given high priority in wildlife management in the state. Environmental education centres have been set up at sanctuaries and national parks; field visits are being organised for school children to create awareness about conservation.
- We must protect the forests for our children, grandchildren and children yet to be born. We must protect the forests for those who can't speak for themselves such as the birds, animals, fish and trees" -Qwatsinas, Tribal Chief of Nuxalk Nation in British Columbia.

Achievements under TKHH Programme

Planting was taken up by the various implementing departments including Forest, Rural Development, Irrigation, Roads and Buildings Department, Panchayat Raj, Municipal Administration, Excise, GHMC, HMDA etc. 38.18 crore seedlings have been planted during 2019.

For the year 2020-21, it is proposed to plant about 68.00 crore seedlings both inside and outside the forest areas under TKHH Programme. Sufficient planting stock is being raised in the nurseries by theForest and other Departments to meet the target of 68.00 crore seedlings in 2020-21.

ISBN: 978-93-93259-95-0

According to the latest Forest Survey of India (FSI) report, Haritha Haram in Telangana has helped increase the forest cover and green cover in the State. According to the report, the Recorded Forest Area (RFA) in the State is 26,904 square kilometers of Forest land of which, 20,353 square kilometers is Reserved Forest, 5,939 square kilometers is Protected Forest and 612 square kilometers is Unclassed Forests.The report says that, three national parks and nine wildlife sanctuaries constitute the protected area network of the State covering 5.08% of its geographical area. In terms of forest canopy density classes, the State has 1,608.24 square kilometers under Very Dense Forest (VDF), 8,787.13 square kilometers under Moderately Dense Forest (MDF) and 10,186.94 square kilometers under Open Forest (OF). Main reasons for the increase in forest cover in the State is due to Telangana kuHarithaHaram.The Government of Telangana has taken up massively the restoration of tanks through 'Mission Kakatiya' programme for addressing the Agriculture sector. The programme of massive plantation through 'Haritha Haram' for addressing the Forestry and Biodiversity. Both these programmes plays key roles in addressing the interventions in other sectors like Health, reducing emissions of Industries, Energy and Transportation sectors, reduction of Carbon Dioxide, improving eco tourism and overall rural and urban development.

Benefits of Haritha Haram

- Improving green cover and Bio diversity
- Maintaining ecological balance
- Ensuring sustainable livelihoods
- Ensuring good rain fall
- Reducing Carbon Dioxide emissions by approximately 10 million tones.

Telangana has a total forest cover (TFC) of 26,969.54 square kilometres, accounting for 24.05% of the total geographical area of the state.

- Five districts - Bhadradri Kothagudem, Mulugu, Nagarkurnool, Komaram Bheem and Mancherial - together account for more than 50% of the total forest area in the state. Bhadradri Kothagudem accounts for nearly 16% of the total forest area in the state.
- Telangana is endowed with a rich diversity of flora and fauna with over 2,939 plant species, 365 bird species, 103 mammal species, 28 reptile species, and a large number of invertebrate species.
- In 2021-22, the forestry and logging sub-sector added Rs. 1,944 crore that accounted for 1.77% of the Gross Value Added by the primary sector and 0.32% of the total Gross State Value Added at constant (2011-12) prices.
- Between 2014-15 and 2021-22, the GVA at constant (2011-12) prices by the forestry and logging grew from Rs. 1,715 crore in 2014- 15 to Rs. 1,944 crore in 2021-22; an absolute increase of 13.35% at a Compound Annual Growth Rate of 1.81%.

ISBN: 978-93-93259-95-0

- The Government set a target of planting 23,000 lakh seedlings across the state from 2015-16 to 2021-22. By January, 2022, 23,599.5 lakh seedlings had been planted-an achievement of 102.6% against the target.
- There are 12 protected areas in Telangana that includes 9 wildlife sanctuaries and 3 national parks covering a total of 5,692 sq.km. This also includes the Amrabad and Kawal Tiger Reserves.
- 29 Sewage Treatment Plants (STP) are operational in the state accounting for a total capacity of 885.5 million litres per day (MLD) and utilization of 735.8 MLD.
- The `Disability-Adjusted Life Years' (DALY) Rate attributable to air pollution (per 1 lakh population) is 2,710 in Telangana compared to the national average of 3,469, implying that per 1 lakh population, 759 fewer persons suffered from deaths and diseases on account of air pollution in Telangana than in the country as a whole.

In all years from 2016-17 to 2020- 21, the Government has ensured that 100% of the Bio-Medical Waste (BMW) generated in the state is treated either through incineration or autoclaved.

The components under CAMPA are: Compensatory Afforestation (CA), Catchment Area Treatment (CAT), Integrated Wildlife Management Plan (IWMP), Net Present Value (NPV), interest and others.

Wildlife & Bio-Diversity Conservation

Biodiversity includes all the various forms of life on Earth including ecosystems, animals, plants, fungi, microorganisms, and genetic diversity. Three levels of biodiversity are commonly discussed - genetic, species and ecosystem diversity. Biodiversity found on Earth today consists of many millions of distinct biological species, the product of four billion years of evolution. The land, air and seas of our planet are home to the tiniest insects and the largest animals, which make up a rich tapestry of interconnecting and interdependent forces.

India, a 'mega-diverse country' with only 2.4% of the world's land area, accounts for 7-8% of all recorded species, including over 45,000 species of plants and 91,000 species of animals.

When it comes to fauna, Telangana State is richly endowed with 97 species of mammals that include tiger, leopard, sloth bear, giant squirrel, hyena, fox, wild dog, wild boar, Indian bison (gaur), spotted deer, barking deer, black buck, four-horned antelope, blue bull, sambar, mouse deer, honey badger, civets, jungle cats, otter, pangolin, bats, tree shrew, common langur, etc.

In order to protect and conserve the rich biodiversity of Telangana, the Govt. has declared a network of 12 protected areas which include 9 wildlife sanctuaries and 3 national parks covering an area of 5692.48 sq. km. The network of protected areas includes important wetlands like Manjeera Wildlife Sanctuary and Siwaram Wildlife Sanctuary which are home to the endangered Marsh Crocodile. The Manjeera Wildlife Sanctuary also attracts thousands of migratory birds like Painted Stork, Open Billed Stork, Herons, Ibis, Ducks, Geese, etc.

ISBN: 978-93-93259-95-0

Threats: There are many threats to our natural world, which include: Habitat loss and destruction, Alterations in ecosystem composition, invasive alien species, over-exploitation, pollution and contamination, global climate change. The International Union for Conservation of of all known mammals, 30 per cent of all known amphibians, 12 per cent of all known birds, 28 per cent of reptiles, 37 per cent of freshwater fishes, 70 per cent of plants and 35 per cent of invertebrates assessed so far, are under threat.

The conservation of biodiversity is a common concern of humankind. Cultural diversity and biodiversity are intimately related to each other. If we lose one, we risk losing the other. The diversity of societies, cultures and languages that have developed throughout human history is intimately related to biodiversity and its use.

The State plays an active role in conversation of bio diversity. Government has released an amount of 1532.98 lakh during the year 2019-20 under CSS-Project Tiger. The State Government has also released matching state share for the two tiger reserves on 60:40 sharing basis. In order to develop national parks and sanctuaries, the Government has allotted an amount of Rs.24.50 lakh during the year 2019-20.

Environment Education

Creating awareness among the people about nature conservation is given a high priority in wildlife management in the state. Most of the sanctuaries and national parks in the state have environment education centre's with exhibits, models, write-ups on nature education. The other facilities at these centre's include a mini auditorium and a library. State-of-art EEC's have developed at Mannanur, Jannaram and Manjira. Nature camps are conducted for schools with special emphasis on Government Schools. An innovative program named, "Vanadarshini" is being implemented in all divisions which involves organizing group visits for school children, especially from government schools to wildlife and other forest areas to create awareness among them towards conservation.

Conclusion

Telangana, located strategically in the central region of the Indian sub-continent, has representatives of Indian plant and animal life. The vegetation found in the State is largely of dry deciduous type with a mixture of teak, and species of the genera Terminalia, Pterocarpus, Anogeissus etc. The varied habitat harbors a diversity of fauna which includes tiger, panther, wolf, wild dog, hyena, sloth bear, Gaur, Black Buck, Chinkara, Chowsingha, Nilgai, Cheetal, Sambar and a number of birds and reptiles in the forest. People's participation in forest management is essential for the protection of forests. Success stories of people's participation in forest management across the world had given boost for shouldering this paradigm by the development practitioners along with environmental and ecologists and more importantly, the researchers. The midnight oil burning and incessant noises by environmentalist and ecologist across the world

ISBN: 978-93-93259-95-0

environmental threats have forced for a relook into the failure of 'policing' as a system of forest management and the need for making people as partners of forests management.The Government of Telangana is led by the constitutional vision to protect its natural environment. It has also aligned its programmes on forest, environment, biodiversity and climate change with four interconnected goals under the 2030 Sustainable Development Goals (SDG) Agenda- Clean Water and Sanitation (SDG 6), Responsible Production and Consumption (SDG 12), Climate Action (SDG 13) and Life on Land (SDG 15). In pursuing this, the policy frameworks such as the Telangana State Climate Action Plan, 2015, and initiatives such as Telangana Ku Haritha Haram would take the lead on achieving the target of 33% forest cover in the state even in the coming years. This would be supplemented with the ongoing initiatives of the Telangana State Pollution Control Board, rural and urban local bodies and the Telangana State Biodiversity Board.

References

1. Angelingis Akwilini Makatta, Faustin Peter Maganga, and Amos Enock Majule, A Hidden Pitfall for REDD: Analysis of Power Relation in Participatory Forest Management on Whether It Is an Obstacle or a Reliever on REDD Pathway, International Journal of Forestry Research Vol.2015, pp. 12.
2. Socio Economic Out Look 2019&2020 Government of Telagana ,Planning Department.
3. Mbwambo, L., Malimbwi, R. E., and Kajembe, G. C., "Community Perceptions on the Impact of Decentralized Forest Management on Access to Livelihood Assets in the North Eastern and Central Tanzania" , Ethiopian Journal of Environmental Studies & Management 7(1): 31 - 42, 2014.
4. Naseer A. Mir, Raza Ali Abidi, Hilal Ahmad Bhat and Malik Asif, "Livelihood Support of Joint Forest Management (JFM) in Rural India", International Journal of Pharma and Bio Sciences, 2014 January, Vol. 5, No.1pp. 361 - 367.
5. S. P. Chavan Role Of Joint Forest Management Committees In The Conservation of Forest And Environment", Indian Streams Research Journal, Vol. 3, Issue-6, July-2013, pp. 1-5.

ISBN: 978-93-93259-95-0

"Forest Based Industries - Problems, Growth and Perspectives" - A Case Study of Paper Industry in India

G. Sudhaker[1], J. Omprakash[2]

[1,2]Department of Commerce, GRP Government Degree College, Bhainsa
Email: spguntha@gmail.com[1]

Abstract

A forest is defined as the area of land that covers with trees. Forests generate both timber forest products and non-timber forest products, which may be sold in markets, or traded, or used by households and individuals. India is one of fast growing forest-based industries in the world. Forest-based Industries includes- the paper industry, match industry, silk industry, lac industry, sports goods industry and handicraft.

Paper Industry

The first effort to produce paper by modern techniques was done in 1816 in Tanjavur (Tamil Nadu). It was unsuccessful. The first successful paper mill was set up in 1879 in Lucknow. Again, in 1881, paper mills were set up in Titagarh (West Bengal). Paper industry is a weight-losing industry. About two and half tons raw materials are needed for making one ton paper. Soft wood, Bamboo, Sabai grass, Bagasse, Ragsare used in making paper. Besides these, straw of paddy, wheat and maize is also used in making paper

Match Industry

The first match factory in India was set up in 1921 in Ahmedabad. Later these, match factories have also been set up in Maharashtra Gujarat, Uttar Pradesh, Karnataka, Telangana, Assam, Chhattisgarh, Rajasthan etc. The matchstick is made by a special kind of soft wood. The wood of the trees called dhoop, markat, salai, semal, sundari etc., are especially useful for it.

Silk Industry

There are two stages in silk industry. 1. Sericulture and obtaining of silk fibres 2. Production of silk textile from silk fibres. Sericultureis completely forest based industry. Sericulture is done mainly on the mulberry trees. Besides it, sericulture is also done on the trees 'like oak, mahua, castor, sal, plum, kusumetc.Silk Textile Industry is indirectly a forest based industry.

Among other forest based industries, the major ones are wood sawing industry, lac industry, beedi making industry and honey collection industry.

ISBN: 978-93-93259-95-0

Conclusion:

Modernization and rebuilding of the existing plants in the industry with the latest technology like new pulping system. Oxygen bleaching is necessary to achieve high performance and to maintain high standard of output at least cost and effective management of environment of pollution.

Key words: *timber forest products and non-timber forest products, wood sawing industry, oxygen bleaching.*

Introduction

India is one of the developing nations of the world. The country is making all out efforts to raise the standard of living of the people. The increase in the standard of living and the exploding population call for greatly expanded supplies of forest products-timber for the construction of houses, packing cases for industrial products, and innumerable other purposes. The forests in India, under the present methods of management, will be unable to meet the requirements of the people within the foreseeable future. The gap between demand and supply of the forest products is widening day by day. The question arises why the existing forests of India are unable to produce enough timber to meet the requirements of the people. For fulfilling the demand, plantations of conifers may be tried wherever they can grow well to serve the needs of long-fibred pulp. In other places eucalyptus or any other quick-growing species may be grown. While planting one should keep in mind that the species which are incapable of yielding at least 10 cubic metres of wood per hectare must not be planted on good sites.

Paper Industry in India:

Paper industry in India is mainly plantation based and is essential that more land must be brought under plantations of eucalyptus and other trees apposite for the making of papers. The paper industry also requires huge amount of soft water and paper utilized for newspapers is called newsprint. The capacity of paper industry in India has been raised to near about 100000 tonnes of paper a year. West Bengal and Maharashtra are leading states for the Industry. Indian paper industry is a vast industry comprising more than 157 paper producing divisions all over India. These 157 functional units manufacture handmade paper worth around 50 crore rupees. And also provide employment to approximately 20000 people. Indian paper industry has created sustainable livelihood in rural areas and has helped generating employment for the local people especially for women. The Indian paper industry has emerged as diversified and specialized industry that produces numerous types of papers that comes in various uses such as water mark, filter paper, drawing sheets etc.Other products of paper industry are paper bags, paper diaries, paper photo frames, greeting cards, paper boxes etc are manufactured and exported across the world. The present research is concerned with an examination of the growth and development of Indian paper industry and problems related to this industry such as marketing, human resource management, inventory management, etc.

ISBN: 978-93-93259-95-0

Objectives of the study:

The principal objectives of the study were :

1. To examine the growth and structure of the Indian paper industry.
2. To study the various managerial aspects.
3. To look into the various problems and to suggest measures to overcome the same

Problems of Paper Industry in India:

1. Long protection of paper price. In the past whatever quality and quantity of paper Indian Paper Manufacturers could produce they did not face much problem as imported paper was too costly in the past due heavy import duty. As a result, due to sudden change in International trade policy paper produced by those inefficient Indian paper plant could not find any market for their product. As a result, many Indian paper mills which did not keep space with others ultimately closed down.
2. Continuous imports of second-hand pulp and paper manufacturing plant and machineries rejected by developed countries though Indian pulp and paper machine manufacturing companies vigorously objected this practice. Actually, during that time advanced countries were replacing the old and inefficient plant and machineries by efficient ones in their place and they were getting booming market in our country. As a result, Indian paper industry remained inefficient and backward. Result proved to be suicidal as we are experiencing to-day.
3. The low demand for paper in the global markets and the process of dumping imports has led to lowering the profits of these small-scale industries. This has affected the prices of paper products in a huge manner.
4. Various types of raw materials are used for production purposes. Today majority of the manufacturers prefer to choose eco-friendly methods to produce pulp and its products. One of the biggest disadvantages of manufacturing paper products is the depletion of forest resources. It is quite difficult to manufacture these products with the use of wheat straw or other renewable sources. Although it is an alternative form of production, it can be quite difficult to find enough raw materials to produce books, printing papers, magazines and so forth.
5. Even with the availability of alternative forms of production, most of the manufacturers are constantly in search of advanced technological methods and reduced costs of production to increase the margin of profits.
6. Today various changes have taken place in the manufacturing sector. New technologies are used to print tissues, paper and so forth. Moreover, there are a large number of foreign investors interested in this field which has further led to competition and increase in the revenue of the industry.

ISBN: 978-93-93259-95-0

7. The current scenario depicts the problems faced by the industry mainly due to the shortage of raw materials in the country. With the increase in population, there is a constant increase in the use of all types of wood. This has further depleted the sources of raw materials in the country. Cheap imports of raw materials from foreign countries are one of the sources of reliable raw materials for the industry.

8. Apart from these factors, there are many other reasons for the slow growth and development of this industry. Majority of the industrial units are located in remote places which seldom attract the attention of young generation. This leads to the lack of work force which further affects the production of the industry. Although these products are in great demand, it procures less revenue compared to the other industries in the country.

9. Even though majority of the manufacturers choose to use eco-friendly products for the production of materials, it is less available in comparison to the demand of the products. The lack of eco-friendly raw materials has affected the industry in many ways.

Perspectives of Paper Industry in India:

We are not sure how the coming years will be for the Indian paper industry. But we are trying to understand various issues from the industry for which we took views from various experts specializing in different fields. The issues covered includes a wide array i.e. raw material procurement, waste paper collection, image makeover, demand, over capacity, imports, human resource, electronic media etc and other similar issues. Some of them are discussed below.

1. **Fibrous Raw Material:** This is the most important and crucial issue of the industry.The best way to secure raw material for the Industry lie in immediate decision by the Government to allow use of degraded forestlands by the industry for captive plantation with necessary safeguards and due control of regulatory authorities, and the need to develop moves to socially and culturally change the mind-sets of people to help improve collection of waste paper for recycling it back to paper making.

2. **Indian Paper Mills Wood Requirement & Generation:** The wood-based paper mills in India continue to face challenges with forest-based raw material.The wood-based industries have been advised to encourage agro forestry for raising plantation to meet the raw material demand. Non-forestlands such as private lands are explored for raising tree crops to augment the available wood resources.

3. **Human Resource:** Certainly, paper industry will have reasonably bright prospect in India during next 5 to 10 years. It is known that the demand of paper and paper products grow and match with the GDP growth. The rapid change in the lifestyle of both rural and urban Indian, specifically in the strong middle-class segment, having high disposal amount, will fuel higher growth in certain product segments. The next generation paper industry will see large new investments in the contemporary technology. However, a parallel growth will also be

ISBN: 978-93-93259-95-0

observed in the investment in the medium size paper units with conventional technology to bridge demand supply gap. As faster growth is also observed in many other new economy segments, young talented Indians will have many carrier options in front of them. This would be a real challenge for the paper industry especially for the integrated pulp & paper companies, who intend to invest large in the high technology area to tackle the competition from global players, who will step in this growing market.

4. **Image Building:** Paper industry has typically been viewed in a poor light due to its dependence on natural resources especially wood for making pulp and paper. One of the major challenges the pulp & paper industry faces today is to create a cleaner image in the mind of consumers by adopting environment friendly practices to produce paper and reduce its impact on the environment.

Moving in this direction, in the last few years the pulp & paper industry around the world has in fact done more than many other industries to become environmentally responsible. There are several paper mills globally and in India, which have invested time and money in developing new technologies and adopting environment friendly manufacturing practices.

Use of alternative raw materials has been the biggest shift in this direction. Today high-quality paper is being manufactured using raw materials other than wood, which on the contrary have a positive impact on the environment. At Trident we stand true to our tagline "In active Collaboration with Nature" by using wheat strawas a primary source of raw material.

Conclusion:

Paper production is a core sector industry in India. The importance of paper and paper products in modern life cannot be overemphasized. Paper plays a key role in any developing economy like that of India. The present work is concerned with the study of the growth and working of the Indian paper industry, various problems associated with its growth, etc.

References:

1. Kulshrestha, N.K. Analysis of Financial Statement of Paper Industry in India, NavamanPrakashan, Aligarh, 1972.
2. Sharma, L.C. " The Pulp and Paper Industry - I " Facts for You, Feb. 1991.
3. Rao, Y.A. The Paper Industry in India - Prospects, Oxford and IBH Publishing Co. Pvt. Delhi. Status Ltd.
4. Bose, D.N. Paper Industry in India - Present Position and Prospects with Special Reference to U.P., Unpublished Ph.D. Thesis, Lucknow University 1977-78.
5. Bhootlingam, S. Paper Industry, Problems and Prospects, National Council of Applied Economic Research, New Delhi, 1972.
6. Singh, Hardev "Paper Industry : Problems Are Not Over Yet", Monthly Commentary on Indian Economic Conditions, June, 1989.
7. Reddy, C.S. and Reddy, P.M. "Indian Paper Industry Problems and Prospects", Indian Journal of Marketing. January 1988.
8. Ansari, M. S. and Talha M. " Paper Industry in India Problems of Sickness ", Southern Economist, July, 15, 1988.

 ISBN: 978-93-93259-95-0

Economic Importance of Forests in India

Dr. T. Hanumantha Rao

S.G. Lecturer in Economics, SVRK Government Degree College, NIDADAVOLE - 534301
East Godavari District, A.P.
Email: hthummalagunta@yahoo.com

Introduction

Trees have a rightful place in the general economy of the country. Forestry is not a mere handmaid of agriculture but an inexhaustible reserve for providing subsistence to our growing millions. For, "Trees mean water, water means bread, and bread is life." The Puranas, rightly said that, "One tree is equal to ten sons. And what a son! he gives moisture to land, gives breeze and shade; saves land from erosion, gives dry leaves for compost and rich fruits for food - What a son! he wants care and water but for five years, wants no milk, no nurse."

Forests are indispensable for the national development and fully grown-up civilisation. "Indeed civilisation has been nursed, nourished and grown to manhood in the regions of temperate natural vegetation." A Fresh proverb rightly says, "Forests precede civilisation but deserts succeed them."

To an agricultural country like India, their importance can hardly be exaggerated. It has been observed in the tenth Five-Year Plan that forests meet nearly 40 per cent of the country's energy needs and 30 per cent of the fodder needs. It is estimated that about 270 million tonnes of fuel wood, 280 million tonnes of fodder, over 12 million cubic metre of timber and countless non-wood forest product are removed from the forest annually.

Objectives of the paper

The main objective of the research paper is to study the economic importance of forests in Indian economy. The other objectives of the paper are:

1. To discuss various definitions of forests.
2. To study various types of forests
3. To understand the importance of forests in our daily life
4. To discuss importance of forests in Indian economy.
5. To suggest suitable measures for controlling degradation of forests.

Data and Methodology

The data is collected from secondary sources. Simple averages, bar and pie diagrams are used for analysis of the data.

ISBN: 978-93-93259-95-0

Definitions of forest

A forest is defined as the area of land that is covered by trees. The Food and Agriculture Organisation of the United Nations defined forest as "Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in this situation". It does not include land that is predominantly under agricultural or urban use.

By using this definition, Global Forest Resources Assessment 2020 has concluded that the total forest lands cover about 4.06 million hectares or 10 million acres of land which sums up to 31% of the total land on the Earth's surface in the year 2020.

Forests are important for the survival of all living beings. They are vital for our life as they provide oxygen, food, shelter, fuel, and means of livelihood for the tribal people living in and around the forest area. Forests are home to 80% of the global terrestrial biodiversity and are the source that fulfils all basic needs for adjacent human settlements. Everything from the oxygen we breathe to the wood used from fuel to use in construction comes from forests. It is a self-nourishing system, which is a host to a number of organisms. The ecosystem of every forest includes both biotic (living) and non-biotic components. The biotic components include plants, trees, shrubs, vines, grasses, mosses, algae, fungi, insects, mammals, birds, reptiles, amphibians, and microorganisms.

Forests are Made of Four Main Layers as Shown Below

1. **Emergent Layer:** The tallest trees in the forest are around 200 feet from the emergent layer. These trees have broad leaves and get abundant sunlight.
2. **Canopy Layer:** The canopy layer is just below the emergent layer. It is thickened by a maze of smooth oval leaves and branches. It is the primary layer of the forest.
3. **Understory Layer:** Sunlight cannot reach the layers below the canopy layer and hence the plants develop larger leaves to absorb it.
4. **Forest Floor:** Sunlight cannot reach the forest floor and hence, it is dark and humid in this layer. It offers a rich source for the growth of fungus. Dead leaves, branches, and dead animals decay in this layer.

There are three major forest zones based on the distance from the equator, which are

1. Tropical,
2. Temperate, and
3. Boreal forests.

ISBN: 978-93-93259-95-0

Tropical rainforests have different subcategories as follows:

- Evergreen
- Seasonal
- Dry
- Montane
- Tropical and subtropical

Subcategories of temperate forests include moist conifer, evergreen broad-leaved, dry conifer, Mediterranean, and temperate broad-leaved rainforest. Boreal forests grow in higher latitudes, where the temperatures reach the freezing point.

Types of Forests

Forests are primarily referred to as the terrestrial ecosystem of the Earth. They are widely spread all over the surface of the Earth. The majority of the forest land is concentrated in just 5 major countries and those are Brazil, the United States, China, Canada, and the Russian Federation. About 45% of the forest land that is the largest forest share is in the tropical zone followed by temperate, boreal, and subtropic domains. Thus, the forests are divided into three major types as follows.

1. **Tropical Forests:** Tropical forests generally lie between 23.50 N and 23.50 S latitudes. The temperature that prevails in this forest is around 680 and 770 Fahrenheit throughout the year. They normally experience 100 inches of rainfall every year and thus do not have any winter season. This type of forest avails broad leaves trees that are in majority in this forest and they normally grow 82 to 115 feet tall. Vines, ferns, mosses, orchids, and palms are the alternative variations that are found here. The various categories of tropical forests are evergreen, seasonal, dry, montane, tropical and subtropical, coniferous, and subtropical.
2. **Temperate Forests:** The temperate forest is further divided into two subcategories and those are temperate deciduous forests and temperate coniferous forests. Temperate deciduous forests are mostly found in Japan, China, Europe, and a few parts of Russia as well as in the eastern part of the United States and Canada.

In this forest, precipitation occurs all year long and it experiences distinctive seasons. Precipitation comes in the form of rain in spring, summer, and fall and it snows heavily in winters. Temperate deciduous forest saves a range of about 30 to 60 inches annually and thus the soils are very fertile here. The floor of this forest is covered with ferns, mosses, and wildflowers. Oak, apples, and birch trees are the dominant trees of this forest.

Temperate forests are mostly found in coastal regions that have heavy rainfall and very mild winters. Thus, they are also found in the regions of inland mountains that have very mild climates.

ISBN: 978-93-93259-95-0

The regions include New Zealand, Southern Japan, Pacific Northwest in the United States and Canada, South-Western South America, and a few parts of North-Western Europe. They have a prolonged growing season with very high precipitation. They are also characterized by moist climates. The rainfall received by this forest is around 50 and 200 inches of rain per year. The soil of this forest is very rich with a thick layer of decaying matter. The conifers are the dominant trees of this forest. These trees grow very tall and are credited to the high precipitation level and moderate temperature.

3. **Boreal Forests:** Boreal forests are also known as taiga forests, better found between 50 and 60 degrees north latitude. Siberia, Canada, North Asia, and Scandinavia are a few of the areas that have boreal forests. About 65% of the boreal forests are concentrated in Scandinavia. These forests are characterized by very long winters and very short summers. They receive between 15 and 40 inches of precipitation annually, most of which is snow. They have an undermined rate of decomposition and a very thin layer of soil because of the very cold temperature. The trees that are found in these forests are mostly evergreen trees. Some of the examples of these trees are pine, spruce, and fir. Due to its very dense canopy, it has very limited vegetation.

Forests in India

The total geographical area of the country is 32,87,263 sq km out of which an area of 6,75,538 sq km or 20.5 per cent was under forests in 2001 (Table-1). This is much below the average of 30.4 per cent for the world.

ISBN: 978-93-93259-95-0

Table-1

India: Forest Cover Estimates (sq km)

Cycle	Year	Satellite and Sensor	Data Period	Forest Cover
First	1987	Landsat-Mss	1981-83	640,819
Second	1989	Landsat-TM	1985-87	638,804
Third	1991	Lansat-TM	1987-89	639,364
Fourth	1993	Lansat-TM	1989-91	639,386
Fifth	1995	IRS-1 B LISSII	1991-93	638,879
Sixth	1997	IRS-IB LISSII	1993-95	633,397
Seventh	1999	IRS-IC/ID LISS III	1996-98	637,293
Eighth	2001	IRS-IC/ID LISS III	2000	675,538

ISBN: 978-93-93259-95-0

Table-2

India: State wise Area under Forest (sq km) in 2001

State /Union Territory	Geographical Area	Total Forest	Dense Forest	Open Forest	Percentage of forest area to geographical area
Andhra Pradesh	275069	44637	25827	18810	16.23
Arunachal Pradesh	83743	68045	53932	14113	81.25
Assam	78438	27714	15830	11884	35.33
Bihar	94163	5720	3372	2348	6.07
Chhattisgarh	135191	56448	37880	18568	41.75
Goa	3702	2095	1785	310	56.59
Gujarat	196022	15152	8673	6479	7.73
Haryana	44212	1754	1139	615	3.97
Himachal Pradesh	55673	14360	10429	3931	25.79
Jammu & Kashmir	222236	21237	11848	9389	9.56
Jharkhand	79714	22637	11787	10850	28.40
Karnataka	191791	36991	26156	10835	19.29
Kerala	38863	15560	11772	3788	40.04
Madhya Pradesh	308245	77265	44384	32881	25.07
Maharashtra	307713	47482	30894	16588	15.43
Manipur	22327	16926	5710	11216	75.81

ISBN: 978-93-93259-95-0

State /Union Territory	Geographical Area	Total Forest	Dense Forest	Open Forest	Percentage of forest area to geographical area
Meghalaya	22429	15584	5681	9903	69.48
Mizoram	21081	17494	8936	8558	82.98
Nagaland	16579	13345	5393	7952	80.49
Orissa	155707	48838	27972	20866	31.37
Punjab	50362	2432	1549	883	4.82
Rajasthan	‘342239	16367	6322	10045	4.78
Sikkim	7096	3193	2391	802	44.99
Tamil Nadu	130058	21482	12499	8983	16.52
Tripura	10486	7065	3463	3602	67.38
Uttaranchal	53483	23938	19023	4915	44.76
Uttar Pradesh	240928	13746	8965	4781	5.71
West Bengal	88752	10693	6346	4347	12.05
A. & N. Islands	8249	6930	6593	337	84.01
Chandigarh	114	9	5	4	7.89
D.& N. Haveli	491	219	151	68	44.60
Daman & Diu	112	6	2	4	5.36

ISBN: 978-93-93259-95-0

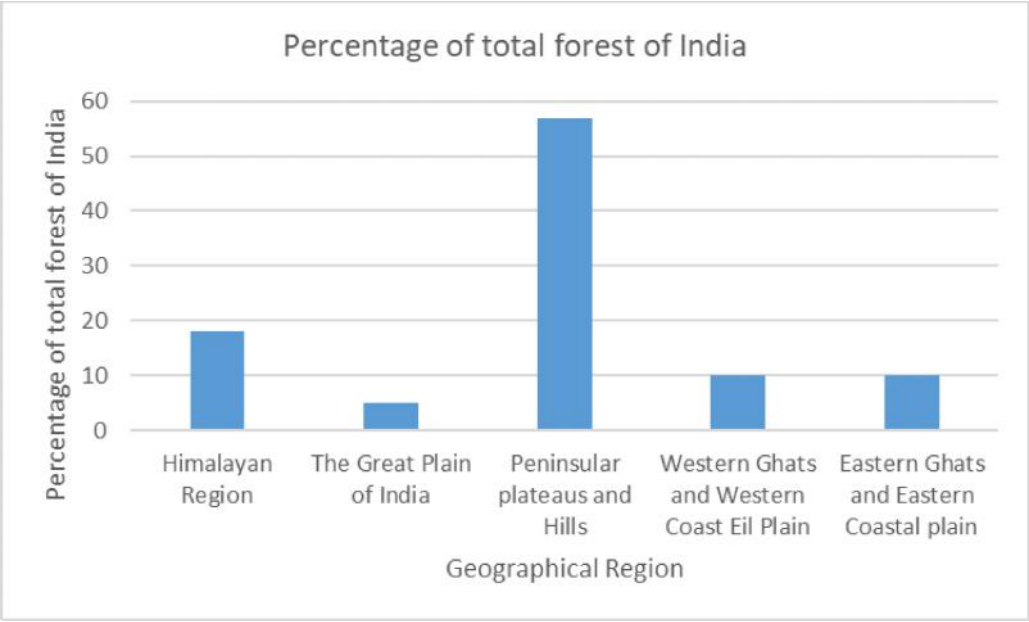
Table-3

Geographical Distribution of Forests in India

SI.No.	Geographical Region	Percentage of total forest of India
1.	Himalayan Region	18
2.	The Great Plain of India	5
3.	Peninsular plateaus and Hills	57
4.	Western Ghats and Western CoastEil Plain	10
5.	Eastern Ghats and Eastern Coastal plain	10
	Total	100

Bar Diagram - 1

Percentage of total forest of India



ISBN: 978-93-93259-95-0

According to the National Forest Policy, the minimum desired area which is considered safe for a tropical country like India is about 33 per cent. As per broad policy recommendations, about 60 per cent of the area in the Himalayas and the Peninsular hills and 20 per cent in the Great Plains should be under forests.

Furthermore, the per capita forest area in India is bare 0. 07 hectares against the world average of 1.08 hectares. The per capita forest cover is 1 .8 hectares in the U.S.A., 3.2 hectares in Sweden, 3.5 hectares in Russia, 5.1 hectares in Australia, 8.6 hectares in Brazil and 22.7 hectares in Canada.

Economic Importance of Forests in India

Forests are natural habitats for many animals. The trees supply oxygen to the atmosphere. They affect the rainfall in a particular region. They also provide us with wood, medicines, food, perfumes, paper, clothes, etc.

Trees are the world's largest storehouses of carbon which is important to maintain global temperatures. The rise in carbon levels is believed to be the main reason behind global warming. In spite of the advantages of forests, deforestation has become very rampant in the modern era causing several problems like pollution, soil erosion, and climate change. Here are some of the reasons that explain the importance of forests for all living beings (See figure 1) and why they should be preserved proactively.

1. Uses of Trees to Absorb Greenhouse Gases

Forests maintain the ecosystem by absorbing greenhouse gases like carbon dioxide that are believed to be the reason for climate change. Carbon is stored in the biomass within the forests. Tropical forests alone harbor a huge amount of carbon (around a quarter of a trillion tons) that can be disastrous if it is released into the atmosphere.

2. Importance of Trees to Provide a Natural Habitat

Forests provide a sustainable environment for the survival of millions of animals. It is home to several species including snakes, turtles, crocodiles, insects, birds, butterflies, monkeys, and other wild animals. It provides an ecosystem for the animals to thrive. The forest floor is also a rich medium for microorganisms, which are essential for the conversion of dead matter into nutrients. Forests are also home to indigenous people who depend on them for their livelihood.

3. Importance of Forests as Watershed Regions

Forest-based water tables, rivers, streams, and lakes are critical sources of water. The green cover preserves the water reserves from sun radiation. The Amazon forest is home to the world's largest watershed and river system.

ISBN: 978-93-93259-95-0

4. Importance of Forests to Support Biodiversity

Globally, around 90% of the species including various plants and animals thrive in forests. They offer the necessary habitat and support biodiversity. They are home to the genes of biodiversity.

5. Importance of Forests to Purify the Air

Photosynthesis is a critical function of plants to generate food and energy. Plants, shrubs, and trees absorb carbon dioxide from the atmosphere during the daytime and release oxygen. According to an estimate, an acre of mature trees can provide oxygen for 18 people. They act as giant lungs purifying the air in the atmosphere by removing carbon dioxide and maintaining balanced levels of oxygen that we breathe every day. Trees absorb odours and pollutant gases like ammonia and sulphur dioxide out of the air. These toxins are trapped in the leaves and barks.

6. Importance of Trees to Regulate Global Temperatures

Forests provide green cover which absorbs the Sun's radiation and keeps the temperature down. They regulate atmospheric temperature through evapotranspiration and breeze. Forests also promote rainfall that helps in maintaining the water table and a cool climate. Deforestation has the opposite effect causing the global temperature to rise dramatically.

7. Importance of Forests to Enrich the Soil

Dead leaves and broken branches ultimately are converted to soil through the decomposition process and this conversion enriches the soil with nutrients. Microorganisms present in the soil convert the biodegradable material to simpler particles that can be utilized by the plants again. Trees have very strong roots that hold the soil intact in cases of floods or any other reasons that cause soil erosion. They are very critical in hilly areas or stream slopes as they slow the runoff and keep the soil intact. Uncontrolled soil erosion can destroy the fertile soil leading to barren conditions.

8. Importance of Forests to Regulate the Water Cycle

Forest is an important component of the water cycle process. They regulate evaporation, condensation, and precipitation of the water. They also nourish the aquifers thereby replenishing groundwater supplies. Trees allow the rainwater to flow down the trunk into the soil thereby preventing the stormwater from carrying pollutants to the ocean. They act as giant sponges that filter water and recharge the water table.

9. Importance of Forests in Our Life

Forests are rich in herbs, plants, and trees of medicinal value. The extracts, seeds, leaves, and bark from these plants and trees treat several diseases while being non-toxic to the human body. Some examples include quinine, curare, rosy periwinkle, wild yams, extracts of willow trees, calabar bean, and samambaia.

ISBN: 978-93-93259-95-0

10. Forests Provide Economic Benefits

Forests have a lot to offer to human beings. Every component of a tree including leaves, branches, stem, bark, fruits, seeds, and root are useful. Forests provide wood, timber, raw materials, vegetables, and fruits, which have significant economic value. The timber is used in construction and making furniture. Wood is also essential in the production of paper. The rubber extracted from trees is used to make several products. Even green waste has economic significance.

Millions of trees are chopped off every year to support the increasing need of human beings. We have to take proactive measures to preserve forests and increase the green cover in the interest of millions of living beings that depend on them.

Thus, there are two types of benefits of forests on an economic front and they are direct benefits and indirect benefits. For instance, the contribution of forests towards the national income of India is increasing gradually. About 0.86 % of the forest wealth of India was contributed towards the gross domestic product in the year 1970-71. It has increased gradually to 1.8% in 1990-91. All the direct benefits are accounted for by forest resources that contribute around 2.9 % to the net domestic product for the country as a whole. Also, about 179 million cattle, 58 million buffaloes, and 120 million other livestock are provided for by the forests of the country. The forest has been declared the home of 500 types of animals.

About 15 lakh people are engaged as woodcutters, sawyers, Carters, and craftsmen and in other related forest industries and therefore are full-time employed because of the presence of forests. They are also homes for the submerged class in the country; for instance, there are about 38 lacs of tribals that found homes in various forests. 10,000 is considered as an ecological and economical part and parcel of the forest environment. There are about 5000 species of wood out of which 450 are commercially valuable and are specially used for extracting acetic acid methyl alcohol acetone, certain oils, and valuable drags like sulphonamide and chloroform. The total volume of timber which is one of the most economically viable wood in the country is about 85,696 M3 of which 93% and non-coniferous and only 7% of coniferous.

The indirect economic benefits consist of rendering the climate that increases the relative humidity of the atmosphere and therefore the precipitation increases by the forest. Sustainable feeding off spring water supply and reduction in violent floods are regulated by the forest and also makes the floor of the water in the river continuous.

This forest also channels the land by protecting it from the evil of erosion and climate access that in the end performs as a valuable and more expressible service that generates revenue than those rendered by the defence force of the country. Various worms, insects, and various miniature organisms feed on the humans and the tunnel in the soil, thus, making it suitable as a portion of food for the plants. Forests also act as a natural defence against aerial attack by covering the entire land with its canopies.

ISBN: 978-93-93259-95-0

References

1. Anonymous. 1998&1999. Forest Survey of India. Ministry of Environment and Forests, Govt. of India, Dehruden, India.
2. Guleria, A.S.1988. Current production and future requirement of wood products in India. Indian J. Agric. Econ., 43 (3): 270-76.
3. Kalla, J.C. 1988. Forestry and economics development. Indian J. Agric. Econ., 34 (3): 237-57.
4. La, J.B. 1989. India's forests-myth and reality. Natraj publishers, Dehruden, India: 214
5. Lynch, O.J.1995.Joint forest management: superior property rights. Econ. and Pol. Weeky, 30 (30).1933-38.
6. Oberia, C.P.2000. Forests for new millennium. Employment News. Ministry of Information and Broadcasting, Govt. of India, New Delhi, 24 (51):1-3
7. Rai, K.N. Shri Niwas and R.K. Khatkar. 1983.

 ISBN: 978-93-93259-95-0

Agro Biodiversity for Sustainable Agriculture in India- Issues and Challenges

Dr. Y. Venuprasad

Asst.Professor of Economics, Girraj Govt College (A), Nizamabad, Telangana

Abstract

Agro biodiversity is a vital subset of biodiversity, which is developed and actively managed by farmers, herders and fishers. Many components of agro biodiversity would not survive without this human interference; local knowledge and culture are integral parts of agro biodiversity management. Sustainable use of agricultural biodiversity can improve people's well-being and food and nutrition security. Agro biodiversity refers to the variety and variability of living organisms that contribute to food and agriculture in the broadest sense, and that are associated with cultivating crops and rearing animals within ecological complexes. India is rich in agro biodiversity and considered to be one of the centers of origin of food crops, oilseed crops, horticultural crops, spices and medicinal plants. Biodiversity and agriculture are strongly interrelated, and the country has around 811 cultivated plants and 186 breeds of livestock and poultry. Some of the challenges India is facing in terms of loss of agro biodiversity include: chemical-intensified agricultural farming and increasing replacement of locally adopted and traditionally grown cultivars by high-yielding modern varieties, soil degradation, fragmentation, excessive tillage, inappropriate crop rotation, water scarcity, post-harvest losses, natural disasters and climate change impacts. The overall objective present paper is to increase the sustainable use of agro biodiversity of India in improving people's well-being and food and nutrition security by conserving the landraces, wild varieties, folk varieties, cultivars, domesticated stocks and breeds. To undertake this paper, a policy analysis of various schemes, missions and programmes of the Ministry of Agriculture and Farmers' Welfare, Government of India was carried out and recommendations were put forth towards promoting ecologically intensified agricultural farming practices by integrating ecological principles.

Keywords: *Agro biodiversity, conservation, genetic resources, Agro biodiversity Index,*

Introduction

Agriculture was first developed around 10000 years ago and biodiversity enabled evolution of farming systems. Biodiversity and agriculture are strongly interrelated in a way that biodiversity forms the basis of agriculture and agriculture promotes conservation and sustainable use of biodiversity. An amalgamation of agriculture and biodiversity, in its broader sense includes all components of biodiversity in relation to food and agriculture, agricultural ecosystems, its structure

and processes. It acts as source of income by providing food, and raw materials for food, fuel, shelter and herbs. Also, it conserves soil and water, maintains soil fertility and flora thus supporting life. Genetic diversity helps species adapt to changing environment conditions and confer resistance against various stress conditions such as extreme temperatures, water retention and diseases. As a result of cumulative effect of both natural selection and human inventive, agricultural biodiversity portrays the interactions among the environment, genetic resources, management systems and agricultural practices.

Objectives of the study

1. To understand the Dimensions agro biodiversity
2. To analyze the Benefits of agro biodiversity
3. To identify the Causes for the loss of agro biodiversity and challenges faced with reference to India
4. To highlight the significance of agro biodiversity with the Policy and institutional strengthening in India by concluding remarks

Methodology

This paper is based on secondary data. It's an exploratory and descriptive in nature. THE information was collected from various official documents, Reports national and international committees and organizations. Research studies, books, journals, newspapers, ongoing academic working papers and concerned websites.

Dimensions of agricultural biodiversity

The identified dimensions of agricultural biodiversity are:

- Genetic resources for food and agriculture that includes plant, animal, microbial genetic resources those constitute the core units of production in agriculture
- Components of biodiversity which support ecosystem
- Abiotic factors which include physical and chemical factors and structure of ecosystems
- Socio-economic and cultural factors which include activities and management practices

Methodologies of assessing agro biodiversity

Agricultural biodiversity contributes to multiple sustainability dimensions and SDGs. Measuring agro biodiversity enables researchers, policy makers, and farmers to work toward a more sustainable food system. Numerous validated methodologies and indicators have been developed for assessing agricultural biodiversity; however, quantifying biodiversity remains problematic as no single indicator is universally applicable (Morris et al., 2014). Indices include

ISBN: 978-93-93259-95-0

the Simpson's diversity (Simpson, 1949), Shannon's diversity (Spellerberg and Fedor, 2003), and more recently, Dietary Species Richness (Lachat et al., 2018)-each holding strengths and limitations.

Beyond conventional measures of agricultural production, metrics should include additional indicators that measure agrobiodiversity for nutritional quality, nutritional diversity, food systems, and dietary diversity (Hunter et al., 2016). As a potential solution, Bioversity International (2017) has recently developed the Agro biodiversity Index (ABD Index) as a method of measuring agro biodiversity in a consistent, long-term manner to be applied across all pillars of sustainable food systems. The ABD Index assesses diversity in production, food markets, consumption, conservation, and seed systems.

Benefits of Agro biodiversity

- Increases productivity, food security, and economic returns.
- Reduces the pressure of agriculture on fragile areas, forests and endangered species.
- Makes farming systems more stable, robust, and sustainable.
- Contributes to sound pest and disease management
- Conserves soil and increase natural soil fertility and health.
- Reduces dependency on external inputs.
- Improves human nutrition and provides sources of medicines and vitamins.
- Conserve ecosystem structure and stability of species diversity.

Agro biodiversity in India

Across the world, 37 sites are designated as Globally Important Agricultural Heritage Systems (GIAHS), of which three are Indian - Kashmir (saffron), Koraput (traditional agriculture) and Kuttanad (below sea-level farming). In India, over 811 cultivated plants and 902 of their wild relatives have been documented.

Causes of loss of agricultural biodiversity

- The social movements of smaller-scale food providers have summarized their views on the principal causes of the loss of agricultural biodiversity:
- The industrial model of production and consumption is rapidly eroding rural societies that manage agricultural biodiversity.
- The industrial model of production also displaces peasant varieties and breeds through using genetically uniform, and, increasingly, genetically modified, monocultures of crops, livestock, and fish, while locking up diversity in gene banks.

ISBN: 978-93-93259-95-0

- Land grabs and ocean/water grabs extend the area under this model of production.
- Intensive use of pesticides, herbicides, and chemical fertilizers further reduces agricultural biodiversity and ecosystem functions.
- Climate change, exacerbated by this model, is putting new pressures on the local diversity of crops and livestock as weather patterns change, and new pests and diseases proliferate. Consequent disaster relief efforts distributing inappropriate, often industrial, seeds and livestock breeds undermine local agricultural biodiversity.
- Industrial research systems for this model devalue and erode peasant and indigenous knowledge, local research capacities, and the multitude of local innovation systems that foster agricultural biodiversity.
- Monopolies, favored by this model, control industrial seed, agrochemical, and industrial commodity markets and value chains, and this jeopardizes freedom for peasants to control, access, and use agricultural biodiversity.
- Intellectual property rights (IPRs) (sometimes dubbed "industrial" property rights by peasant organizations because they defend the interests of industry) and other laws that protect seed monopolies stimulate the widespread use of industrial varieties and can also criminalize peasant producers who develop, use, share, exchange, and sell their heterogeneous seeds.

Challenges facing agricultural biodiversity

Modern agriculture has evolved from time to time to meet the ever increasing demand of growing population coupled with changing production and consumption patterns. This led to an increase in the food production and improved food security meanwhile causing considerable damage to biodiversity. In the last few decades, the world has witnessed an unprecedented loss of biodiversity in all the ecosystems including agriculture ecosystems. It has been estimated that about three quarters of the agricultural genetic diversity has been lost over the last century.

- Loss of crop genetic resources due to adopting new crop varieties without conserving traditional varieties. For example, Bt cotton.
- Similarly, there are concerns on high output breeds for production of meat, milk and eggs. Crossbreeding of foreign breeds with indigenous breeds leads to erosion of genetically diverse pool.
- Out of 2,50,000 globally identified plant species, about 7,000 have historically been used in human diets.
- Today, only 30 crops form the basis of the world's agriculture and just three species of maize, rice and wheat supply more than half the world's daily calories.

ISBN: 978-93-93259-95-0

- The main challenges agriculture counters in relation with biodiversity are Sustenance of agricultural biodiversity and ecosystem services and Lessening the negative impacts of agricultural systems and practices on biodiversity.

There are various factors that contribute to the loss of biodiversity in agriculture and other ecosystems. They include direct drivers such as climatic changes and availability of natural resources, land-use changes and indirect drivers such as demography, economy, socio politics and science and technology.

The loss of forest cover, coastal wetlands, 'wild' uncultivated areas and the destruction of the aquatic environment exacerbate the genetic erosion of agro biodiversity. the main cause of genetic erosion in crops, as reported by almost all countries, is the replacement of local varieties by improved or exotic varieties and species.

The following measures help address the challenges discussed above:

- Assessing the current status and future trends of the worlds agricultural biodiversity
- Understanding the original causes of these changes and gaining knowledge of management practices
- Identifying management techniques and practices that can be adapted to bring about the change
- Increasing awareness and promoting the plan of action
- Bringing into practice the plans and strategies for the conservation and sustainable use of agricultural biodiversity into relevant sectors

Significance of Agro biodiversity for India

India's promising genetic resources include rice from Tamil Nadu (Konamani), Assam (Agni bora) and Kerala (Pokkali), Bhalia Wheat and mushroom (Guchhi) from Himachal Pradesh and rich farm animal native breeds - cattle (42), buffaloes (15), goat (34), sheep (43) and chicken (19). Since, genetic diversity of crops, livestock and their wild relatives, are fundamental to improve crop varieties and livestock breeds, this can help in the following ways:

- **In combating hunger:** India is ranked 102 in the Global Hunger Index (GHI) out of 117 qualified countries.Hunger is defined by caloric deprivation; protein hunger; hidden hunger by the deficiency of micronutrients.
- **In combating Malnutrition:** Nearly 47 million or four out of 10 children in India do not meet their potential because of chronic under nutrition or stunting.This leads to diminished learning capacity, increased chronic diseases, low birth-weight infants from malnourished parents.The global nutrition report pegs 614 million women and more than half the women in India aged 15-49 as being anaemic. Agrobiodiversity can help in nutrition-sensitive farming and bio-fortified foods.

ISBN: 978-93-93259-95-0

- For instance, moringa (drumstick) has micronutrients and sweet potato is rich in Vitamin A. There are varieties of pearl millet and sorghum rich in iron and zinc.

This will help India achieve UN Sustainable Development Goal 2 (Zero Hunger) and the Aichi Biodiversity Target (focuses on countries conserving the genetic diversity of plants, farm livestock and wild relatives).

Policy and institutional strengthening of agro biodiversity

The BD Act, 2002, defines agro biodiversity as agriculture-related species and their wild relatives. It is important that the conservation and sustainable utilization of agriculturally important plants, animals and microbes need to be effectively integrated into the biodiversity strategies, plans and programmes of the MoA&FW, GoI. Some of the issues that need immediate attention includes: (a) protection of landraces/traditional crop varieties; (b) policy on conventional breeding, and (c) conservation of wild relatives of crop plants, etc. For strengthening the implementation of BD Act into the agricultural sector, the following are recommended: (a) This concerned State Governments in consultation with the local biodiversity management committee should notify the agrobiodiversity hotspots as Biodiversity Heritage Sites (BHS). The PPV&FRA has already identified 22 agro biodiversity hotspots and these can be considered for BHSs. (b) For sustainable utilization of livestock and animal breeds, it is recommended to list out animals and animal products and notify them as 'Normally Traded as Commodities'. (c) Guidelines need to be prepared for utilizing the national, state and local biodiversity funds accrued as royalties, and modalities need to be evolved for sharing the benefits to the benefit claimers. (d) A single window clearance system can be developed by integrating National Biodiversity Authority (NBA), PPV&FRA, Patent Office, State Biodiversity Boards (SBB), Biodiversity Management Committees (BMCs), etc. to make the entire process simple and transparent. (e) There must be clarity regarding the use of foreign microbes by Indian companies. (f) National-level invasive alien microbes by Indian companies species strategy need to be developed or identifying the pathways, mapping, monitoring,

Concluding remarks

To strengthen the implementation of the BD Act, it is recommended to: (a) identify the agro biodiversity important areas and notify them as BHS; (b) list out animals/animal products under the 'Normally Traded as Commodities' as similar to plants varieties; (c) create a single-window clearance for processing ABS applications and prepare guidelines for utilizing the biodiversity funds for benefit-sharing and (d) develop national policy/ strategy for controlling and managing the invasive species. By adhering to the above recommendations, it is assured that the agro biodiversity wealth of India can be enhanced for food, nutritional, health and livelihood security of the country.

- It is strongly recommended to have a comprehensive policy on ecological agriculture for sustaining the country's agro biodiversity. For maintenance of biodiversity in the production

ISBN: 978-93-93259-95-0

landscape, it is recommended to promote native, agriculturally important insects and bees in the agricultural landscapes by growing hedges, cooling ponds and flowering plants in the from fences to attract insects and bees. Bio-village concept: Ecologically sensitive farming can be done by conserving crop wild relatives of cereals, millets, oilseeds, fibres, forages, fruits and nuts, vegetables, spices etc. for crop genetic diversity healthier food.

- Providing incentives for farmers cultivating native varieties and those conserving indigenous breeds of livestock and poultry varieties.
- Community seed banks should be encouraged in each agro-climatic zone.
- Developing a national level invasive alien species policy is required to identify pathways, mapping, and monitoring, managing, controlling and eradicating invasive species.
- The consumption pattern and culinary diversity must be enlarged to increase India's food basket.

References

1. FAO. 1996. Global plan of action for the conservation and sustainable utilization of plant genetic resources for food and agriculture. Leipzig, Germany, June 1996.
2. FAO. 1999a. Agricultural Biodiversity, Multifunctional Character of Agriculture and Land Conference, Background Paper 1. Maastricht, Netherlands. September 1999.
3. FAO. 1999b. Women: users, preservers and managers of agrobiodiversity (available at www.fao.org/FOCUS/E/Women/Biodiv-e.htm).
4. IK Notes, No 23. August 2000. Seeds of life: Women and agricultural biodiversity in Africa.
5. IUCN/ DFID. (No date). Biodiversity in development, Biodiversity Brief No. 6. United Kingdom. (available at www.iucn.org/themes/wcpa/pubs/pdfs/biodiversity/biodiv_brf_06.pdf).
6. Thrupp, L.A. 1997. Linking biodiversity and agriculture: Challenges and opportunities for sustainable food security. World Resources Institute, USA.
7. Annual Report of Agriculture 2017-18, Ministry of Agriculture and Farmers' Welfare (MoA&FW), Government of India (GoI).
8. MoEFCC, National Biodiversity Action Plan (NBAP) Addendum 2014 to NBAP, Ministry of Environment, Forest and Climate Change, GoI, 2008.
9. UNDP, Linking sustainable development goals to national biodiversity targets. Biodiversity Finance Initiative, United Nations Development Programme, 2016.
10. MoA&FW, Annual Report of Agriculture 2017-18, GoI. Department of Chemicals and Petrochemicals, Annual Report 2015-16, Ministry of Chemicals and Fertilizers Department of Chemicals and Petrochemicals, GoI.
11. Ministry of Statistics and Programme Implementation, GoI; http://www.mospi.nic.in (accessed on December 2018).
12. MoEFCC, State of Environment Report, 2015 (Draft), Ministry of Environment Forest and Climate Change, GoI.
13. FAO and Biodiversity for Food and Agriculture; http://www.cbdint/financial/idb2015/fao-foodagro.docx
14. Magdoff, F., Ecological agriculture: principles, practices and constraints. In Renewable Agriculture and Food Systems, Cambridge University Press, UK, 2007, vol. 22(2), pp. 109-117.
15. Vision 2050, ICAR-National Bureau of Animal Genetic Resources; http://nbagr.res.in

ISBN: 978-93-93259-95-0

Trees and Tribes an Analysis of Ecological Perspective in Mahasweta Devi's "Arjun"

Gonela Subhash

Assistant professor of English, GRP Government Degree College, Bhinsa
Email: subhashgnl@gmail.com

Abstract

Mahasweta Devi's Short story "Arjun" is an allegory that shows how the lives of trees and tribes are interdependent on each other. Through this story, Mahasweta Devi throws light on the systemic state violence on tribes and the trees. For the feudal land lords of the story, who also happen to represent political power, exploitation of forest resources and the human resources is the only thing that paves way for their prosperity and dominance. For them forest is an unending source of income and the tribes who dwell in the forest are a source of cheap labour. The story shows how the land lords use the tribal youth to cut down trees and spread their agricultural fields deep into the forests. Clearing the forests is also an act of destroying the identity; the way of life, the culture and traditions of the tribal communities for forest is inseparable from the tribal civilizations. Deforestation leads to extinction of many species of flora and fauna and it also means the displacement of tribal communities and extinction of their way of civilization. The tribal people who once were great hunters are turned into petty criminals, drunkards and menial labourers in their own land by displacing and disassociating them from forest. At the end of the story the awakened people of forest show their resistance against the might of the land lords. The unharmed Arjun tree remains firmly rooted as a symbol of tribal civilization. The tree and the tribe, both free themselves from the clutches of the capitalistic and feudal forces.

Key words: *tribal people, forest, marginalization, criminalization, exploitation,*

Tribal people are often the protagonists of the works of MahaSweta Devi. Through her works, she attempts to stand against the injustices and atrocities being committed on the tribal people. She raised her voice several times against the discrimination suffered by tribal people in India. She resents the systemic oppression which includes criminalization of native tribes with the help of unjust laws. Mahasweta Devi once said, "All my writing is about real people and real issues. It doesn't cater to any specific ideology." (She the people blog, Mahasweta Devi: Writer And Activist Who Fought For Tribal Community)

Her writing addressed one single word: injustice," G. N. Devy, a writer and activist who worked closely with Ms. Devi, said. "Wherever she saw what she thought was injustice, she plunged into the struggle and never looked back."

ISBN: 978-93-93259-95-0

According to Gayatri Chakrabortny Spivak, the Indian cultural critic who translated a collection of Ms. Devi's short stories into English "Her tribal characters are too much the noble savage," She represented all the sections of society that had no voice. Even her fictional work is littered with social messages. Her protagonists are the socially marginalized tribals, and she wrote extensively about their struggles. She realized fiction could not properly represent the issues she wanted to bring attention to. Thus she took to writing journals and papers about tribal issues.

The lives of trees and tribes in the forest are intertwined with each other. The tribes have been hunting and gathering in the jungles from the time immemorial. The modern system of governance has imposed new laws that branded their traditional way of life as being criminal. The tribes utilizing the forest resources in a controlled and limited way suddenly became illegal hunters, poachers and smugglers with the onset of new laws. The dominant caste oppressive outsiders who wielded the power in administration and politics, compelled the tribes into subjugation with the help of the laws.

The protagonist of the story Arjun belongs to Shabar community of Purllia district, West Bengal. The Sabar people (also Shabar and Saora) are one of the Adivasi of Munda ethnic group tribe who live mainly in Odisha and West Bengal. During the colonial period, they were classed as one of the 'criminal tribes' under Criminal Tribes Act 1871, and suffer from social stigma and ostracism in modern times.

In his "Kharia: The Victim of Social Stigma", Chandidas Mukhopadhyay tells us: "villagers in general believe that [Sabars] do not have human feelings like a normal man", that they are "born criminals [who] commit all sorts of crime." Like all denotifiedtribals elsewhere in the country, Shabars of Purulia region live under the constant threat of arrest, torture and murder by the local police.

The tribal people fell trees and the furniture made from the felled trees adorns the homes of the rich outsiders. The tribal people are made to clear the jungles and the same cleared jungles become agricultural lands of the rich land lords.

Ketu Shabar, a tribal youth from Purulia, works for bishalMahato, a land lord. Ketu had been sent to prison for felling the trees of the forest for the paddy fields of Ram Haldar, who collects the profits of the felled trees. Mahato and Haldar, though they belong to different political parties, their nature of exploitation of tribes is the same.BishalMahato asks Ketu to cut down the Arjun tree which is considered divine manifestation by the local tribes. He is threatened with a jail sentence if he does not obey to cut down the tree.

For Ketu's Shabar tribe and all other tribes in the region, the Arjun tree is a symbol of their civilization and identity. Cutting down the tree would only mean the breaking away from the tradition and culture of the tribe itself. Ketu, along with his other tribal friends hatches a plan to protect the tree from the greedy clutches of the land lord. He spreads a word among the local tribes that Diga, a friend of Ketu had a dream in which Bishal Mahato gave him money to build

ISBN: 978-93-93259-95-0

a concrete base around the trunk of the Arjun tree by giving him money. All the tribes gathered around the tree to celebrate that occasion. The permanent base built at the base and the wide attention and celebration under the tree ensured permanent safety for the tree. In this way ketu cleverly manages to save the tree from being cut down.

Tribes and trees have been living in a symbiotic relationship for centuries in the forests of India.Trees and forests are synonymous with the tribal civilization. Especially for the tribal people, trees are the mute spectators and symbols of their way of life. If forests go extinct, so will the civilization of the tribes. Here in the story, Ketu, did not mind going to prison or the exploitation by the land lords. But when he was asked to cut down the Arjun tree, which is considered sacred and holy, he could not allow it to happen. He felt that very existence of their tribe is at stake if th tree is cut down. From being a loyal servant, Ketu evolved into a clever rebel to protect what he considers to be the symbol of his and his tribe's civilization.

Mahasweta Devi, through this short story, conveys the message that trees and tribes are interdependent on each other for survival. For the tribes forests are an integral part of their way of life, rituals - festivals, traditions and cultural practices of the tribes are inseparably woven with the jungle. For them, jungle is the all giving and forgiving mother. In contrast, for the outsiders jungle is a mere source of income or a hindrance to the progress and development. In recent years there have been many instances, where jungles are cleared for the purpose of construction of some dam or factory and the tribes of the jungle are driven away from their home lands. The story "Arjun" is a mirror reflection of such incidents. As per an article published in India Water portal the callous attitude of the state can be attributed to the fact that "most displaced persons are assetless rural poor like landless labourers and small and marginal farmers (Gandhi's last man). The tribals who comprise 8.08% of India's population are estimated to be more than 40% of the displaced population. Dalits constitute 20% of displaced persons."

The story is also about the simmering anger of the tribes of India against unjust policies which are being implemented in the name of development and progress to plunder the forest resources and displace the tribes from their homes.

References:

1. Maha Sweta Devi, "Arjun." English for Accomplishment, edited byV. Srinvas, et.al., Cambridge University Press 2017, pp 85-89.
2. Fernadez,Walter, Deveopment and displacement, India Water Portal.
3. D'Souza, Dilip, On the Shabar tribe, October 16, 1999, Rediif.com
4. D'Souza, Dilip, accused of being accused,10 June 1999, Rediff.com
5. Swminathan, Kaushik, Maha Shweta Devi, 02 August 2016, New York Times

 ISBN: 978-93-93259-95-0

Nature Reflects in Diversity

Dr. Pavan Kumar

Asst Professor of Hindi, Gopal Rao Patil Govt Degree College, Bhainsa Dist. Nirmal, Telangana
Email: pandeypavan67@gmail.com

Abstract

Forest provides food, shelter, clean air and water to support a wide range of species. All species provide some kind of functions to our ecosystem. They can store energy, produce organic material, decompose organic material, help to recycle water and nutrients throughout the ecosystem, control pests, fix atmospheric gases, and help to regulate climate. The role of biodiversity in climate is most important at global scales.

Forest conservation is the practice of planting and maintaining forested areas for the benefit and sustainability of future generations. Biodiversity is part of the nature that is alive. Forest plays vital role in human life, they provide diverse resources. Now-a-days forest area is depleting rapidly due to construction of roads, industries, expansion of agriculture, high growth rate of population. Forest biodiversity refers to all forms of lives, there is need of public awareness, people need to save the resources and conserve the bio diversity so that our future will be on safe hands.

Introduction

Nature always attracts all beings. And nobody can say this attraction will be end at certain point. The Main cause of this attraction is its Diversity. And from that period when seed of so called human civilization not planted in soil, we can see diversity in Forest only. Diversity includes plants also. From the beginning the Forest is only place where all beings can survive. Each and every being can get food in forest.

The journey towards the civilization of human being, created a huge distance between Forest and Human being's life. In this journey he took so many steps against the Nature. His view towards the nature or forest is changed. Human beings ambitions has no limits. By these ambitions diversity of forest is badly effected. As a result the humanity and all beings including plants also facing so many problems. So many species and plants losing existence. Human beings health is effecting badly and in various ways.

Objectives

- In the era of mechanical life human is not more than tools. Human beings concern with his own life is reduced at drastic level. We can't see his involvement in his own life. In this aspect it is our responsibility to attract human beings attention towards the nature. And we can enjoy nature in its all forms at Forest only.

ISBN: 978-93-93259-95-0

- By developing good relation with diversity of forest we create or make our life more beautiful and meaningful.
- For ourselves only, we should stop harming to Forest and its diversity. By reforestation or conservation of forest and making an atmosphere of save forest culture human being can make or create his life more enjoyable, harmonious, balanced, natural and beautiful.

Now the keeping and maintaining of diversity in all aspects is main task or challenge for humanity. Each and every human being has to do an important role to achieve this target. In all level we should start reforestation or forest conservation.

Methodology

Information gathered from secondary sources, Personal observation during routine life and from tours and trips in previous years.

This article not concern with any specific area or not limited to any geographical land. Article focus on or discuss about importance of Forest, bio-diversity and conservation of forest. Because Forest impact on our daily lives, we depend on forest for our survival, from the air we breathe, from the wood we cook food or we use it in various ways. Forest provides habitats for animals and livelihood for human beings, it also offer watershed protection, prevent soil erosion. Forest influences upon biotic and abiotic conditions also includes it's effect on animal and human life.

Forest also plays a major role in reducing various types of pollution such as air, water and noise pollution. Influence of forest on their environment forms part of vast and complex relationship between environment and forest. Forest provides essential nutrients to mankind, it provides medicinal products, gum, oil, spices, honey from honey bee ,etc.

It plays critical role for global environment, population and even on economy, the efforts of climate change and natural disasters. Trees are a renewable resource that can replenish themselves. Sustainable forest management ensures that young trees are planted when old ones are harvested. Forests can mitigate climate change by capturing and storing carbon dioxide from atmosphere.

The paper and wood are produced these are renewable and environmentally friendly compared to other materials such as plastics. They control or reduce landslides and avalanches.

Forests are among the bio diverse ecosystems on planet including food, fiber, biomass, shelter for people and wildlife. Forests also play a key role in protection of water resources, about one-third of world's largest cities obtain a significant proportion of their drinking water from forested protection areas. Forest is an important economic sector in many countries. Forest are predominant terrestrial ecosystems of earth and are found around the globe.

ISBN: 978-93-93259-95-0

Influence of forest on climate conditions:

Effect of forest in reducing temperature is much greater. it diminishes the daily range of air temperature. Air of forest is cooler and moisture than air in open, it also influence evaporation of water from the land. Natural forest which occurs naturally help in reducing soil erosion, also protects biodiversity. The trees absorb carbon dioxide from atmosphere and fix it into roots and it increases water holding capacity.

Impact of forest on plant and animal kingdom:

There are numerous kinds of trees which are used for making of several things. The teakwood is used for making furniture. Different types of leaves are used for making medicines, the bark of trees are used as raw material for making pulp.

Trees provide, food and shelter to various kinds of animals, birds, insects and other microorganisms. The biodiversity in forest forms a food chain to animals like different organisms depend on each other. They depend on each other for survival and the base of all is forest.

Impact of forest on pollution:

Forest is a rich source of oxygen and the air inside the forest is always pure and clean. The dense of trees and plants also prevents wind and dust storm. Since the atmosphere of the forest is always cool, it receives a good amount of rainfall. It also helps in reducing the noise pollution.

Water is released in the form of water vapor in the process of transpiration, it increases the content of water vapor in atmosphere. These leads to rainfall. If rainfall increases the trees absorb the water and underground water level increases. It also helps in agriculture process.

Conclusion

If human beings wants to live the life, then compulsorily they start journey towards the forest conservation. Otherwise that day or time is not more away when they can't get air even for breathing. They can't get water even for drinking. Now saving forest is our moral duty or it utmost needed. Each and every one should do make this slogan more familiar and popular '**No Forest- No Life**'.

Reference books:

1. Generation Green: The Ultimate Teen Guide to Living Eco-Friendly Life by Linda sivertsen
2. Protecting Life on Earth Micheal Paul Marchetti
3. Trees: Between Earth and Heaven by Gregory Mcnamee
4. Wild Life Conservation by David Yarrow

ISBN: 978-93-93259-95-0

Government Initiatives in Protection and Development of Forest Resources

U. Gangadhar[1], K. Divya[2]

[1,2]Assistant Professor of Public Administration and Department of Computer Science,
GRP Government Degree College, Bhainsa
E-mail Id: ugangadhar006@gmail.com[1]

Abstract

Forest is an important natural habitat for human survival and also for wild life. It is also utilized by farmers for commercial and recreational purposes. Forests are renewable resources and play a major role in enhancing the quality of the environment. Forests have a significant role in reducing the risk of natural disasters, including floods, droughts, landslides and other extreme events. At global level, forests mitigate climate change through carbon sequestration, contribute to the balance of oxygen, carbon dioxide and humidity in the air and protect watersheds, which supply 75% of freshwater worldwide.Around 1.6 billion people - including more than 2,000 indigenous cultures depend on forests for their livelihood. Forests are the most biologically-diverse ecosystems on land, home to more than 80% of the terrestrial species of animals, plants and insects. They also provide shelter, jobs and security for forest-dependent communities. Governments have enacted various Acts, regulations, schemes and policies for the conservation of forests. For protection of forests improve human, technical and professional skills, as well as expertise and capabilities to effectively formulate and implement policies, plans, programs, research and projects on management, conservation and development of all types of forests and forest-based resources, and forest lands. Now-a-days the tendency of deforestation is increasing day by day. Man is cutting forest to get temporary benefits but there is a tremendous loss in due course of time. Not to mention, forests are essential to our well-being and ability to live on this planet! yet, despite the amazing things that forests do for us, global deforestation continues at an alarming rate. This needs to stop. Great emphasis must be paid to environmental education and peoples' participation to conserve the forest resources. Government also put keen concentration in the protection and improvement of forests.

Key words: *Renewable, Environment, Livelihood, Ecosystem, Peoples' participation*

Introduction

Forests are defined as large areas of land with trees. Forest is an important natural habitat for human survival and also for wild life. It is also utilized by farmers for commercial and recreational purposes. Forests are renewable resources and play a major role in enhancing the quality of the environment. Forests have a significant role in reducing the risk of natural disasters, including floods, droughts, landslides and other extreme events. At global level, forests mitigate climate

 ISBN: 978-93-93259-95-0

change through carbon sequestration, contribute to the balance of oxygen, carbon dioxide and humidity in the air and protect watersheds, which supply 75% of freshwater worldwide.Around 1.6 billion people - including more than 2,000 indigenous cultures depend on forests for their livelihood. Forests are the most biologically-diverse ecosystems on land, home to more than 80% of the terrestrial species of animals, plants and insects. They also provide shelter, jobs and security for forest-dependent communities. Forest varies in composition and diversity position and can contribute substantially to the economic development of any country. It is estimated that about 30% of world area is covered by forest where as 26% by pastures. Nearly 4 billion hectare so forest cover the earth's surface, roughly 30 percent of its total land area. According to a 2015 report, 23% of India's land cover consists of the forest region.

Causes of deforestation:

a) Shifting cultivation

This practice is prevalent in tribal areas where forest lands are cleared to grow subsistence crops. It is estimated that principle cause of deforestation in tropics in Africa, Asia and tropical America is estimated to be 70, 50, and 35% respectively. Shifting cultivation which is a practice of slash and burn agriculture are posses to clear more than 5 lakh hectares of land annually. In India, shifting cultivation is prevalent in northeast and to limited extent in M.P, Bihar and Andhra Pradesh and is contributing significantly to deforestation.

b) Commercial logging

It is a important deforestation agent. It may not be the primary cause but definitely it acts as secondary cause, because new logging lots permits shifting cultivation and fuel wood gatherers access to new logged areas.

c) Need for fuel wood

Increased population has lead to increasing demand for fuel wood which is also acting as an important deforestation agent, particularly in dry forest.

d) Expansion for agribusiness

With the addition of cash crops such as oil palm, rubber, fruits and ornamental plants, there is stress to expand the area for agribusiness products which results in deforestation.

e) Development projects and growing need for food

The growing demand for electricity, irrigation, construction, mining, etc. has lead to destruction of forest. Increased population needs more food which has compelled for increasing area under agriculture crops compelling for deforestation.

ISBN: 978-93-93259-95-0

f) Raw materials for industrial use

Forest provides raw material for industry and it has exerted tremendous pressureon forest. Increasing demand for plywood for backing has exerted pressure oncutting of other species such as fir to be used as backing material for apple in J&K and tea in northeast states.

Major Consequences of Deforestation:

Deforestation has far reaching consequences, which may be outlined as follows:

(i) It threatens the existence of many wild life species due to destruction of their natural habitat.

(ii) Gases such as methane and carbon dioxide trap heat in Earth's atmosphere, leading change in climate. Trees absorb the carbon dioxide and release oxygen and water into the atmosphere and this contributes to global warming.

(iii) Biodiversity is lost and along with that genetic diversity is eroded.

(iv) Hydro-logical cycle gets affected, thereby influencing rainfall.

(v) Problems of soil erosion and loss of soil fertility increase.

(vi) Deforestation leads to land erosion because the trees maintain the surface of the mountains. The water level of the rivers increases suddenly, causing floods.

(vii) In hilly areas it often leads to landslides.

Forest Related Policies and Acts for conservation:

Indian Government has initiated so many policies andpassedmany Acts to conserve forest which is explained below:

Indian Forest Policy, 1952

This was a simple extension of colonial forest policy, which became conscious about the need to increase forest cover to one-third of total land area. The policy laid stress on weaning the primitive people by persuasion, from the harmful practice of shifting cultivation. Increasing efficiency of forest administration by having adequate forest laws. Providing facilities for forest research and for conducting research in forestry and forest products utilization. Controlling grazing in forestry.

Forest Conservation Act 1980

This Act stipulated that the central permission is necessary to practice sustainable agro-forestry in forest areas. Violation or lack of permit was treated as a criminal offence. It targeted to limit deforestation, conserve biodiversity and save wildlife. This act provide hope of forest conservation, but wasn't successful.

ISBN: 978-93-93259-95-0

Forest policy of 1988

It made a very significant and categorical shift from commercial concerns to focus on the ecological role of the forests and participatory management.It aims were

- Maintenance of environmental stability through preservation and restoration of ecological balance.
- Check on soil erosion and denudation in catchment areas.
- Substantive increase in forest cover through massive afforestation and social forestry programmes.
- Increase in productivity of forests to meet national needs.

Amended Forest Act, 1992:

The Act made some provisions for allowing non-forestry activities with the prior approval of the central government. Wildlife sanctuaries, natural parks are entirely prohibited from being used for any exploration or survey without prior approvals from the Central Government. Cultivation of tea, coffee, spices, rubber, palms, oil-bearing plants, and cash crops comes under non-forestry activities, therefore, are prohibited and are not allied in the forest lands.

National Green Tribunal Act, 2010

This was for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto

Nagar Van Udyan Scheme, 2015

The vision of creating and develop at least one City Forest in each city having Municipal Corporation or Class 1 Cities to accommodate a wholesome health environment and contribute to the growth of clean, green, and sustainable India. Its objective is to create 200 City forests in the country and to create awareness about the plants and biodiversity.

Compensatory afforestation fund Act, 2016

It seeks to provide an appropriate institutional mechanism, both at the Centre and in each State and Union Territory, to ensure expeditious utilization in efficient and transparent manner of amounts released in lieu of forest land diverted for non-forest purpose which would mitigate impact of diversion of such forest land.

Green Skill Development Programme, 2017

The Ministry of Environment, Forest and Climate change launched in June 2017. Green skills include conserving and protecting the green of nature alongside creating awareness among

ISBN: 978-93-93259-95-0

the youth to develop skills and gain experience. In May 2018, during the launch of the GSDP mobile app, Harsh Vardhan, the Union Minister for Environment, forest, and climate change said that 2.25 lakh people will be employed through GSDP by the next year and about five lakh will be employed by 2021.

Measures to be taken for Conservation of forests:

Following are some of the major steps for conservation of forest:

1. With the advent of industrialization, several trees have been cut at an alarming rate for raw materials and various other purposes. This felling of trees can be regulated by selective cutting, clear-cutting and shelter wood cutting.
2. Forest fires are one of the common causes of loss of forests. Latest fire fighting techniques should be adopted to conserve the forest. However, forest fires are an important part of the ecosystem and it helps replenish nutrients in the soil from dead and decaying matter.
3. More trees should be planted to increase the forest cover. Trees should be selected according to the geographical conditions of a particular region and proper care should be taken during the growth of trees.
4. Prevention of exploitation of forestry and forest products is necessary for the conservation of forest.
5. The existing forests should be protected from diseases by spraying chemicals, antibiotics or development of pest-resistant strains of trees.
6. There should be an implementation of regulations of laws at organizational and governmental levels due to the extent of deforestation.
7. Spread the awareness about sensitization and organize educative campaigns about the effects of deforestation.

Conclusion

Forests are a unique gift of nature to man and constitute one of the prized assets of a nation. They are of both direct and indirect use, and hence are aptly termed as an 'index of prosperity of a nation'. Keeping in view the benefits which we derive from forests, it is of utmost importance that strong steps be taken to conserve forests.Great emphasis must be paid to environmental education and peoples' participation to conserve the forest resources. Government also put keen concentration in the protection and improvement of forests.

ISBN: 978-93-93259-95-0

References:

1. India State of Forest Report, 2009, Forest Survey of India, Dehradun
2. India's Forest and Tree Cover - Contribution as a Carbon Sink, Ministry of Environment and Forests, Government of India, August 2009
3. State of Environment Report-India 2009, Ministry of Environment and Forests, Government of India
4. "Environmental legislation", The Statesmen,19 January 2017
4. http://edugreen.teri.res.in/explore/life/forest.htm
5. http://www.earthwatch.org/rcc_india
6. https://www.nationalgeographic.org/encyclopedia/conversation/
7. https://www.nationalgeographic.org/article/conserving-earth/

ISBN: 978-93-93259-95-0

Effects of Variability and Climate Changes on Agriculture Productivity

Dr. Padala Thirupathi

Assistant Professor, NSS Programme Officer, Coordinator Telangana Harithaharam, Department of Botany, Government Degree College (Women), Near Old Bus Stand, Jagtial-505327, Telangana State-India - 504106, Email:padalathirupathi@gmail.com

Abstract

Global climate change is a change in the long-term weather patterns that characterize the regions of the world. The term "weather" refers to the short-term (daily) changes in temperature, wind, and/or precipitation of a region. In the long run, the climatic change could affect agriculture in several ways such as quantity and quality of crops in terms of productivity, growth rates, photosynthesis and transpiration rates, moisture availability etc. Climate change is likely to directly impact food production across the globe. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce the yield. In areas where temperatures are already close to the physiological maxima for crops, warming will impact yields more immediately. Drivers of climate change through alterations in atmospheric composition can also influence food production directly by its impacts on plant physiology. The consequences of agriculture's contribution to climate change, and of climate change's negative impact on agriculture, are severe which is projected to have a great impact on food production and may threaten the food security and hence, require special agricultural measures to combat with. This research paper is to be discussed "Effects of Variability and Climate Changes on Agriculture Productivity"

Key Words *- Climate change, Greenhouse Effect, Greenhouse gases (GHGs), Global Warming Potential (GWP), Inter governmental Panel on Climate Change (IPCC), parts per million (ppm).*

Statement of the Problem

"Earth provides enough to satisfy every men's need, but not every men's greed"

- Mahatma Gandhi

Climate change is any significant long-term change in the expected patterns of average weather of region (or the whole Earth) over a significant period of time. It is about non-normal variations to the climate, and the effects of these variations on other parts of the Earth. These changes may take tens, hundreds or perhaps millions of year. But increased in anthropogenic activities such as industrialization, urbanization, deforestation, agriculture, change in land use pattern etc. leads to emission of green house gases due to which the rate of climate change is much faster. Climate change scenarios include higher temperatures, changes in precipitation, and

 ISBN: 978-93-93259-95-0

higher atmospheric CO_2 concentrations. There are three ways in which the Greenhouse Effect may be important for agriculture. First, increased atmospheric CO_2 concentrations can have a direct effect on the growth rate of crop plants and weeds. Secondly, CO_2-induced changes of climate may alter levels of temperature, rainfall and sunshine that can influence plant and animal productivity. Finally, rises in sea level may lead to loss of farmland by inundation and increasing salinity of groundwater in coastal areas.

The greenhouse effect is a natural process that plays a major part in shaping the earth's climate. It produces the relatively warm and hospitable environment near the earth's surface where humans and other life-forms have been able to develop and prosper. However, the increased level of greenhouse gases (GHGs) (carbon dioxide (CO_2), water vapor (H_2O), methane (CH4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) etc) due to anthropogenic activities has contributed to an overall increase of the earth's temperature, leading to a global warming. The average global surface temperature have increased by 0.74 ^oC since the late 19th Century and is expected to increase by 1.4 ^oC - 5.8^oC by 2100 AD with significant regional variations (IPCC, 2007). The atmospheric CO_2 concentration has increased from 280 ppm to 395 ppm, CH4 concentration increased from 715 ppb to 1882 ppb and N_2O concentration from 227 ppb to 323 ppb from the year 1750 and 2012. The Global Warming Potential (GWP) of these gases i.e, CO_2, CH_4 and N_2O are 1, 25 and 310 respectively.

GLOBAL SCENARIO OF CLIMATE CHANGE

Projected scenarios of global warming indicate that the global average surface temperature could rise by 1.4 to 5.8°C by 2100. The projected rate of warming is unprecedented during last 10,000 years.

All climate models indicate a rising trend in temperature. Precipitation pattern has changed with decreased rainfall over south and south-east Asia. More intense and longer droughts have occurred since 1970s. Perpetual snow cover has declined on both area and depth of snow cover. Global mean sea level is projected to rise by 0.18 to 0.59 m by the end of the century.

Six of the 10 countries most vulnerable to climate change are in the Asia-Pacific. Bangladesh tops the list followed by India, Nepal, the Philippines, Afghanistan and Myanmar. In Bangladesh, for example, about one-fifth of the nation's population would be displaced as a result of the farmland loss estimated for a 1.5 m sea-level rise. The Maldives Islands in the Indian Ocean would have one-half of their land area inundated with a 2 m rise in sea level.

Indian Scenario of Climate Change

The warming may be more pronounced in the northern parts of India. The extremes in maximum and minimum temperatures are expected to increase under changing climate, few places are expected to get more rain while some may remain dry. Leaving Punjab and Rajasthan in the

ISBN: 978-93-93259-95-0

North West and Tamil Nadu in the South, which show a slight decrease on an average a 20 per cent rise in all India summer monsoon rainfall over all states are expected. Number of rainy days may come down (e.g. MP) but the intensity is expected to rise at most of the parts of India (e.g. North East). Gross per capita water availability in India will decline from 1820 m^3/ yr in 2001 to as low as 1140 m^3/yr in 2050.

Corals in Indian Ocean will be soon exposed to summer temperatures that will exceed the thermal thresholds observed over the last 20 years. Annual bleaching of corals will become almost a certainty from 2050. Currently the districts of Jagatsinghpur and Kendrapara in Odisha; Nellore and Nagapattinam in Tamilnadu; and Junagadh and Porabandar districts in Gujarat are the most vulnerable to impacts of increased intensity and frequency of cyclones in India (NATCOM, 2004). The past observations on the mean sea level along the Indian coast show a long-term (100 year) rising trend of about 1.0 mm/year. However, the recent data suggests a rising trend of 2.5 mm/year in sea level along Indian coastline. The sea surface temperature adjoining India is likely to warm up by about 1.5-2.0^{o}C by the middle of this century and by about 2.5-3.5 ^{o}C by the end of the century. A 1 meter sea-level rise is projected to displace approximately 7.1 million people in India and about 5764 sq km of land area will be lost, along with 4200 km of roads.

Over 50% of India's forests are likely to experience shift in forest types, adversely impacting associated biodiversity, regional climate dynamics as well as livelihoods based on forest products. Even in a relatively short span of about 50 years, most of the forest biomass in India seems to be highly vulnerable to the projected change in climate. Further, it is projected that by 2085, 77% and 68% of the forested grids in India are likely to experience shift in forest types.

Crop Responses To Expected Climate Change Factors

Climate change scenarios include higher temperatures, changes in precipitation, and higher atmospheric CO_2 concentrations which may affect on yield (both quality and quantity), growth rates, photosynthesis and transpiration rates, moisture availability, through changes of water use (irrigation) and agricultural inputs such as herbicides, insecticides and fertilizers etc. Environmental effects such as frequency and intensity of soil drainage (leading to nitrogen leaching), soil erosion, land availability, reduction of crop diversity may also affect agricultural productivity.

An atmosphere with higher CO_2 concentration would result in higher net photosynthetic rates. Higher CO_2 concentrations may also reduce transpiration (i.e. water loss) as plants reduce their stomatal apertures, the small openings in the leaves through which CO_2 and water vapor are exchanged with the atmosphere. The reduction in transpiration could be 30% in some crop plants. However, stomatal response to CO_2 interacts with many environmental (temperature, light intensity) and plant factors (e.g. age, hormones) and, therefore, predicting the effect of elevated CO_2 on the responsiveness of stomata is still very difficult. For every 75 ppm increase in CO_2 concentration rice yields will increase by 0.5 t/ha, but yield will decrease by 0.6 t/ha for every 1 °C increase in temperature. CO_2 enrichment have generally shown significant increases

ISBN: 978-93-93259-95-0

in rice biomass (25-40%) and yields (15-39%) at ambient temperature, but those increases tended to be offset when temperature was increased along with rising CO_2. Yield losses caused by concurrent increases in CO_2 and temperature are primarily caused by high-temperature-induced spikelet sterility. Increased CO_2 levels may also cause a direct inhibition of maintenance respiration at night temperatures higher than 21°C. In rice, extreme maximum temperature is of particular importance during 3 flowering which usually lasts two to three weeks. Exposure to high temperature for a few hours can greatly reduce pollen viability and, therefore, cause yield loss. Spikelet sterility is greatly increased at temperatures higher than 35°C and enhanced CO_2 levels may further aggravate this problem, possibly because of reduced transpirational cooling.

A key mechanism of high temperature-induced floret sterility in rice is the decreased ability of the pollen grains to swell, resulting in poor thecae dehiscence. Significant genotypic variation in high-temperature induced floret sterility exists. Variation in solar radiation, increased maintenance respiration losses or differential effects of night vs. day temperature on tillering, leaf-area expansion, stem elongation, grain filling, and crop phenology have been proposed as possible causes. In a recent climate chamber study, there was first evidence of possible genotypic variation in resistance to high night temperatures High CO_2 levels and/or temperature are likely to affect crop development rates.

Predicted effects of climate change on agriculture over the next 50 years

Warming will accelerate many microbial processes in the soil-floodwater system, with consequences for the C and N cycle. Crop residue decomposition patterns may change. Increased soil temperature may also lead to an increase in autotrophic CO_2 losses from the soil caused by root respiration, root exudates, and fine-root turnover. Climate change impacts will also impact on rice production through rising sea level rise. Most studies project decreased yields in non-irrigated wheat and in rice, and a loss in farm-level net revenue between 9% and 25% for a temperature increase of 2-3.5°C. Aggarwal and Mall (2002) observed that a 2 °C increase resulted in a 15-17% decrease in grain yield of rice and wheat. Fungal and bacterial pathogens are also likely to increase in severity in areas where precipitation increases. Under warmer and more humid conditions cereals would be more prone to outbreaks of pest and diseases thereby reducing yield.

4.1 IMPACT OF CLIMATE CHANGE ON WORLD'S AGRICULTURE

Climate change is likely to directly impact on food production across the globe. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce final yield. In areas where temperatures are already close to the physiological maxima for crops, warming will impact yields more immediately (IPCC, 2007).

ISBN: 978-93-93259-95-0

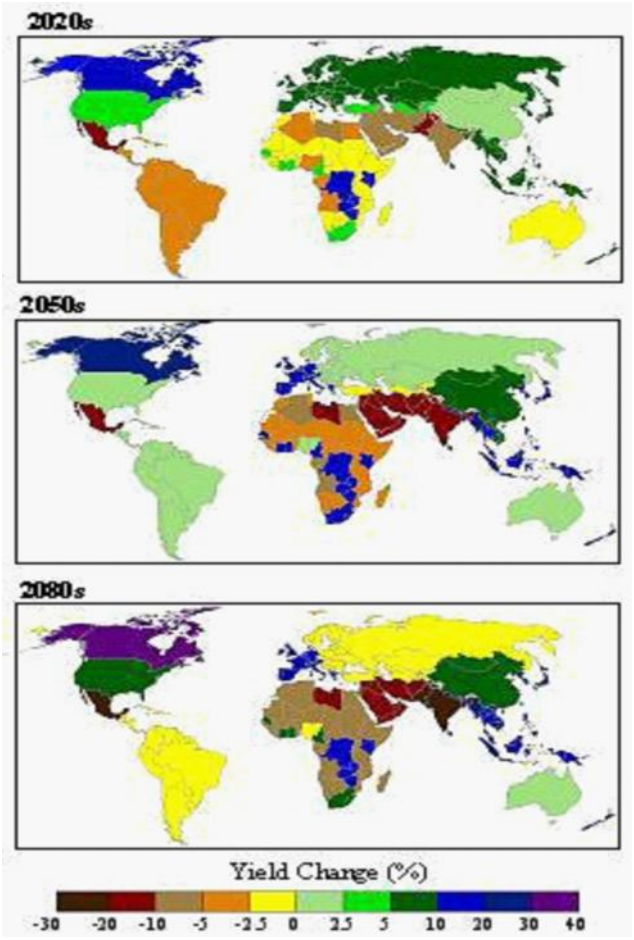


Fig. 1 Results of models showing possible crop yields in the future

World agriculture faces a serious decline within this century due to global warming. Overall, agricultural productivity for the entire world is projected to decline between 3 and 16 % by 2080. Developing countries, many of which have a average temperatures that are already near or above crop tolerance levels, are predicted to suffer an average 10 to 25% decline in agricultural productivity the 2080s. Rich countries, which have typically lower average temperatures, will experience a much milder or even positive average effect, ranging from a 8% increase in productivity to a 6% decline. Individual developing countries face even larger declines. India, for example, could see a drop of 30 to 40%.

The figure shows the results obtained using the Hadley climate model for the years 2020, 2050 and 2080. The maps show that increased temperatures in many parts of Africa will reduce food production. The decrease in rainfall in Australia will reduce crop yields but this decline can be overcome by irrigation in some cases. The increase in rainfall combined with a moderate

ISBN: 978-93-93259-95-0

increase in temperatures in North America may benefit food production. The burden of climate change is likely to fall disproportionately on the poorer countries of the world.

To interpret the maps we have to remember that the results obtained depend on climate, the effect of CO_2 levels on crop growth and changes in socioeconomic conditions. For example, in developed countries lower rainfall levels can be overcome through irrigation but these technological solutions are not necessarily possible in less developed countries.

Impact of Climate Change on India's Agriculture

India's agriculture is more dependent on monsoon from the ancient periods. Any change in monsoon trend drastically affects agriculture. Even the increasing temperature is affecting the Indian agriculture. In the Indo-Gangetic Plain, these pre-monsoon changes will primarily affect the wheat crop. In the states of Jharkhand, Odisha and Chhattisgarh alone, rice production losses during severe droughts (about one year in five) average about 40% of total production, with an estimated value of $800 million.

Increase in CO_2 to 550 ppm increases yields of rice, wheat, legumes and oilseeds by 10-20%. A 1oC increase in temperature may reduce yields of wheat, soybean, mustard, groundnut, and potato by 3-7%. Much higher losses at higher temperatures. Productivity of most crops to decrease only marginally by 2020 but by 10-40% by 2100 due to increases in temperature, rainfall variability, and decreases in irrigation water. The major impacts of climate change will be on rain fed or un-irrigated crops, which is cultivated in nearly 60% of cropland. A temperature rise by 0.5^{o}C in winter temperature is projected to reduce rain fed wheat yield by 0.45 tonnes per hectare in India (Lal et al., 1998). Possibly some improvement in yields of chickpea, rabi maize, sorghum and millets; and coconut in west coast. Less loss in potato, mustard and vegetables in north-western India due to reduced frost damage. Increased droughts and floods are likely to increase production variability

Recent studies done at the Indian Agricultural Research Institute indicate the possibility of loss of 4 - 5 million tons in wheat production in future with every rise of 1^{o}C temperature throughout the growing period. Rice production is slated to decrease by almost a tonne/hectare if the temperature goes up by 2 ^{o}C. In Rajasthan, a 2^{o}C rise in temperature was estimated to reduce production of Pearl Millet by 10-15%. If maximum and minimum temperature rises by 3^{o}C and 3.5^{o}C respectively, then Soyabean yields in M.P will decline by 5% compared to 1998. Agriculture will be worst affected in the coastal regions of Gujarat and Maharashtra, as fertile areas are vulnerable to inundation and salinisation.

Agricultural Productivity And Food Security

Food security is both directly and indirectly linked with climate change. Any alteration in the climatic parameters such as temperature and humidity which govern crop growth will have a direct impact on quantity of food produced. Indirect linkage pertains to catastrophic events such

ISBN: 978-93-93259-95-0

as flood and drought which are projected to multiply as a consequence of climate change leading to huge crop loss and leaving large patches of arable land unfit for cultivation and hence threatening food security. The net impact of food security will depend on the exposure to global environmental change and the capacity to cope with and recover from global environmental change. On a global level, increasingly unpredictable weather patterns will lead to fall in agricultural production and higher food prices, leading to food insecurity.

Food insecurity could be an indicator for assessing vulnerability to extreme events and slow-onset changes. This impact of global warming has significant consequences for agricultural production and trade of developing countries as well as an increased risk of hunger. The number of people suffering from chronic hunger has increased from under 800 million in 1996 to over 1 billion recently. United Nations population data and projections (UN 2009) show the global population reaching 9.1 billion by 2050, an increase of 32 per cent from 2010. The world's population is expected to grow by 2.2 billion in the next 40 years to 2050, and a significant part of the additional population will be in countries that have difficulties feeding themselves. Preliminary estimates for the period up to 2080 suggest a decline of some 15-30 per cent of agricultural productivity in the most climate-change-exposed developing country regions - Africa and South Asia.

Even the IPCC, scarcely alarmist, says 0.5^{o}C rise in winter temperature would reduce wheat yield by 0.45 tons per hectare in India. Rice and wheat have a total share in total food grain production in India. Any change in rice and wheat yields may have a significant impact on food security of the country. And this when Indian agriculture has already pushed into crisis, and 2.56 lakh farmers have committed suicide since 1995.

According to A K Singh, deputy director-general (natural resource management) of the Indian Council of Agricultural Research (ICAR), medium-term climate change predictions have projected the likely reduction in crop yields due to climate change at between 4.5 and 9 per cent by 2039. The long run predictions paint a scarier picture with the crop yields anticipated to fall by 25 per or more by 2099. With 27.5% of the population still below the poverty line, reducing vulnerability to the impacts of climate change is essential. Indian food production must increase by 5 million metric tons per year to keep pace with population increase and ensure food security. Coping with the impact of climate change on agriculture will require careful management of resources like soil, water and biodiversity. To cope with the impacts of climate change on agriculture and food production, India will need to act at the global, regional, national and local levels.

Climate Change-Mitigation and Adaptation In Agriculture

1. Assist farmers in coping with current climatic risks by providing value-added weather services to farmers. Farmers can adapt to climate changes to some degree by shifting planting dates, choosing varieties with different growth duration, or changing crop rotations.

ISBN: 978-93-93259-95-0

2. An Early warning system should be put in place to monitor changes in pest and disease outbreaks. The overall pest control strategy should be based on integrated pest management because it takes care of multiple pests in a given climatic scenario.
3. Participatory and formal plant breeding to develop climate-resilient crop varieties that can tolerate higher temperatures, drought and salinity.
4. Developing short-duration crop varieties that can mature before the peak heat phase set in.
5. Selecting genotype in crops that have a higher per day yield potential to counter yield loss from heat-induced reduction in growing periods.
6. Preventive measures for drought that include on-farm reservoirs in medium lands, growing of pulses and oilseeds instead of rice in uplands, ridges and furrow system in cotton crops, growing of intercrops in place of pure crops in uplands, land grading and leveling, stabilization of field bunds by stone and grasses, graded line bunds, contour trenching for runoff collection, conservation furrows, mulching and more application of Farm yard manure (FYM).
7. Efficient water use such as frequent but shallow irrigation, drip and sprinkler irrigation for high value crops, irrigation at critical stages.
8. Efficient fertilizer use such as optimum fertilizer dose, split application of nitrogenous and potassium fertilizers, deep placement, use of neem, karanja products and other such nitrification inhibitors, liming of acid soils, use of micronutrients such as zinc and boron, use of sulphur in oilseed crops, integrated nutrient management.
9. Seasonal weather forecasts could be used as a supportive measure to optimize planting and irrigation patterns.
10. Provide greater coverage of weather linked agriculture-insurance.
11. Intensify the food production system by improving the technology and input delivery system.
12. Adopt resource conservation technologies such as no-tillage, laser land leveling, direct seeding of rice and crop diversification which will help in reducing in the global warming potential. Crop diversification can be done by growing non-paddy crops in rain fed uplands to perform better under prolonged soil moisture stress in kharif.
13. Develop a long-term land use plan for ensuring food security and climatic resilience.
14. National grid grain storages at the household/ community level to the district level must be established to ensure local food security and stabilize prices.
15. Provide incentives to farmers for resource conservation and efficiency by providing credit to the farmers for transition to adaptation technologies.
16. Provide technical, institutional and financial support for establishment of community banks of food, forage and seed.

ISBN: 978-93-93259-95-0

17. Provide more funds to strengthen research for enhancing adaptation and mitigation capacity of agriculture.

Summing Up

Climate change, the outcome of the "Global Warming" has now started showing its impacts worldwide. Climate is the primary determinant of agricultural productivity which directly impact on food production across the globe. Agriculture sector is the most sensitive sector to the climate changes because the climate of a region/country determines the nature and characteristics of vegetation and crops. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce final yield. Food production systems are extremely sensitive to climate changes like changes in temperature and precipitation, which may lead to outbreaks of pests and diseases thereby reducing harvest ultimately affecting the food security of the country. The net impact of food security will depend on the exposure to global environmental change and the capacity to cope with and recover from global environmental change.

Coping with the impact of climate change on agriculture will require careful management of resources like soil, water and biodiversity. To cope with the impact of climate change on agriculture and food production, India will need to act at the global, regional, national and local levels.

References

1. Adams, Richard M. , Hurd, Brian H. , Lenhart Stephanie , Leary, Neil., 2020, Effects of global climate change on agriculture:an interpretative review CLIMATE RESEARCH Clim Res, Vol. 11: 1,20,21
2. Adamo, Susana B., 2011, Slow-onset hazards and population displacement in the context of climate change
3. Ahmad, J., Alam, D., & Hassen, S., Impact of Climate Change on Agriculture & Food Security in India, : 131-136
4. Aiken, Rob., Feb. 2009, Climate Change impacts on Crop Growth in the Central High Plains, Proceedings of the 21st Annual Central Plain Irrigation Conference, :14-15
5. Cline William R., 2021, Global Warming and Agriculture: New Country Estimates Show Developing Countries Face Declines in Agricultural Productivity, Center for Global Development, :1-4
6. Eriksson,M.,Fang,J., Dekens, J., 2008,How does climate change affect human health in the Hindu Kush-Himalaya region?, Regional Health Forum - Volume 12, Number 1, :11-15
7. Gulatia, A.,Gupta, P., Jha, M., Sarathi, P.P. & Vishal, K. ,Impact of Climate Change, Variability, and Extreme rainfall Events on Agricultural Production and Food Security, ISPRS Archives XXXVIII-8/W3 Workshop Proceedings: Impact of Climate Change on Agriculture, : 371
8. Hoffmann, Ulrich, 2021, Assuring Food Security in Developing Countries under the Challenges of Climate Change: Key Trade and Development Issues of a Fundamental Transformation of Agriculture, United Nation Conference on trade and Environment, :3-5
9. Kattumuri, Ruth, Food Security and the Targeted Public Distribution System in India, Asia Research Centre Working Paper 38, :3
10. Mall, R.K, Singh, R., Gupta, A., Srinivasan, G., & Rathore, L.S., Impact of Climate Change on Indian Agriculture : A Review, : 446-448,472
11. Pasupalak, S., Pasupalak,.S., April-May - 2020, Climate Change and Agriculture in Orissa, Orissa Review , :49 - 52

 ISBN: 978-93-93259-95-0

12. Priyadarshi , Nitish., 2009, "The Survival of Agriculture in a Destabilized Climate with special reference to India and its Jharkhand State. "

13. Rai, Mangala., February 2010, India's preparedness for food security in view of climate change, International Conference on Food Security and Climate Change in Dry Areas,: 6-7

14. Reddy, D. Raji, Sreenvias , G. & Pranuthi, G., Climate Change Impacts on ice in Andhra Pradesh, ISPRS Archives XXXVIII-8/W3 Workshop Proceedings: Impact of Climate Change on Agriculture, :124-126

Related Internet Resources and Websites

1. www.agriculturalproducts.com
2. https://access.onlibraryagri.com
3. https://agriculture.ny.gov>agriculture
4. https://www.springer.com

ISBN: 978-93-93259-95-0

A Study on Non-Timber Forest Products Availability in Telangana

B. Srinivas

Faculty of TSKC in GRP Govt Degree College, Bhainsa, Dt: NIRMAL.T.S,
Email: srivasu.bs@gmail.com

Abstract

Forest is an important natural resource. It is most important natural habitat for wild life. It is also utilized by farmers for commercial and recreational purposes. Many herbivores find shelter and carnivores their prey in the forest. Besides this, forest plays most important role from commercial point of view. Forest based cottage industries, such as bee-keeping, bamboo mat and basket making provides small-scale industry to the tribal people.

Non-timber forest products (NTFPs) are any product or service other than timber that is produced in forests. They include fruits and nuts, vegetables, fish and game, medicinal plants, resins, essences and a range of barks and fibers such as bamboo, rattans, and a host of other palms and grasses. Over the past two decades, governments, conservation and development agencies and non-government organizations have encouraged the marketing and sale of NTFPs as a way of boosting income for poor people in the tropics and encouraging forest conservation. But as forest areas shrink, human populations grow, markets change, and traditional management institutions lose their authority, the sustainable production of many NTFPs is no longer assured. For example, as international rattan prices increased in the 1980s and '90s, commercial companies in Asia hired local people to harvest available resources. Widespread over-exploitation resulted and in many places the resource was destroyed, affecting the local biodiversity and leaving the people without an important source of income. Future research needs to look at the use of NTFPs in the home, the role of forests in nutrition and health, land tenure change, the increasing move by small communities to monetary-based economies and the cultural importance of NTFPs.

Key Words: *Recreational, Exploitation, Widespread, convergence, scenario*

Introduction

Non-Timber Forest Products (NTFPs), or minor forest produce as they are also referred, are a very important part of the economy and livelihood of the people living in and around forests. NTFPs are a critical component for the sustenance for around 50 million people residing in and around forests throughout India. NTFPs also support a large number of small to large scale industries engaged in the processing and/or trading of NTFPs and NTFP based products. NTFPs make significant contribution to the revenues of the forest department. In India NTFPs

 ISBN: 978-93-93259-95-0

provide about 40% of total official forest revenues and it is as much as 70% in some states like Odisha.

The Non Timber Forest Products play important roles in the livelihoods of millions of rural and urban people across the globe. NTFP provide the products for food, shelter, medicines, fibres, energy and cultural artefacts for many of the world's poorest people and a considerable proportion of the less poor. The contribution of these daily net resources to livelihoods typically ranges from 10-60% of total household income. The NTPF are goods of biological origin other than timber from natural, modified, or managed forest and Landscapes. They include fruits, and nuts, vegetables, Medicinal plants, gum, and resins, essences, bamboo, rattans and palm medicinal plant gum, and resins, essences and a range of barks and fibres such as bamboo, rattans, and a host of other palms and grasses.

Some of the following strategies need to be addressed for sustained livelihood through NTFPs. Sustainability the sustainability of NTFP harvest depends on the organs that are harvested but also on the life cycle of harvested species. Good collection/harvesting practices of some important medicinal plants like i.e., aonla (Phyllanthus emblica), baividang (Embelia tsjeriam-cottam), baheda (Terminalia bellerica), gudmar (Gymmema sylvestre), sarpagandha (Rauvolfia serpentina), kalmegh (Andrographis paniculata) and bark of arjuna (Terminalia arjuna) have been standardized (Pandey, 2009). Adoption of sustainable harvesting practices at right time of harvest showed positive impact on resource conservation, socio-economic status of community, quality of produce and economic returns. It is evident from our study that the medicinal plants collected at right time of maturity following sustainable harvesting practices possess better quality in terms of active ingredient concentration. Harvesting practices/standards are available only for few commercially important species. The sustainable techniques/standards for other important species need to be developed (Shackleton and Pandey, 2014). Most NTFPs can be harvested in more than one way.

Marketing system The NTFPs value chains are complex with multiple stages and actors involved in the process of getting a product from forest to consumer they are also dynamic and change over time. Therefore, information about the quantity and quality of the product, price and their market is very important.

Study Area

Telangana State lies between 15 50'12" N & 19 55'2" N latitudes and 77 14'55" E & 81 19'30" E 2 Longitudes. The Geographical Area of the State is 112102 Km which is 3.41% of the landmass of the country. The State has two physiographic zones, the hilly region having an altitude of 500 to 1324 m; the plateau having an altitude of 46 M to 1000 M. Godavari and Krishna are the Principle rivers of the State which drain into the Bay of Bengal through Andhra Pradesh. The River Godavari with its tributaries Pranahita, Manjeera, Maneru, Indravati, Kinnerasani, Pamuleru and Sileru, flows through the northern parts of the State into Bay of Bengal. The River Krishna

ISBN: 978-93-93259-95-0

with its tributaries Tungabhadra, Vedhavati, Musi, Paleru and Munneru flows through the southern parts of the States.

Methodology:

For documentation of information and collection of NTFP products several tours were undertaken during the period of 2015-2020.For local collection of plant material, local informer accompanied to authors. Data presented here is based on personal observations and interviews with local inhabitants and Methodology used is based on the methods available in literature jain(1989) and jain Mudgal(1999).

Results and Discussions:

The notified forest area of the State is 26903.70Km, which is 23.99% of the geographical area. Reserved-, Protected- and Un-classed forests occupy 18294.52 Km (68%), 7802.07 Km (29%) and 807.11 Km (3%) of the forest area respectively. The Adilabad District has the highest notified forest area of 7101.30 Km and the Rangareddy the Lowest of 758.87 Km, in the State. As regards the ratio of notified forest to geographical area, Khammam District has the highest (45.49%) and Nalgonda the lowest (6.25%). As per Champion and Seth's classification, the Forest of the State fall under Dry Teak Forest, Southern Dry Mixed Deciduous Forest, Dry Deciduous Scrub, Dry Savannah Forest, Hardwickia Forest, Dry Bamboo Brakes, Southern Thorn Forest.

The Telangana State of Forest Report gives a detailed view of the health of the notified Forests in the State of Telangana on annual basis. The 'Telangana State Forest Report 2015' is the second report after formation of the new State. It gives precise location of the forest cover changes assessed using LISS- III date of 2012 & 2013 seasons up to Compartment level. It shows the positive as well as negative changes in forest cover inside the notified forests during the above period. All the change polygons have been ground truthed through field officers, which gives high degree of authenticity to the results.

Notified forest area of the State is 26903.70 Km. Forest cover based upon the interpretation of the LISS-III data of 2013 and LISS-IV data of 2011-2014 inside the notified forests is 16504.33 Km. It is 61.34 % of the notified forest area and 14.72 % of the Geographical Area of the State. The Forests cover comprises of 286.66 km of Very Dense Forests (VDF), 7789.48 km of Moderately Dense Forests (MDF) & 8428.19 Km of Open Forests (OF) in 2013. The errors crept due to limitations of LISS-III data and interpretations are corrected; and the deduction shall not be counted towards degradation of forest cover between 2012 and 2013

When compared to Forest cover of 2012, there is Positive change in the forest cover in an extent of 11.74 Km. There is a positive change in the Scrub as well of 15.84 Km. Hence the total positive change is noticed in an area of 27.58 Km. Improvement is noticed in 2.40 Km of natural forest, 23.42 Km in plantations and 1.76 Km of old abandoned cultivated or "Podu" areas. Of

ISBN: 978-93-93259-95-0

the total positive change of 27.58 Km, an extent of 0.35 Km of Scrub has improved to MDF, 7.49 Km of Non-Forest has improved to Open Forest, 3.90 Km of Scrub has improved to Open Forest and 15.84 Km of Non Forest has improved to Scrub. Taking into consideration the positive and negative changes during the period, the net loss in forest cover is 15.80 Km in MDF and 19.05 Km in open forest.

Much of the product-oriented literature mentioned above assumes or suggests that tropical NTFP are collected from unmanaged woodlands. Awareness that many tropical smallholders manage forests is growing, but there is still little technical information on just how they manipulate forest stands to increase production of economic products (Wiersum 1996). Our experience indicates that a great variety of management methods, techniques and models used by smallholders have Net to be described.

Research on and for Smallholder Forest Managers to help put the resources of inter-disciplinary science in the service of smallholder forest managers, several changes must be made in research agendas. Among these might be the following: Research, training, extension and other programmers should not be organized around a timber/non-timber dichotomy. Questions of scale, and levels of inputs and outputs, should be given priority. Research on small scale, low input, multiple-output forest management, including both timber and non-timber products, should be a priority. Many scholars writing about the need to design sustainable small-scale management systems have given scant acknowledgement to the multitude of management methods, techniques and models that already exist (see, for instance, Gentry and Vasquez 1988). Study of existing techniques and their effects should be a priority. Descriptions of the diversity of site-specific techniques need to be complemented with a search for common principles and effects. The results of our studies suggest that some traditional management techniques might indeed be useful in designing and implementing large, Smallholders Forest Management 114 C. Padoch and M. Pinedo-Vasquez medium or small programmers of forest management at the industrial level. More detailed experimental studies are required however, to measure the ecological sustainability and the economic viability of the practices used by smallholders. Further experimentation and development of management methods incorporating the knowledge of smallholders should be a priority. Many recent studies appear to assume that all Amazonian Indians are expert forest managers or all Bornean Dayaks are equally competent extractors. There are experts and incorporated in these as in all other communities. Local experts should be identified and incorporated into programmers for developing and improving existing systems. If valuation studies are to serve smallholders in forest areas and to help policy makers design adequate policies for them, those studies need to pay more attention to the realities of household and regional economies.

Valuing managed forests that contain high biodiversity and large number of valuable species, however, cannot be done by making a list of products and assigning prices to each. Such approaches lead to fictitious values that confuse rather than facilitate understanding of how forest management is conducted in the tropics. Valuation studies need to account for the actual behaviour of

ISBN: 978-93-93259-95-0

smallholders who rarely, if ever, receive the value that was computed by a study of available volume of forest products and their sometime market prices. Socio-economic constraints on use of forests and marketing opportunities need to be understood and clarified. Future valuation of forest in the tropics should consider realistic economic analyses of alternative uses of land and resources rather than the assumptions implicit in future benefit and net present value. Flexibility in response to both problems and opportunities is an important and rarely discussed feature of smallholder forest use and management. This omission is largely the result of a common disregard of the history of forest product trade in many areas. Studies need to add an historical dimension and subsequent plans need to incorporate this understanding.

CONCLUSION

It is apparent that the contribution of NTFPs to income varies across ecological settings, seasons, income level, etc. They contribute to improving nutrition either as part of the family diet or as a means to achieve household food security. It has been established that a significant number of rural, tribal and overall forest dependent communities derive a significant part of their food, nutrition, healthcare needs and income from NTFPs. They also contribute to the well-being of rural households, particularly the poor, in terms of food security, nutrition, health and subsistence. However, a number of factors, including a policy vacuum, non-destructive harvesting, destruction of natural habitats, bushfires, population growth and high demand, are hindering the use and development of NTFPs. An appropriate policy framework for a sustainable promotion of NTFPs, domestication of NTFPs, improving harvesting and processing techniques are necessary to facilitate food security, reduction of poverty and improved livelihoods, particularly for the economically-marginalized and forest-dependent communities. Augmenting livelihoods of the forest dependent communities requires some focused intervention on NTFPs. Facilities pertaining to storage, grading, processing and value addition through convergence of existing schemes and programs in private and public sectors should be promoted and created. Communities should be empowered with information about the market, policy and products to enable them strategizing and accessing better returns from NTFPs.

References

1. Non Timber Forest Products (NTFPs) for Sustained Livelihood: Challenges and Strategies A.K. Pandey, Y.C. Tripathi and Ashwani Kumar Forest Research Institute, (Indian Council of Forestry Research and Education), Dehradun, 248 006, India
2. Telangana State of Forest Report 2015
3. Increased development of non-timber forest products http://www.fao.org/docrep/w2149e/w2149e06.htm
4. Reddy, M. a. (2010). Political Economy of Tribal Development: A Case Study of Andhra Pradesh. Hyderabad: Center For Economic and Social Studies. Retrieved 04 05, 2015
5. Forest Department GOAP. (2012). Facts and Figures. Forest Department Hyderabad. Retrieved 04 05, 2015
6. Chopra, K. (1993). The Value of Non-Timber Forest Products; An Estimation for Tropical Deciduous Forest in India. Economic Botany. Retrieved 04 05, 2015

 ISBN: 978-93-93259-95-0

Devastation of Golusu Kattu Cheruvulu (Chair Type Tanks) in Nirmal : A Case Study

Prof. B. Rama Devi[1], S. Pavan Kumar[2], G. Saikrishna[3], A. Rishika[4], A. Rithwika[5], Ch.Akshay Kumar[6], Mohd. Junaid[7], Rathod Balu[8]

[1]Department of Botany, Osmania University, Hyderabad, Telangana.
[2,3,4,5,6,7,8]Department of Botany, Government Degree College, Nirmal- 504106.

Abstract

The main Aim of this Research paper is to bring awareness among the society about the importance of Bio-diversity and ill effects of Distracting the biodiversity,for this project the students of Government Degree college.Nirmal, Telangana, made a Case study on the Aquatic Ecosystems surrounding nirmal town,and also identified the human interference in distructing the Lakes and Enchroachment.

This project is conducted as per the curriculum and as a part of Jignasa - Student Study Project, the students along with the supervising lectuer visited a dozen of lakes surrounding nirmal town and identified the factors polluting the lakes, they prepared the Questionair and interacted with the people living besides these lakes , after careful observation they prepared this case study entitled as "Devastation of Golusukattu cheruvulu (chair type lakes) in Nirmal.

The paper describes Species composition, Abundance, Density, Community Structure of Aquatic and Forest ecosystems in Nirmal District of Telangana region around 14 lakes and the surrounding vegetation is taken as Samples for the study.

Biological diversity-or biodiversity-is the complete variety of life on earth, and people are an integral part of this. Biodiversity is easiest to understand when you think of the different kinds of plants and animals around us and all the species that support and link them. A high biodiversity can mean that there are a lot of different species, while a biodiversity loss means that these species become extinct. However, biodiversity is more than plants and animals.

Biodiversity includes: genetic diversity, which is the variability in the genetic make up amongst individuals of the same species, species diversity, which is the variety of species within a particular area e ecosystem diversity, which is the variety of ecosystem types and associated biological communities or habitats (eg scrubland, forest, sand dunes, wetlands, streams).

Introduction

Nirmal district of Telangana is famous for its rich and varied Bio diversity with dense forests and Aquatic Ecosystems which is garlanded with Holy River Godavari and also famous for wooden toys and its painting (koyabommalu), these toys are made from the wood Tella puniki (Givotia rotilliformis) which is available in the forests of Nirmal.

ISBN: 978-93-93259-95-0

The forests have beautiful waterfalls, the nirmal town is surrounded by chain of lakes between the mountains popularly known as Golusukattu cheruvulu (chair type tanks), these lakes are connected as chain system. Due to the growing population and Urbanization these lakes are effected and polluted, as a result the Flora and Fauna of this rich biodiversity area is threatened. There are 14 lakes which are connected to each other. These Golusukattu chervulu were built by king Nimma Naidu the ruler of Nirmal area around 450 years ago.

In ancient times these lakes were used for Drinking water, Agriculture purposes and also for Protection from Enemies in the Kingdom. These Golusukattu cheruvulu built by King NIMMA NAYUDU. Due to Urbanization these lakes are Encroached and Polluted.

Aims & Objectivies

- Protection of Golusukattu cheruvulu
- Factors effecting Nirmal Golusukattu cheruvulu
- Lakes impact on Aquatic Ecosystem
- Floods in Nirmal
- Suggesting some Measures to Control Devastation of Lakes (Golusukattu cheruvulu)

Names of these Golusukattu cheruvulu, lakes are

- KHAZANA CHERUVU
- KURANPET CHERUVU
- IBRAHIM CHERUVU
- KANCHERONE CHERUVU
- MANJULAPUR CHERUVU
- DHARMASAGAR CHERUVU
- BANGALPET CHERUVU
- DHOBI CHERUVU
- SITHA SAGAR CHERUVU
- MOTHILAL TALAB
- RAMANAGAR CHERUVU
- AKKAPUR CHERUVU

ISBN: 978-93-93259-95-0

Factors Effecting Nirmal Lakes:

Sewage from colonies.

- Sewage water pollution is one of the major problems in Nirmal town, Improper handling of waste water is the main reason behind the pollution of lakes. The careless disposal of sewage water leads to a chain of problems, such as spreading of diseases, eutrophication, increase in Biological Oxygen Demand (BOD), etc. These untreated sewage is directly released into these lake which lead to above consquences.
- Phosporous and Nitrogen from agriculture and Un treated Sewage which leads to excess growth of Phytoplankton like Eichhornia, Lemna and Euphorbia species and also to depletion of oxygen level and sunlight in lakes this may leads to death of fishes and aquatic animals.

Plastic Wastes

- Plastic is a non-biodegradable synthetic material which is toxic. Widely dumped into these lakes for example plastic cover and bottles are dumped by people in nirmal. These plastics are affecting these lake in many ways as mentioned below. Plastics also Leech into the water Degrading water quality with Toxic compounds and end up harming Animal health and also leads to bank Erosion.

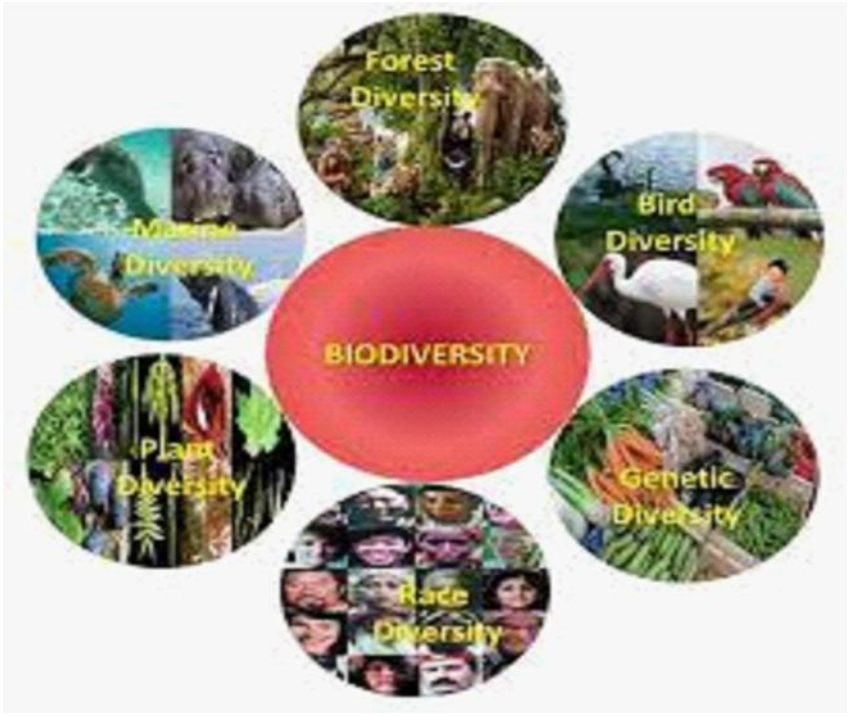
Encroachment

- Nirmal was popular for Golusukattu Cheruvulu (Chair type tanks) but a majority of them have been encroached and today many buildings and shopping complexes have come up on these lakes. Even Telangana Highcourt alleged Encroachment of tanks and asked officials to submit a report on this, by this Encroachment floods occurred for the first time in Nirmal. Flood water rose upto first floor in some colonies. Standing crops cotton, Soya and red gram were badly affected and shattered the hopes of farmers, who expected a good cotton crop this season.

Animal Waste

- Animal waste such as faecal matter and poultry waste are dumped into these lakes which made increase in organic matter and pathogens, leads to death of fishes and many Zooplanktons and degrade of water quality. Pollutants in animal waste can impact waters through several possible pathways, including surface runoff and erosion, direct discharges to surface waters, spills and other dry-weather discharges, leaching into soil and groundwater, and releases to air (including subsequent deposition back to land and surface waters).

ISBN: 978-93-93259-95-0



Research & Methodology

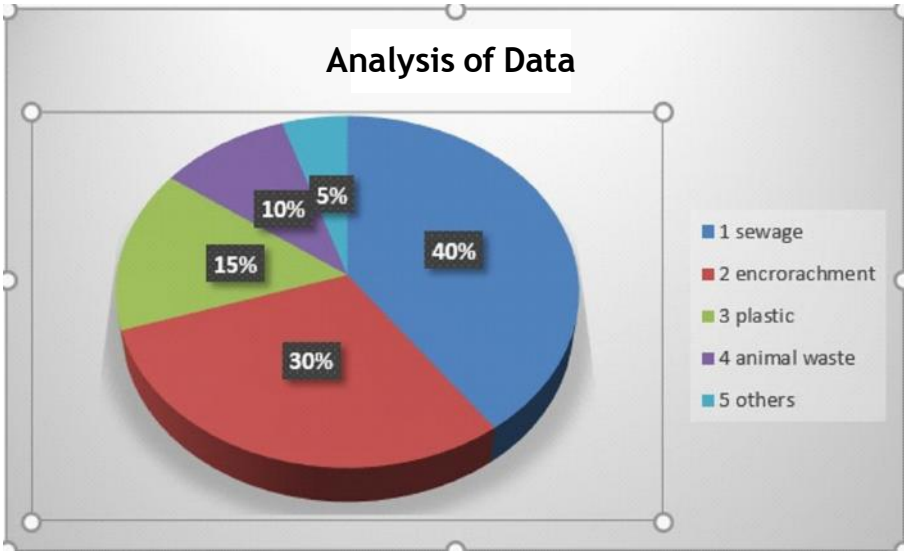
We have visited and observed mainly the lakes in Nirmal , which are effected by Plastic waste and Encroachment. Interacted with the people living besides these lake by using Questionnaire method. We analyzed the problem that Degrading of water quality , onset of floods and decreased groundwater levels etc.

ISBN: 978-93-93259-95-0

Analysis of Data (Percentage)

The following data is based on the Questionnaire conducted by students when they interacted with the people in the society.

- SEWAGE - 40%
- ENCROACHMENT - 30%
- PLASTIC WASTE -15%
- ANIMAL WASTE -10%
- OTHERS -5%



We have found that if one lake is effected by pollution all the lakes are effected or polluted because of chain linkage system. We also found that species like Eichornia, Lemna, Euphorbia species and Algal blooms which serve as pollution indicators and also effects aquatic organisms in lakes. Ground water level is also decreased. Fishes and Fishermen are Effected by this Activities. Post the floods Seasonal Diseases like viral fevers and Dengue have been Increased and Several people admitted in Hospitals.

Conclusions

By this project we came to know about these prestige Golusukattu chervulu and its importance. Sewage & plastic is the main pollutant which effecting these lakes. We also experienced floods for first time in Nirmal.

ISBN: 978-93-93259-95-0

References

1. Local News papers, news channels, books related to - History of Nirmal.
2. Conserving Biodiversity, Research Agenda for Development Agencies
3. Deshmukh, S., M. G. Gogate and A.K. Gupta 1998. Sacred groves and biological diversity: Providing new dimensions to conservation issue. Pp. 397-414. In: P.S. Ramakrishnan, K.G. Saxena and U.M. Chandrashekhara (eds), Conserving the Sacred for Biodiversity Management. Oxford and IBH, New Delhi.
4. N. Ramakrishna 2013. Ethno Botanical studies of Adilabad district, A.P. Ph. D Thesis Osmania University.
5. Raju VS, Krishna PG, Suthari S (2014) Environmental assessment of climate of a habitat through floristic life-form spectra, a case study of Warangal north forest division, Telangana, India. J Nat Sci 2(1):77-93.
6. Mohan AC, Suthari S, Ragan A (2017a) Ethnobotanical plants of Kawal wildlife sanctuary, Telangana, India. Ann Plant Sci 6(2):1537-1542.
7. Balon E., Coche, A.G. 1974. Lake Kariba: A man-made tropical ecosystem in central Africa. The Hague: Junk

 ISBN: 978-93-93259-95-0

"వనదేవతా సంస్కృతీ - విలువల ప్రాధాన్యత- అంతరించిపోతున్న వైనం "

Are. Raju,
Lecturer in Telugu,
GRP Government Degree College Bhainsa, Nirmal District
Email: areraju77@gmail.com

సంగ్రహణ :-

వనాల యొక్క ప్రాముఖ్యత ప్రాణికోటికి వాటి ప్రాధాన్యత తెలుపుతూ మన పెద్దవారు, ఋషులు ప్రతి చెట్టు, పుట్ట చీమ పాము ఇలా చెప్పుకుంటూ పోతే ప్రకృతిలోని ప్రతిదానికి దైవత్వాన్ని ఆపాదించారని మనందరికీ తెలుసు. గిరిజనుల సాంప్రదాయ బద్ధంగా జరుపుకునే వారి పండుగలలో ఉన్న సంస్కృతి, ఆచార వ్యవహారాలు వాటిని ప్రేమించే తత్వాన్ని వివరించడం, పల్లె జీవనంలో ముడిపడి వారికి అన్ని రకాల అండగా నిలిచే వనాలను వనదేవతగా కొలుస్తూ ప్రాణులను దేవతలుగా ఆరాధిస్తూ పూజించే సంస్కృతి ,మనదేశంలోనే రెండవ కుంభమేళగా చెప్పే సమ్మక్క, సారక్క మేడారం జాతర ను,అటవీ సంపద తగ్గిపోతున్న తీరు, ఫలవృక్ష జాతులు వాటి క్షీణత వల్ల దాని ప్రభావం ఏ విధంగా ప్రాణికోటిపై పడి మానవ మనుగడకు పెనుముప్పుగా మారుతున్నటువంటి విధానం, తెలంగాణ ప్రభుత్వం వనసంరక్షన కోసం చేపడుతున్నటువంటి చర్యలు, హరితహారం వల్ల వాటి ప్రాధాన్యతను గుర్తించి ప్రతి ఏటా వాటి పరిరక్షణ చేపడుతున్నటువంటి పద్ధతులు తీసుకుంటున్నటువంటి చర్యలు వివిధ పత్రికలలో వచ్చినటువంటి వార్తల విశ్లేషణ.

ప్రాముఖ్యత గల పదాలు:-జీవ వైవిధ్యం, వనదేవతలు, తెలంగాణా జాతరలు:- మేడారం, నాగోబా.

పరిచయం:--

పచ్చని వనాలతో విలసిల్లే ఏ గ్రామమైన, ఏ పళ్ళెనా, ఏ పట్టణమైనా సహజ సుందరంతో మెరుస్తూ కొత్త పెళ్లికూతురు శోభల ఆగిపిస్తాయి. జీవుల మనుగడకు దోహ టీవీదం చేస్తాయి. పల్లె జీవనంతో ముడిపడి వారికి అన్ని రకాల అండగా నిలిచే వనాన్ని వనదేవతగా కొలుస్తూ వివిధ రకాల ఉత్సవాలను కూడా జరుపుకునే సంస్కృతి మనది. వనాలను దేవతగా కొలుస్తూ వివిధ రకాల మొక్కలపై పండ్లపై ఆధారపడి వాటితో తమ జీవనం కొనసాగించుకుంటున్న గిరిజనులు ఎందరో.

సమాచార సేకరణ:--

మన తెలంగాణలోనే చూసుకుంటే దేశంలోనే రెండవ కుంభమేళగా చెప్పుకునే సమ్మక్క సారక్క జాతర తెలంగాణ రాష్ట్ర పండుగగా గుర్తింపు పొందిన విషయం మన అందరికీ తెలిసిందే. ములుగు జిల్లా కేంద్రంలోని 44 కిలోమీటర్ల దూరంలో తాడ్వాయి మండలంలో ఉన్న మారుమూల అటవీ ప్రాంతమైన మేడారంలో దట్టమైన అడవులు, కొండలకుండల మధ్య ఈ చారిత్రాత్మకమైన జాతర జరుగుతుంది. సమస్త గిరిజనుల సమారాధ్య దేవతలు కష్టాలు కడతేర్చే కలియుగ దైవాలుగా

ISBN: 978-93-93259-95-0

ఆపదలో ఉన్న వారిని ఆదుకునే ఆపద్బాంధవులుగా, కేవలం తెలంగాణలోని కాక అఖిల భారతదేశం లోనే వనదేవతలుగా పూజలందుకుంటున్న ఈ సమ్మక్క సారక్క జాతర దేశంలోని అతిపెద్ద గిరిజన జాతరగా గణతికెక్కింది. మేడారం జాతర గిరిజన సంప్రదాయ రీతిలో జరుగుతుంది. ఎన్నో రాష్ట్రాల నుండి లక్షల కొద్ది భక్తులు తండోపతండాలుగా తరలివచ్చి మొక్కులు చెల్లించుకుంటారు. ఇటువంటి సాంప్రదాయం ప్రపంచంలో ఎక్కడా వెతికిన దొరకదు. అలాగే తెలంగాణ రాష్ట్రంలోనే ఉమ్మడి ఆదిలాబాద్ జిల్లాలో గిరిజనుల ప్రత్యక్ష దైవంగా పూజలు అందుకుంటున్న నాగోబా జాతర గూర్చి కూడా మనం చెప్పుకోవాల్సినటువంటి అవసరం ఉంది. ప్రతి పుష్య మాసం అమావాస్యనాడు జాతరను నిర్వహించుకుంటారు. ఈ జిల్లాలో జరిగే అతిపెద్ద గిరిజన జాతర నాగోబా జాతర . ఇక్కడ సర్పాన్ని దేవతగ మోస్రం వంశీయులు ప్రత్యేకంగా పూజిస్తారు. ప్రత్యేకంగా తయారు చేయించినటువంటి కొత్త కుండల్లో గంగా జలాన్ని తీసుకు రావడానికి వెళ్లేసమయంలో మర్రి చెట్టు క్రింద నిద్రించి, గోదావరి నుండి గంగాజలాన్ని తీసుకువచ్చి నాగోబాను అభిషేకిస్తారు.సహజ వనరుల కు ప్రతీకగా నదిని,అటవీ సంపదకు ప్రతీకగా మర్రిచెట్టును,జీవ కాలానికి ప్రతీకగా నాగదేవతను పూజించే గిరిజనులు తమ సంస్కృతి ద్వారా జీవ వైవిధ్యవిశిష్టతను నాగరిక ప్రపంచానికి తెలియజెప్తున్నారు. పుష్యమాసం వచ్చిందంటే చాలు అడవుల జిల్లా ఆదిలాబాద్ జాతరలతో సంబరంగా ముస్తాబవుతుంది. కొత్తకోడల్లను నాగోబాకు పరిచయం చేయడం వీరి ఆచారం. ఈ పూజలు చేసే వరకు ఆ కోడల్లకు ఇంట్లో దేవుళ్ళకు కూడా పూజించే అర్హత ఉండదు. ఈ మొక్కులు చెల్లించుకునేందుకు మహారాష్ట్ర, చత్తీస్గడ్, జా, మధ్యప్రదేశ్, ఒరిస్సా, కర్ణాటక రాష్ట్రాలకు చెందిన మోస్రం వంశీయులు అందరు కూడా వస్తారు.ఈ నాగోబా దేవాలయం ఇంద్రవెల్లి మండలంలోని కేస్లాపూర్ గ్రామంలో ఉంది. ఈ నాగోబా జాతరకు దర్బార్ ఒక ప్రత్యేకమైన ఆకర్షణగా చెప్పుకోవచ్చు. అలాగే మోస్రం వంశీయులు ఇక్కడ 22 పొయ్యిలు ప్రత్యేకంగా పెట్టి వాటి మీదనే వంట చేసుకుంటారు. వేలాది మంది అందరికీ 22 పొయ్యిలు మీదనే వంట చేస్తారు. వేరేవాళ్లు ఎక్కడైనా చేసుకోవచ్చు. ఇక దర్బార్ చివరి రోజున జరుగుతుంది.అప్పటి దీనికి దాదాపుగా 64 ఏళ్ల క్రితం ఇక్కడ మారుమూల ప్రాంతం కాబట్టి నాగరికులు అంటేనే ఆదివాసులు పరిగెత్తేవారు.భూమి కోసం, విముక్తి కోసం జల్,జంగల్,జమీన్ అని సాయుధ పోరాటం చేసినటువంటి కొమురం భీమ్ మరణించిన తరువాత వీరి సమస్యల గురించి పర్యవేక్షణకు నిజాం నవాబు, హైమన్ డా ర్ఫ్ ను పంపించడం జరిగింది. అతను ఎక్కడే క్కడినుండి నుంచో వస్తున్నటువంటి ఈ గిరిజనుల సమస్యల్ని తెలుసుకోవడానికి దర్బార్ను ఏర్పాటు చేయడం అనేది జరిగింది. అప్పటినుండి ఈ దర్బార్ జరుగుతూ వస్తోంది.ఈ విధంగా మనం మన జీవనంలో ప్రతి దానికి దైవత్వాన్ని ఆపాదించిన తీరు చూసుకోవచ్చు. ఎందుకంటే మనం చెట్టును పూజిస్తాం, పుట్టని పూజిస్తాం వాటితో ఎనలేని అనుబంధం కూడుకుని ఉన్న జీవనం మనది. అలాంటి వనాలు నేడు మనుగడ లేక నశించిపోతున్నాయి. అటవీ విస్తీర్ణం నాటికి నేటికి తరిగిపోతున్న విధానం చూస్తుంటే రాబోయే కాలం ఎలా ఉంటుందో ఊహించుకుంటేనే భయం వేస్తుంది. ఎందుకంటే మనం చూస్తే మొన్నటికి మొన్న కరోన వచ్చి ఊపిరాడక ప్రాణాలు ఎన్నో గాలిలో కలిసిపోయాయి. ప్రధానంగా ఆక్సిజన్ కొరవత ఏర్పడిన తీరుతో దేశం ప్రపంచం అతలాకుతలమై కృత్రిమ ఆక్సిజన్ సిలిండర్లపై ఆధారపడి ప్రాణాలు ఊపిరాడక ఆగిన గుండే లెన్నో,వాటి కొరతతో ఎంత ఇబ్బందికర పరిస్థితులు ఎదుర్కొన్నా మో మనందరికీ తెలిసిందే,

 ISBN: 978-93-93259-95-0

అటువంటి ఆక్సిజన్ ను ప్రాణి కోటికి సహజసిద్ధంగా నిరంతరం అందిస్తున్న ఈ వనాలు క్షీణత, అటవీ తరుగుదల మానవ మరియు జీవకోటికి పెనుముప్పుగా అని చెప్పవచ్చు అటవీ విస్తీర్ణం తగ్గిపోవడంతో ఎన్నో జంతుజాలం వాటి మనుగడకే ప్రమాదంగా మారింది. కొన్ని జీవులు కనుమరుగైపోతున్న తీరు మనకు అందరికీ చాలా బాధాకరం ప్రమాదకరం. ఇప్పటికే చూస్తూ ఉంటే కొన్ని సర్పజాతులు గాని కొన్ని వివిధ సరిసృపాలు గాని మనం చూసుకుంటే అనేకమైనటువంటి కొన్ని జీవులు కనుమరుగైపోయాయి. అడవులు ఏ రాష్ట్రానికి అయినా ఆస్తులు మరి ఆదాయాన్ని ఇవ్వడమే కాకుండా ఎన్నో రకాల ప్రయోజనాలు కూడా చేకూరుస్తాయి. అడవులను పరిరక్షించడంతోపాటు విస్తీర్ణాన్ని పెంచితే ఎన్నో విధాలుగా జీవకోటికి ఆధార భూతం అవుతాయి. రాష్ట్ర ఆర్థిక వ్యవస్థలో అటవీ వనరులు ప్రధాన పాత్ర పోషిస్తాయి, అనడానికి ఎటువంటి సందేహం లేదు. పర్యావరణ పరిరక్షణకు గ్రామీణ పేదల జీవనోపాధికి భూమి తాపాన్ని తగ్గించడం భూసార పరిరక్షణకు ఎంతో దోహదం చేస్తాయి.

విశ్లేషణ:--

అడవి విస్తీర్ణం నానాటికి తరిగిపోవడం జనవాసం విస్తరించడంతో అడవిని నరికి వేస్తూ ఇతరత్ర గృహో పకరణ వినియోగ నిమిత్తం వీటిని ఉపయోగించడంతో వాటిపై ఆధారపడి జీవిస్తున్నటువంటి జంతుజాలం వాటి మనుగడకే ప్రశ్నార్థకంగా మారింది. అంతేకాకుండా వివిధ ఫల జాతి వృక్షాలు మూలికా వైద్యానికి ఉపయోగపడే వివిధ మొక్కలు, అంతరించిపోతున్నాయి. ఉదాహరణకు మనం ప్రపంచ ప్రఖ్యాతిగాంచినటువంటి నిర్మల్ కొయ్య బొమ్మలకు ఉపయోగించే పనికి కర్ర ఆదిలాబాద్ అడవులలో ఒకప్పుడు విస్తారంగా లభించేది .ఇది ఇప్పుడు రాను రాను మరి కణుమరుగై దాని జాడ ప్రశ్నార్థకంగా మారిన తీరు బాధాకరం . అలాగే అడవులలో ఫల జాతి వృక్షాలు అంతరించిపోవడంతో వాటిపై ఆధారపడిన వానరాలు తిండి దొరకక గ్రామాలు, పట్టణాలలో పంటచేళ్లపై పడి ఎన్నో నష్టాలు కలగజేస్తూ మనుషులను వారి యొక్క ప్రాణాలకు ముప్పు తెస్తూ, మరి ఎన్నో ఇబ్బందులు గురి చేస్తున్నటువంటి తీరు మన రాష్ట్రంలో ఎక్కడ చూసినా కూడా కనిపిస్తుంది . జీవవైవిద్య పరిరక్షణ మన తెలంగాణ రాష్ట్రాన్ని తీసుకుంటే చేను చేమ పర్యావరణ వ్యవస్థ ఉంది జీవవైవిద్య పరిరక్షణకు 12 ప్రాంతాలను రక్షిత ప్రాంతాలుగా ప్రకటించారు. వీటిలో 9 వన్యప్రాణి, మూడు జాతీయ వన్యప్రాణి, నిలయాలు వీటి మొత్తం విస్తీర్ణం 5692.48 చదరపు కిలోమీటర్లు, రాష్ట్ర అటవీ విస్తీర్ణంలో ఇది 19.73శాతం. ముఖ్యంగా తెలంగాణ రాష్ట్రం "తెలంగాణ తల్లికి హరితహారం "అనే కార్యక్రమాన్ని ప్రతి ఏటా నిర్వహిస్తోంది. అటవీ విస్తీర్ణం, మొక్కల పెరుగుదలకు ప్రభుత్వం ప్రత్యేకంగా కృషి చేస్తా ఉంది తెలంగాణలో అటవీ విస్తీర్ణం ఆదాయం అమలు చేస్తున్నటువంటి పథకాలు ఈ దిశగా ప్రభుత్వ కృషి అభినందనీయమని చెప్పవచ్చు. ఇక జానపదులు తమ జీవనంతో ముడిపడిన అడవి తల్లి అందాలను తమ ఆటలతో, పాటతో, మాటలతో అనునిత్యం కొలుస్తూనే వస్తారు. "నా పల్లె అందాలు సూసితే కనువిందురో- ఎత్తు వంపులతోని డొంకదారుల్లో సూడు -ఏపుగా పెరిగినట్టు యాపలు ఈదులు సూడు- అల్లుకున్న అడవి తీగలాదొ ండపొదలురో సారములు లేని భూములు సుట్టంత మొలసి బారెడు మండల కోనలకు బంగారపు వన్నె కలిగి వంగిన పొదలల్ల తంగేడు పూలు ఉన్నాయో అన్న మన గోరేటి వెంకన్న రేల పూతల్లో పల్లె అందాలను, తంగేడు పూల గొప్పదనం ఈదుల విస్తరించిన తీరు ఎలమంద గొర్రె

మంద వాడే వాడి యొక్క లోకం. ఆ తోడు ఉన్నటువంటి యాడదికొక్కసారి లారెక్కుతుంటే, యాడి కోతున్నాయని తల్లిని అడుగుతాడు, ఇటు తండ్రిని అడుగుతాడు, కన్నీళ్లు కార్చుతాడు." ఇట్లా కరుణ రసాత్మకంగా రెళ్ళ పూతల్లో వర్ణించినటువంటి తీరు మనకు తెలుగు సాహిత్యంలో జీవవైవిద్యాన్ని మరి వనాలతో పల్లె వాసులు,జానపదలు ఆ పల్లెతో ముడి పడినటువంటి తీరు అడవితో ముడిపడినటువంటి వారి యొక్క జీవన విధానం, తర్వాత ఆ జంతుజాలం పైన ఆధారపడినటువంటి తీరు నేడు అవన్నీ కనుమరుగుతున్నటువంటి విధానం చూస్తుంటే మనకు చాలా బాధాకరమని చెప్పవచ్చు.

"జీవ వైవిధ్యం యొక్క ప్రాముఖ్యత" జీవగోళం మరియు భూమి యొక్క భౌగోళిక ఎన్వలపుల మధ్య పరస్పరం చర్య ఫలితంగా జీవవైవిద్యం ఏర్పడింది. హైడ్రోస్పియర్ వాతావరణం మరియు భూమి యొక్క క్రస్ట్ (లితోస్పియర్) దీని కూర్పు ఎక్కువగా బయోట ద్వారా నిర్ణయింపబడుతుంది. బయోట ఒక సమయంలో తగ్గించే వాతావరణాన్ని ఆక్సిడైజిగ్ గా మార్చడానికి కారణమైంది .ఇది పరిణామ ప్రక్రియ మరియు కొత్త జీవిత రూపాల ఆవిర్భావానికి ప్రేరణ నిచ్చింది.

ముగింపు:--

ఈవిధంగా అడవిని వనదేవత లుగా కొలుస్తూ వివిధ వృక్షాలను,మొక్కలను పూజించే సంస్కృతీ మనది వేప చెట్టును పోచమ్మగా,తులసిని లక్ష్మీదేవిగా,ఉసిరి,మారేడు ఎలా ఎన్నో మొక్కలను పూజిస్తు ,ఆరాధిస్తూ వనరక్షనే మనరక్షనగా భావిస్తూ కొలుస్తూ వాటిని అలాంటి భావనతోనే కాపాడుతూ, ఈ భూమిపై వాతావరణం యొక్క సమతుల్యత దెబ్బతినకుండా అటవీ ,జంతు జలాన్ని కాపాడుకోవడం, వాటి పరిరక్షణకు పాటుపడవలసినటువంటి బాధ్యత ప్రతి ఒక్కరిపై ఉందని గుర్తు చేస్తూ అంకితభావంతో వివిధ ఔషద మొక్కల గుర్తించి వాటిని కాపాడుతూ రాబోయే తరాలకు వాటి గొప్పదనాన్ని తెలియపరచాల్సిన అవసరం ఎంతైనా ఉంది .

ఆధార గ్రంథాలు:-

1. ఈ నాడు ప్రతిభ సౌజన్యం
2. మేడారం జాతర కంక్లూడ్స్ , న్యూ ఇండియన్ ఎక్స్ప్రెస్
   20 -2 -2022
3. నాగోబా జాతర మేశ్రంస్ క్యాంప్ అండర్ బనియన్ ట్రీస్ ఇన్ ఆదిలాబాద్. తెలంగాణ టుడే
   28- 1- 2022

 ISBN: 978-93-93259-95-0

Medicinal Plants and its Uses

Dr. Sailaja C.S

Assistant Professor of Botany, Government Degree College, Kuppam,
Chittoor District, Andhra Pradesh-517425
Email : sailajarajaram2009@gmail.com

Abstract

A Number of plants have been used in traditional medicine for many years. Some do seem to work although there may not be sufficient scientific data to confirm their efficacy. Such plants should qualify as medicinal plants. These plants are used for flavor and conserve food to treat health disorders and to prevent diseases including epidemics. Across the broad utilization of home-grown cures and health care preparations is depicted in the Vedas and other epics. Treating of diseases without documentation has been practiced and transmitted throughout the decades within and among the Human groups. Now, the studies have been carried out globally to verify their efficacy and some of the findings have led to the production of plant-based medicines. The value of these medicinal plant products is more than billion per annum. The substances got from plants may possibly control microbial development in diverse circumstances and in the particular instance of ailment treatment. Various studies have intended to depict the chemical composition of these plants antimicrobial and the mechanisms required in microbial development hindrance, either independently connected with conventional antimicrobials. The usefulness of the common-factor approach as a method of engaging other health promoters in propagating the ideals of medicinal plants is highlighted. The place of medicinal plants in preventing common diseases is further examined. The proposal for strategizing the future role and place for medicinal plants in disease control, prevention and treatment.

Keywords: *Medicinal plants, Epidemics, Efficacy, Communicable diseases, Antimicrobials, Coronary heart diseases, Kuppam (Dt), Andhra Pradesh State.*

Introduction

Medicinal plants are the one in which all the parts of it are used for preparing medicine. Even the Literature considerable report in recent times on research work on the use of medicinal plants and their constituents in disease prevention. A World Health Organization (WHO) Expert Group defined Traditional Medicine as the sum total of all Knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental, or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing (WHO,1976). In Traditional Medicine this may be extended further by including an expression, such as 'While bearing in mind the original concept of nature which includes the material world, the sociological environment whether

living or dead and the metaphysical forces of the universe'. Over 90% of traditional medicine recipes/remedies contain medicinal plants but this paper will address, specifically, the medicinal plants that have been implicated with preventive measures in disease control strategies. However, it must be noted that only a very thin divide exists between treatment and prevention in some cases.

A medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs. This description makes it possible to distinguish between medicinal plants whose therapeutic properties and constituents have been established scientifically, and plants that are regarded as medicinal but which have not yet been subjected to a thorough scientific study. A number of plants have been used in traditional medicine for many years. Some do seem to work although there may not be sufficient scientific data (double-blind trials) to confirm their efficacy. Such plants should qualify as medicinal plants.

Be whole plants or parts of plants which have medicinal properties. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed (UNESCO, 1996). Furthermore, an increasing reliance on the use of medicinal plants in the industrialised societies has been traced to the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used rural herbal remedies (UNESCO, 1998). Moreover, in these societies, herbal remedies have become more popular in the treatment of minor ailments, and also on account of the increasing costs of personal health maintenance. Indeed, the market and public demand has been so great that there is a great risk that many medicinal plants today face either extinction or loss of genetic diversity.

Allium cepa and A. sativum (Family Liliaceae) Onion and Garlic, Antony and Singh (2011) have reviewed the mechanisms and targets of cancer chemoprevention by diallyl trisulfide (DATS) extracted from Allium species, while Zhou et al (2011) in a meta-analysis, in which they pooled analysis of all studies, concluded that the consumption of large amounts of Allium vegetables (in a comparison of the highest and lowest consumption groups) reduced the risk for gastric cancer. Allium sativum (garlic) and its chemical constituents, especially Allicin, DiallyDisulfide, Diallyl Trisulfide, have also been shown in recent studies to be chemo preventive agents for lung cancer and breast cancer (Chu et al., 2012; Nkrumah-Elie et al., 2012; Li et al., 2012).

Methodology Used

The information gathered was documented in tabular form prepared. The information was collected by personal interview of the people nearby villages of Kuppam mandal of chittoor district. Plants was identified by references of books of Pullaihetal. (1992), Pullaih and Rao (1995), Cooke (1958).

ISBN: 978-93-93259-95-0

For documentation of information and collection of plant materials several trips were undertaken to the villages. Methodology used is based on the methods available in the literature of Jain (1989) and Jain and Mudgal (1999), Sharma P.P and Singh N.P. 2001.(Table - 1)shows the plants with its names and its uses;

Table:-1

S.No	Botanical Name	English Name	Hindi Name	Uses
1	***Adhatodavasica***Nees.	Malabar Nut	Adusa/Vasaka	Cough, Asthma, Bronchitis
2	***Ananas comosus***.	Pineapple	Ananas	Sore Throat, Diabetes, Heart Disease, Obesity
3	***Acacia arabica***Willd.	Indian Gum	Babool	Oral Care, Bleeding Gums, Wounds
4	***Bacopa monniera***..	Thyme leafed gratiola	Brahmi	Enchances Memory, Anxiety
5	***Coriandrum sativum***Linn .	Coriander	Dhaniya	Indigestion, Flatulence, Controls Spasmodic Pain
6	***Andrographis paniculata***.	Kalmegh	Kalmegh	Indigestion, Acne, Diarrhea
7	***Allium sativum***.	Garlic	Lashun	Ringworm, Dysentery, Wounds
8	***Cyperus rotundus***Linn .	Nut Grass	Nagarmotha	Fever, Diabetes, Solar Dermatitis
9	***Boerhaaviadiffusa***Linn .	Spreading Hogweed	Punarnava	Anemia, Liver Diseases, Wounds
10	***Desmodiumgangetium***DC .	Shal Leafed Bush	Shalparni	Analgesic, Anti-Inflammatory
11	***Ocimumsactum***Linn .	Holy Basil	Tulsi	Indigestion, Heart Diseases, Respiratory Diseases
12	***Argyreia speciosa***Sweet .	Elephant Creeper	Vridhadaru	Diabetes, Skin Diseases, Wounds
13	***Aquilaria agallocha***Roxb.	Eagle Wood	Agarkasth	Bed-Wetting, Incompetency of Urinary Bladder
14	***Alangiumsalvifolium***.	Sage leaf alangium	Ankol	Snakebite, Scorpion Bite, Dog Bite
15	***Amomum subulatum***.	Greater Cardamom	Badi Elaichi	Bronchitis, Asthma, Appetizer, Digestant
16	***Achyranthes aspera***.	Prickly chaff flower	Chirchita	Indigestion, Cough, Asthma, Anemia, Jaundice
17	***Elettaria cardamomum***Maton.	Lesser Cardamom	Elaichi	Nausea, Vomiting, Dry Cough
18	***Abutilon indicum***.	Country Mallow	Kanghi	Facial Paralysis, Joint Disorders, Increases Strength
19	***Celastruspaniculatus***Willd.	Staff Tree	Malkagini	Muscle Cramps, Backache, Osteoarthritis, Paralysis
20	***Azadirachta Indica*** A. Juss.	Margosa Tree	Neem	Leprosy, Eye Disorders, Bloody Nose, Intestinal Worms
21	***Allium cepa***Linn .	Onion	Pyaj	Prostate Cancer, Esophageal, Stomach Cancer
22	***Asparagus racemosus***Willd.	Asparagus	Shatavari	Infertility, Loss Of Libido, Threatened Miscarriage
23	***Abroma augusta***.	Devil's Cotton	Ulatkambal	Gynaecological Problems, Irregularity In Periods
24	***Alhagicamelorum***.	Camel Thorn	Yavasa	Rheumatism, Vomiting, Stomachache, Constipation
25	***Anacyclus pyrethrum***.	Pellitory	Akarkara	Toothache, Dryness Of The Mouth, Throat, Catarrh
26	***Withaniasomnifera***Dunal.	Winter Cherry	Ashgandh	Stress Tolerance, Immunity, Joint Pains, Skin Sores
27	***Aegle marmelos***Corr. .	Bengal Quince	Bael	Dysentery And Diabetes, Sunstrokes, Anti-Cancer

ISBN: 978-93-93259-95-0

S.No	Botanical Name	English Name	Hindi Name	Uses
28	***Plumbago zeylanica***Linn .	Leadwort	Chitvan	Arthritis, Skin Diseases, Menstrual Disorders, Obesity
29	***Aloe vera*** Tourn ex. Linn .	Aloes	Ghee Kunwar	Ulcers, Burn Injuries, Jaundice, Acne
30	***Costusspeciosus*** (Koeing) Sm.	Crepe Ginger	Ketaki	Obesity, Hyperlipidaemia, Diabetes
31	***Centella asiatica***Urban .	Gotu Kola	Mandukparni	Sedative, Antibiotic, Detoxifier, Laxative
32	***Butea monosperma***Kuntze.	Bastard Teak	Palasha	Complexion of Skin, Worm Infestations, Roundworm
33	***AbrusPrecatorius***	Rosary Pea	Ratti	Joint Pains, Paralysis, Alopecia
34	***Albizia lebbeck*** (Linn) Benth.	Siris Tree	Shirish	Bronchial Asthma,
35	***Acorus calamus***.	Sweet Flag	Bach	Flatulent Colic, Atonic Dyspepsia, Ulcers
36	***Cassia fistula***Linn .	Indian Laburnum	Amaltas	Ulcers, Wounds
37	***Saracaindica***.	Sorrowless tree	Ashok	Menstrual Irregularities, Uterine Stimulant
38	***Clerodendronserratum***Moon .	Bharangi	Bharangi	Common Cold, Chronic Sinusitis, Allergic Rhinitis,
39	***Alstoniascholaris***.	Dita	Chitvan	Skin Ulcers, Fever, Increasing Lactation
40	CommiphoramukulEngl.	Indian Bdelium	Guggulu	Joint Disorders, Heart Diseases, Hypolipidaemic,
41	***Acacia catechu***Willd.	Cutch Tree	Kadirkasth	Skin & Respiratory Problems, Oral Hygiene, Astringent
42	***Aconitum ferox***.	Monks hood	MeethaVish	Fever, Diuretic Action, Arthritis
43	***Cissampelos pareira***Linn .	Velvet Leaf Tree	Patha	Ulcers, Sinuses, Skin Diseases, Poisonous Bites
44	***Cassia angustifolia***Vahl.	Indian Senna	Senna	Laxative, Constipation, Irritable Bowel Syndrome, Weight Loss
45	***Areca catechu***Linn .	Areca Nut/Betelnut	Supari	Obesity, Hyperlipidaemia, Diabetes, Irregular Menstruation
46	***Barleriaprionitis***Linn .	Barleria	Vajradanti	Strengthens Teeth, Fever, Catarrh
47	***Emblica officinalis***Linn .	Indian Gooseberry	Amla	Antioxidant, Antistress, Constipation, Fever
48	***Aconitum heterophyllum***Wall.	Indian Ateech	Atees	Fever, Respiratory
49	***Betula utilis*** D. Don .	Himalayan Birch	Bhojpatra	Wounds, Obesity
50	***Cinnamomum Zeylanicum***Breyn.	Bark Cinnamon	Dalchini	Antibacterial, Antiseptic
51	***Amorphophallus campanulatus***.	Elephant yam	Jimikand	Dysentery, Piles, Haemorrhoids
52	***Alpinia galanga***.	Greater Galangal	Kulanjan	Flatulence, Dyspepsia, Vomiting, Seasickness, Catarrh
53	***Glycyrrhiza glabra***Linn .	Liquorice	Mulethi	Digestive Disorders, Ulcers, Bronchitis
54	***Piper longum***Linn .	Long Pepper	Pippali	Asthma, Cough, Indigestion
55	***Boswellia serrata***Roxb. .	Indian Olibanum	ShalaiGuggal	Joint Pains, Headache, Diabetes
56	***Cinnamomum tamala***Nees.	Cinnamon Leaf	Tamalpatra	Diabetes, Digestion, Cold
57	***Crataevanurvala*** Buch-Ham	Three Leafed Caper	Varun	Kidney Stones, Bladder Stones

Preventive strategies:

Health promotion, disease prevention and chronic disease management are proactive approaches to health care that stresses prevention at different points along the health care continuum. Health promotion and disease prevention strategies focus on keeping people well and preventing diseases from occurring.

ISBN: 978-93-93259-95-0

These strategies are referred to as primary prevention activities. Prevention is categorised into three levels

1. Primary Prevention:

Which seeks to decrease the number of new cases of a disorder or illness. At this level of prevention, we have:

- Health promotion/education, and
- Specific protective measures (such as immunisation)

2. Secondary Prevention:

Which seeks to lower the rate of established cases of a disorder or illness in the population (prevalence). This level essentially involves measures that ensure early diagnosis (such as screening) and prompt management

3. Tertiary Prevention:

Which seeks to decrease the amount of disability associated with an existing disorder. This level involves:

- Disability limitation and
- Rehabilitation

The secondary and tertiary prevention activities focus on maintaining the health of individuals with chronic conditions, delaying progression of their conditions, and preventing complications.

Disease prevention should focus on strategies that reduce the risk of disease, identify risk factors, or detect disease in its early, most treatable stages. Examples of disease prevention activities include well-baby visits, immunisations, calcium and Vitamin D supplements to reduce the risk of osteoporosis, blood pressure and cholesterol assessments during annual health exams, and screening for illnesses such as breast, cervical, colorectal and prostate cancer (Family Health Teams, 2006).

Public health, diet, food production and the environment are deeply interrelated, and understanding these relationships is crucial in pursuing a liveable future. Sometimes therefore, there is only a thin line between treatment and prevention of certain diseases. For example, treatment of mild hypertension will prevent many chronic renal diseases. This is also true for obesity, cancers, coronary heart diseases (CHDs) as well as diabetes and its sequelae, though these are non-communicable diseases.

The common risk factor approach aims at bringing together several health promoters working on eliminating common-risk factors as a way of preventing diseases. (Sheiham and Walt, 2000) Poor Diet for example can lead to obesity, diabetes, cancers, and dental caries. Hence, nutritionists,

ISBN: 978-93-93259-95-0

diabetologists, oncologists, dental practitioners can work together with diet as common theme. A modified form of this approach can be a useful tool in engaging other health promoters, in tackling the different forms of disease, and in propagating the ideals of medicinal plants. Working with various groups, for example, appropriate medicinal plants can be incorporated into the diets to alleviate disease and suffering. This approach will enable those working to promote the use of medicinal plants to collaborate with other health promoters in areas such as malaria, diabetes, cancers, cardiovascular diseases, tuberculosis, oral diseases, dermatological problems, etc.

Result and Discussion:

The Information was gathered from Kuppam Mandal of Chittoor District, Andhra Pradesh state indicates that the tribals, and other village people of this region utilize medicinal plants for various purposes, but their continuous andprogressive exposure to modernization and pollution and without documentation, only oral information is passing from one generation to other generation may result in extinction of such rich heritage of knowledge of using the plants in curing different diseases.

Ayurvedic herbs are time tested for their health and other benefits. The nutritive value that they pack are highly recommended for their healing powers. Known to induce no side effects, they have a unique aroma and flavor and when consumed regularly, they act as a perfect mechanism to bring about a balanced harmony between mind and body. They rejuvenate the whole system instead of focusing on one specific organ or body part.

- They have a holistic approach and aid in proper absorption and digestion,
- They are not disease specific but act as a preventive medicine that positively effects theoverall healthand well-being by boosting the immune system,
- They are at par with allopathic medicines and are at times known to be effective in treating diseases like cancer and autoimmune diseases,
- They are self-contained and nutritive in nature, therefore, are non-toxic and harmless,
- It deals with the overall well-being and aims to bring harmony between mind, body and soul,
- Several metabolic and chronic conditions can be treated without any side effects using Ayurvedic medicines and treatments.

The term 'crude drugs of natural or biological origin' is used by pharmacists and pharmacologists to describe plants or plant parts used medicinally in galenical preparations (e.g. decoctions, infusions, etc.) e.g. Cascara bark.

- Plants used for extraction of pure substances either for direct medicinal use or for the hemi-synthesis of medicinal compounds.

ISBN: 978-93-93259-95-0

E.g. hemi-synthesis of sex hormones from diosgenin obtained from Dioscorea yams.

- Food, spice, and perfumery plants used medicinally.

  E.g. ginger.

- Microscopic plants, e.g. fungi, actinomycetes, used for isolation of drugs, especially antibiotics.
- Examples are ergot (Claviceps purpurea growing on rye) or Streptomyces griseus.
- Fibre plants, e.g. cotton, flax, jute, used for the preparation of surgical dressings.
- Prevention and treatment of male osteoporosis due to androgen deficiency by using the medicinal plant: Eurycoma longifolia

Food Supplements

Public health, diet, food production and the environment are deeply interrelated, and understanding these relationships is crucial in pursuing a liveable future. Sometimes therefore, there is only a thin line between treatment and prevention of certain diseases. For example, treatment of mild hypertension will prevent many chronic renal diseases. This is also true for obesity, cancers, coronary heart diseases (CHDs) as well as diabetes and its sequelae, though these are non-communicable diseases.

The common risk factor approach aims at bringing together several health promoters working on eliminating common-risk factors as a way of preventing diseases. (Sheiham and Walt, 2000) Poor Diet for example can lead to obesity, diabetes, cancers, and dental caries. Hence, nutritionists, diabetologists, oncologists, dental practitioners can work together with diet as common theme. A modified form of this approach can be a useful tool in engaging other health promoters, in tackling the different forms of disease, and in propagating the ideals of medicinal plants. Working with various groups, for example, appropriate medicinal plants can be incorporated into the diets to alleviate disease and suffering. This approach will enable those working to promote the use of medicinal plants to collaborate with other health promoters in areas such as malaria, diabetes, cancers, cardiovascular diseases, tuberculosis, oral diseases, dermatological problems, etc.

The four core principles of the PHC approach include the following:

- Equitable distribution
- Community Participation (as issues that local people identify rather than predetermined services introduced by professionals, working within existing community organisations and local government structures, etc.)
- Focus on Prevention
- Appropriate Technology

ISBN: 978-93-93259-95-0

Multisectoral Approach - Emphasis should be made that the reason for the failure of many programmes is due to the fact that they operate in isolation, separate from the general health care structure and without the support of other relevant sectors. The need for programme medicinal plants can play vital roles in disease prevention and their promotion and use fit into all existing prevention strategies. However, conscious efforts need to be made to properly identify, recognise and position medicinal plants in the design and implementation of these strategies. These approaches present interesting and emerging perspectives in the field of medicinal plants cooperation and collaboration cannot be over-emphasised.

The elements include Immunisation, Maternal and Child Health (MCH) Care, Essential Drugs, Food and Nutrition, Education, Common Illnesses and injury, Water and Sanitation, Endemic Infectious Diseases, Mental health and Oral health. Medicinal plants can play vital roles in disease prevention and their promotion and use fit into all existing prevention strategies. However, conscious efforts need to be made to properly identify, recognise and position medicinal plants in the design and implementation of these strategies. These approaches present interesting and emerging perspectives in the field of medicinal plants.

In developing countries all over the world, large numbers of people die daily of preventable or curable diseases because of the lack of even simple health care. Diseases in these countries are often associated with malnutrition. As a result, those that do survive often never recover completely from the effects. The developing world is not a homogenous entity, but is made up of a variety of widely differing countries and areas which are at different stages of development. Nevertheless, these developing countries have certain features in common, including extremely limited resources, poor communications, vast distances, low levels of education, and individual and community poverty. These factors act together to keep these countries in a perpetual state of poverty. Yet, their populations continue to rise, especially in the rural regions which usually account for about 80 per cent of the total population.

The elements (or components) of PHC include (but not limited to) Immunisation, Maternal and Child Health (MCH) Care, Essential Drugs, Food and Nutrition, Education, Common Illnesses and injury, Water and Sanitation, Endemic Infectious Diseases, Mental health and Oral health.

The burden of healthcare and its human and financial resources requirement

In developing countries all over the world, large numbers of people die daily of preventable or curable diseases because of the lack of even simple health care. Diseases in these countries are often associated with malnutrition. As a result, those that do survive often never recover completely from the effects. The developing world is not a homogenous entity, but is made up of a variety of widely differing countries and areas which are at different stages of development. Nevertheless, these developing countries have certain features in common, including extremely limited resources, poor communications, vast distances, low levels of education, and individual and community poverty. These factors act together to keep these countries in a perpetual state of

 ISBN: 978-93-93259-95-0

poverty. Yet, their populations continue to rise, especially in the rural regions which usually account for about 80 per cent of the total population.

Another special characteristic of the developing world is the nomadic lifestyle of some of its people. Some 50 to 100 million nomads have been estimated to be present in the world, and 90 per cent of these live in Africa or Asia. Nomads have their own needs and problems peculiar to their lifestyle. Because of their constant movement and dispersion, it is difficult for conventional health services to reach these people. The striking difference between the developed and the developing world in terms of health care is reflected in the differing life expectancy of their populations.

For WHO, the priority interventions for the development of Traditional Medicine during first and second decades (2001-2010 and 2011-2020) are as follows:

- Policy formulation;
- Capacity building;
- Research promotion;
- Support for the local production of Traditional Medicines including cultivation of medicinal plants;
- Protection of intellectual property rights and traditional medical knowledge.

Global Disease Burden

Diseases have been grouped as communicable or non-communicable based on the involvement or otherwise of a transmissible biologic disease-causing agent. Until recently, communicable diseases (CDs) were the major causes of ill-health and deaths in the developing (low and middle resource) countries while non-communicable diseases were prevalent in the developed (high resource) countries, where improvement in living conditions and widespread deployment of technology had brought the CDs under control. However, the optimism that communicable diseases would be less of a health problem in the developed countries appears to have been misplaced with the appearance of new infectious diseases and re-emergence of older disease agents. Similarly, non-communicable diseases are already a major cause of morbidity and mortality as a consequence of globalisation and changing lifestyle in developing countries. Globally therefore, NCDs and CDs account for about equal quantities of morbidity and mortality, thus making all countries to currently face the double disease burden. The overall is, however, graver for low- and middle-income countries in terms of the health and socio-economic impacts.

Conclusions

Efforts must be geared towards measures that will enhance the effectiveness, efficacy and rational use of medicinal plants, especially through the integration into national, regional and local

ISBN: 978-93-93259-95-0

health policies and programmes. Most African, Asian countries, hinge their health care system on the Primary Health Care (PHC) strategy and it is necessary to incorporate the use of medicinal plants into all the components of PHC in these countries.

The burden of healthcare and its human and financial resources requirement

In developing countries all over the world, large numbers of people die daily of preventable or curable diseases because of the lack of even simple health care. Diseases in these countries are often associated with malnutrition. As a result, those that do survive often never recover completely from the effects. The developing world is not a homogenous entity, but is made up of a variety of widely differing countries and areas which are at different stages of development. Nevertheless, these developing countries have certain features in common, including extremely limited resources, poor communications, vast distances, low levels of education, and individual and community poverty. These factors act together to keep these countries in a perpetual state of poverty. Yet, their populations continue to rise, especially in the rural regions which usually account for about 80 per cent of the total population.

Another special characteristic of the developing world is the nomadic lifestyle of some of its people. Some 50 to 100 million nomads have been estimated to be present in the world, and 90 per cent of these live in Africa or Asia. Nomads have their own needs and problems peculiar to their lifestyle. Because of their constant movement and dispersion it is difficult for conventional health services to reach these people. The striking difference between the developed and the developing world in terms of health care is reflected in the differing life expectancy of their populations.

For WHO, the priority interventions for the development of Traditional Medicine during first and second decades (2001-2010 and 2011-2020) are as follows:

- Policy formulation;
- Capacity building;
- Research promotion;
- Support for the local production of Traditional Medicines including cultivation of medicinal plants;
- Protection of intellectual property rights and traditional medical knowledge.

Global Disease Burden

Diseases have been grouped as communicable or non-communicable based on the involvement or otherwise of a transmissible biologic disease-causing agent. Until recently, communicable diseases (CDs) were the major causes of ill-health and deaths in the developing (low and middle resource) countries while non-communicable diseases were prevalent in the

 ISBN: 978-93-93259-95-0

developed (high resource) countries, where improvement in living conditions and widespread deployment of technology had brought the CDs under control. However, the optimism that communicable diseases would be less of a health problem in the developed countries appears to have been misplaced with the appearance of new infectious diseases and re-emergence of older disease agents. Similarly, non-communicable diseases are already a major cause of morbidity and mortality as a consequence of globalisation and changing lifestyle in developing countries. Globally therefore, NCDs and CDs account for about equal quantities of morbidity and mortality, thus making all countries to currently face the double disease burden. The overall is, however, graver for low- and middle-income countries in terms of the health and socio-economic impacts.

The following are recommended:

a) Collation of data from books, research articles, conducting of ethnobotanical surveys (because African, Asian countries, have only recently started documentation of medicinal plants and their uses; oral tradition had been the mainstay) specifically to look for plants used in preventing diseases in our communities.

b) Collaborative research with Institutes for preventive medicine as well as departments of preventive dentistry in teaching hospitals; and

c) Coordination of the research to avoid duplication of efforts.

References

1. Ambasta, S. P. 1992. The useful plants of India, Publication and Information Directorate, CSIR, New Delhi.
2. Cooke, T. 1958. The Flora of the Presidency of Bombay, Vols 1-3 Reprinted edition, Government of India.
3. Jain, S.K.1991.Dictionary of Indian Folk medicine and Ethonobotany, Deep Publications, New Delhi.
4. Jain S.K. 1996. Ethonobiology in Human Welfare, Deep Publications, New Delhi.
5. Pullaiah. T and Ravi Prasad Rao, B. 1995. Flora of Chittoor, Andhra Pradesh, India, Bhisensingh, Mehandrapalsingh, Dehradun.

ISBN: 978-93-93259-95-0