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Van Sangyan

Note to Authors:

We welcome the readers of Van Sangyan to write to us about their views and issues in forestry. Those who wish to share their knowledge and experiences can send them:

by e-mail to vansangyan_tfri@icfre.org

or, through post to The Editor, Van Sangyan,
Tropical Forest Research Institute,
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Jabalpur (M.P.) - 482021.

The articles can be in English, Hindi, Marathi, Chhattisgarhi and Oriya, and should contain the writers name, designation and full postal address, including e-mail id and contact number. TFRI, Jabalpur houses experts from all fields of forestry who would be happy to answer reader's queries on various scientific issues. Your queries may be sent to The Editor, and the expert's reply to the same will be published in the next issue of Van Sangyan.

Cover Photo: Panoramic view of Achanakmar-Amarkantak Biosphere Reserve
Photo credit: Dr. N. Roychoudhury and Dr. Rajesh Kumar Mishra, TFRI, Jabalpur (M.P.)

From the Editor's desk

Forest products play an important role in supporting rural livelihoods and food security in many developing countries. Forests are important in the livelihoods of local people in most developing countries. Local people depend on forests resources for various products such as fuel wood, construction materials, medicine, and food. Globally, it is estimated that between 1.095 billion and 1.745 billion people depend to varying degrees on forests for their livelihoods and about 200 million indigenous communities are almost fully dependent on forests. Moreover, 350 million people who live adjacent to dense forests depend on them for subsistence and income. It is estimated that 20–25% of rural peoples' income is obtained from environmental resources in developing countries and act as safety nets in periods of crisis or during seasonal food shortages.

The NTFPs play important roles in the livelihoods of millions of rural and urban people across the globel. It is well established that NTFPs fulfil multiple functions in supporting human well being. The NTFPs 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 NTFPs also provide many households with a means of income generation, either as supplementary income to other livelihood activities, or as the primary means of cash generation.

Non-timber forest products (NTFPs) are goods of biological origin other than timber from natural, modified or managed forested landscapes. They include fruits and nuts, vegetables, medicinal plants, gum and resins, essences, bamboo, rattans and palms; fibres and flosses, grasses, leaves, seeds, mushrooms, honey and lac etc. The NTFPs can also be referred to as all the resources or products that may be extracted from forest ecosystem and are utilized within the household or are marketed or have social, cultural or religious significance. Majority of rural households in developing countries and a large proportion of urban households depend on the products to meet some part of their nutritional, health, house construction, or other needs1. The NTFPs create high economic value and large-scale employment. The NTFPs have attracted global interest due to the increasing recognition of the fact that they can provide important community needs for improved rural livelihood.

Globally, more than a billion people depend directly on forests for their livelihoods and the remaining six billion of us depend on forests for a variety of economic, social and environmental benefits such as the rainfall, biodiversity, pollinators, carbon storage and clean water they provide. Out of which NTFPs contribution is significant in providing adequate food, fuel, feed, health and fiber for growing populations. The importance of NTFPs in rural livelihoods in developing countries has become widely acknowledged. In India, NTFPs contribute an income equivalent to US$ 2.7 billion per year and absorb 55% of the total employment in forestry sector. Moreover, 50% of forest revenues and 70% of forest based export income come from such resources. They provide 50% of the household income for approximately one third of India's rural population. Considering the importance of NTFPs in the livelihoods and wellbeing of local people, especially in the developing world, it is intriguing why the sector still receives so little attention in development policies and budgets as well as in programmes and budgets from relevant government departments, such as for forestry, agriculture, rural development, environment or energy. In this paper we suggest challenges and strategies of NTFP management which will be useful in sustainable development of resources vis-a-vis provide livelihood opportunities to the poorest section of society.

In line with the above this issue of Van Sangyan contains an article on the contribution of forest products to rural livelihood. There are other useful articles viz. the forest seeds of Telangana, Diversity of macro-fungi in Central India-XVI: Colus pusillus, a member of Phallaceae from Maharashtra, Heavy outbreak of leaf skeletonizer Phazaca theclata on Haldina cordifolia, ग्लोबल वार्मिंग के दुष्प्रभाव and Diversity of macro-fungi in Central India-XV: Ganoderma colossus causing butt rot in Feronia elephantum, kaitha

I hope that readers would find maximum information in this issue relevant and valuable to the sustainable management of forests. Van Sangyan welcomes articles, views and queries on various such issues in the field of forest science.

Looking forward to meet you all through forthcoming issues

Dr. R. K. Verma
Scientist 'G' & Chief Editor

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The contribution of forest products to rural livelihood

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Abstract

In a developing country like Sierra Leone, forest products has from time immemorial supported livelihood in diverse ways and continue to do so even in this 21st century. This study investigated the role played by forest products in sustaining rural livelihood at Njama Township. The socioeconomic and demographic characteristics, livelihood indicators, livelihood functions etc. were obtained by interviewing 50 households using a well-structured questionnaire. The random sampling method was used in selecting households. Livelihood indicators such as energy, food, medicine, shelter and income where used to determine the role of forest products in sustaining rural livelihood at Njama Township. The Descriptive Statistics, Cross Tabulation and Analysis of Variance (One-way ANOVA) were used to analyze the data. In all statistical tests, ($p > .05$) level of significance was used. Critical value of ($F = 4.043$ @ $df = 1$ and $df = 48$). About 70% of all respondents admitted that the forest support their livelihood through the provision of poles, bamboo, thatches, energy (fuelwood, charcoal), mushrooms, bush yams, fruits honey, cash income and herbal medicine on a daily or weekly basis. There was virtually no significance difference between male and female at $P>0.05$. It was concluded that forest products has a huge potential in subsidizing rural livelihood in rural communities like Njama and that there is no significance difference between male and females in using forest products for livelihood. The findings of this research provide valuable information on the livelihood support of Singaba forest reserve to the Njama community and this case can be used to design effective conservation policies for enhanced ecosystem service for the current and future generation living in forest edge communities. It is recommended that more protection measures be initiated to keep this forest from being over exploited due to population increase and farming activities.

Keywords: Livelihood, Forest, Products, Income, Poles, Fuel Wood.

Introduction

Forests are important in the livelihoods of local people inmost developing countries. Local people depend on forestsresources for various products such as fuel wood, constructionmaterials, medicine, and food (Langat, 2016). Chao (2012) estimated that 1.095 to 1.745 billion people globally depend on forest to a vary degree for their livelihoods and about 200 million of local communities are almost entirely dependent on forests. World Bank (2006) and Chao

(2012) ascertain that around 350 million people living adjacent to dense forest depend on these forests for their subsistence and income. Shackleton (2004; 2006) stated that forests support livelihood by providing food for local communities in periods of food shortage.

The majority of Sub-Saharan Africa's population relies on forest products for subsistence uses, cash income, or both (Timko et al., 2010) and a wide range of non-timber forest products such as wild foods, game and caterpillars are common in rural diets, providing essential vitamins and minerals (Jumbe et al., 2009). In Sub-Sahara Africa forest goods and services are extremely important for rural livelihoods providing food, shelter, medicine, fuel and cash income (Kaimowitz, 2003). Millions of people throughout the tropics make use of Non Timber Forest Products (NTFPs) for various reasons and has received attention in light of their perceived potential to address both poverty reduction and tropical forest conservation (Chilalo and Wiersum, 2011). Forests are important in the livelihoods of local people in most developing countries like Sierra Leone.

About 65% of Sierra Leonean lives in rural areas and solely depend on surrounding forests products to sustain their basic daily livelihood. The most important forest products in Sierra Leone are; timber, medical and aromatic plant, edible products (mainly exotic and natural fruits, bush meat and bee production products) ornamental, utensil, hand crafts construction materials etc. (Rivero, 2001). Forest product plays an important role in supporting rural livelihood and food security in many developing countries such as Sierra Leone, Guinea and Liberia (Getaham, 1974) and they depend on these resources for several products such as building materials, food, cropland, fuel wood, and non-wood products (Fikir et al., 2016). About 1.6 billion rural people are dependent upon forests to some extent while 350 million of the world's poorest people depend almost entirely for their subsistence and survival on forests (Chao, 2012).

Local people depend on forests resources for various products such as fuel wood, construction materials, medicine, and food (Langat et al., 2016). For instance the forests in southwest Ethiopia are an important natural resource rendering households high value and low value NTFP products. High value products are those products that have commercial value and low value products are those that only serve households for subsistence purposes (Chilalo and Wiersum, 2011).

In Sierra Leone fermented Parkia seeds 'kandi' are an important ingredient of the side of dishes soups and stew made to accompany porridges (FAO, 1989) with wild animals used as food. It has been estimated by FAO, (1989) that 80% of the people in the rural areas of Sierra Leone consume bush meat and its accounted for an average of 20% of the animal protein consume country wide.Similarly, in Ivory Coast, it is estimated that 70% of the meat consumed by people are derived from the wild (Ajayi, 1979). In terms of medicinal importance of plant in the forests, Ekukudo (2000) stated that medically, no plant is useless for example; quinine for the treatment of malaria is extracted from the bark of cinchonas calisaya in forests. There are two basic terms of forest medicine being practiced in Sierra Leone for many centuries including: Traditional

herbalism, employing medical plants with accurate properties for treating various diseases and indigenous (tribal) herbalist systems in which "medicine" is used for relieving a sickness of super natural origin and where in the plant materials and other ingredients seem to manifest accurate result (Turay, 1996). Wood products from the forest have traditionally ranked as an income earner, while fuel wood, bush meat, medicinal plants and other non-timber products have continued to contribute significantly to the welfare of most Sierra Leoneans; charcoal production and trade is also a source of income, especially for rural people (GOSL, 2013-2018)

Across the developing countries, a lot of research on forest role in sustaining livelihood has been carried out by great scholars such as (Cambell et al, 2002; Shackleton et al., 2004; Heubach, 2011; Belcher, et al., 2005; Ellis, 2000; Kamanga et al., 2009; Sunderlin et al., 2005; Angelsen, et al., 2014; Mariara and Gachoki, 2008; Okasmen, and Mersmann 2008; Babulo et al., 2009; Gobeze et al., 2009; Wakjira and Gole, 2007) have carried various research on forest products livelihood around the globe.

Many people living around forest areas in Sierra Leone harvest a range of forest products from the forest and earn income from non-timber forest products. The most commonly extracted and traded Non timber forest products include root-thatching materials, wild honey, mushrooms, ants, caterpillar and medical plants. Forest product provide food, medicine, local household equipment and building materials, raw materials, materials for agricultural and products for cash sale in mostly rural areas. They are also socially and culturally important, serving as temples, cultural symbols, social gathering place and locations for social right such as initiation ceremonies. However, there is little or no specific information of such livelihood support derived from forests within Moyamba District and Njama Township in particular. This research is focused to close this long existing gap and bring to light the livelihood role played by surrounding NjamaTownship forest reserve. This reason for selecting this Township is because of it close proximity to the Njama forest reserve and is believed to be supporting diverse livelihood functions.

Materials and methods

Study area

The study was conducted at Njama Town, Kowa Chiefdom, Moyamba District, Southern Sierra Leone in May 2013. Base on the physical features; three natural regions can be identified; lowland, mid-land and high land. The low land region situated near the forest is characterized by paddle fields, the mid-land region primarily consist of hills and valleys and the terrain is gently to moderate slopes. In contrast the high land region is rugged with steep sloppy (Thomson, 1993). The vegetation of the study area is mainly the Singamba Forest reserve which is located in a high land region. Almost half of the forest is covers by tropical rain forest, comprising a rich mixture of species arranged in three or more storey (Birchall, 1979). The radius of the forest is about 310ha radius which runs between two Chiefdoms Kowa and Kameji respectively. Since the wild life conservation act 1972 the area has been designated a non-hunting forest reserve (GOSWANI, 1980). The study area has biannual rainfall pattern

which is relatively unpredictable. The rainy season may start in May or April and end in October or December. The climate is tropical with relative constant temperature. The annual temperature in the area ranges from 16.7°c to 30°c. Two rivers are flowing through the study area, serves primarily as domestic water supply source and to some degree as fishing ground (CARDI, 1981).

Sampling and sample size

The random sampling method was adopted to solicit information from respondents. Heads of families, herbalist, blacksmiths, carvers, local traders and elderly women were the target groups. A total of fifty (50) households in the Njama community where randomly selected for questioning. The data collection technique used in the survey included structural questionnaires, oral interview, and internal discussion on the contribution of forest product to their rural livelihood.

Data analysis

The Descriptive Statistics, Cross Tabulation and Analysis of Variance (One-way ANOVA) were used to analyze the data collectedand interpret the results of the findings. In all statistical tests, ($p > .05$) level of significance was used.Other methods used to analyze the data were simple percentages.

Results and interpretation

Findings from the study reveal that majority of the respondents were within the age range of 40 and above years and were married (Table 1). Over two third of the respondents were males with farming being their major occupation. Almost half of the respondents had primary school education and respondents with 2 to 5 children made of the bulk of the sample size (Table 1).

Table 1: Demographic representation of respondents by sex (N=50)

Demography		Descriptive Statistics Test			
		Male		Female	
		N	%	n	%
Age	15-25	10	20	5	10
	26-35	7	14	3	6
	36-40	3	6	2	4
	41 and Above	12	24	8	16
Marital Status	Married	22	44	8	16
	Single	6	12	4	8
	Widow	4	8	3	6
	Divorced	0	0	3	6
Occupation	Farmer	20	40	8	16
	Hunter	5	10	0	0
	Herbalist	2	4	6	12
	Trader	1	2	4	8
	Blacksmith	4	8	0	0
Educational Status	Nonformal Education	3	6	7	14
	Primary Education	10	20	10	20
	Secondary Education	9	18	1	2
	Tech Voc Education	7	14	0	0

	Tertiary Education	3	6	0	0
Family Size	0-2 Per Household	8	16	4	8
	2-5 Per Household	20	40	7	14
	5-8 Per Household	3	6	5	10
	8 and Above Per Household	1	2	2	4

The highest f-value, mean and standard deviationon major livelihood function of forest products are as follows: Medicine for Livelihood ($F_{1, 48}$= 1.807, p > .05) and M±SD (2.000±.0000) for male and (1.9444±.23570) for female as in Tables 2 and 3.

Table 2: Descriptive Statistics – Major Livelihood Function of Products by Sex (N=50)

Major Livelihood Function of Products	Descriptive Statistics Test					
	Sex	n	Mean	Std. Deviation	95% CI Mean	
					Lower	Upper
Food for Livelihood	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.8889	.32338	1.7281	2.0497
Shelter for Livelihood	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.8889	.32338	1.7281	2.0497
Medicine for Livelihood	Male	32	2.0000	.00000	2.0000	2.0000
	Female	18	1.9444	.23570	1.8272	2.0617
Cash for Livelihood	Male	32	1.8125	.39656	1.6695	1.9555
	Female	18	1.7778	.42779	1.5650	1.9905
Energy for Livelihood	Male	32	1.3750	.49187	1.1977	1.5523
	Female	18	1.5000	.51450	1.2441	1.7559
Note: CI = Confidence Interval						

Table 3: Analysis of Variance – Major Livelihood Function of Forest Productsby Sex (N=50)

Major Livelihood Function of Products		Analysis of Variance Test			
		Sum of Squares	Mean Square	F	Sig.
Sex	Food for Livelihood	.003	.003	.037	.848
	Shelter for Livelihood	.003	.003	.037	.848
	Medicine for Livelihood	.036	.036	1.807	.185
	Cash for Livelihood	.014	.014	.083	.774
	Energy for Livelihood	.180	.180	.720	.400
Note: df_1=1; df_2=48					

The highest f-value, mean and standard deviationon major forest products used for shelter construction are as follows: Thatch for shelter ($F_{1,48}$= .358, p > .05) and M±SD (1.9375±.24593) for maleand (1.8889±.32338) for female as in tables 4 and 5.

Table 4: Descriptive Statistics – Forest Products used for Shelter by Sex (N=50)

ForestProducts for Shelter	Descriptive Statistics Test					
	Sex	n	Mean	Std. Deviation	95% CI Mean	
					Lower	Upper
Timber for Shelter	Male	32	1.8750	.33601	1.7539	1.9961
	Female	18	1.8889	.32338	1.7281	2.0497
Pole for Shelter	Male	32	1.5938	.49899	1.4138	1.7737
	Female	18	1.6111	.50163	1.3617	1.8606
Rope for Shelter	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.8889	.32338	1.7281	2.0497
Thatch for Shelter	Male	32	1.9375	.24593	1.8488	2.0262
	Female	18	1.8889	.32338	1.7281	2.0497
Bamboo for Shelter	Male	32	1.7813	.42001	1.6298	1.9327
	Female	18	1.8333	.38348	1.6426	2.0240
Rattan for Shelter	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.8889	.32338	1.7281	2.0497

Note: CI = Confidence Interval

Table 5: Analysis of Variance – Forest Products used for Shelter by Sex (N=50)

Forest Products for Shelter		Analysis of Variance Test			
		Sum of Squares	Mean Square	F	Sig.
Sex	Timber for Shelter	.002	.002	.020	.888
	Pole for Shelter	.003	.003	.014	.907
	Rope for Shelter	.003	.003	.037	.848
	Thatch for Shelter	.027	.027	.358	.553
	Bamboo for Shelter	.031	.031	.188	.666
	Rattan for Shelter	.003	.003	.037	.848

Note: df_1=1; df_2=48

The highest f-value, mean and standard deviationon forest products sold for income are as follows: Poles ($F_{1,48}$= .596, p > .05) and M±SD (1.9063±.29614) for male and (1.8889±.32338) for female as in Tables 6 and 7.

Table 6: Descriptive Statistics – Forest Products Sold for Income by Sex (N=50)

Forest Products Sold for Income	Descriptive Statistics Test					
	Sex	n	Mean	Std. Deviation	95% CI Mean	
					Lower	Upper
Timber Sold	Male	32	1.7813	.42001	1.6298	1.9327
	Female	18	1.8333	.38348	1.6426	2.0240
Pole Sold	Male	32	1.7188	.45680	1.5541	1.8834

	Female	18	1.6111	.50163	1.3617	1.8606
Fuel Wood Sold	Male	32	1.7500	.43994	1.5914	1.9086
	Female	18	1.7222	.46089	1.4930	1.9514
Honey Sold	Male	32	1.8750	.33601	1.7539	1.9961
	Female	18	1.8889	.32338	1.7281	2.0497
Bush Meat Sold	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.8889	.32338	1.7281	2.0497

Note: CI = Confidence Interval

Table 7: Analysis of Variance – Forest Products Sold for Income by Sex (N=50)

Forest Products Sold for Income		Analysis of Variance Test			
		Sum of Squares	Mean Square	F	Sig.
Sex	Timber Sold	.031	.031	.188	.666
	Pole Sold	.133	.133	.596	.444
	Fuel Wood Sold	.009	.009	.044	.834
	Honey Sold	.002	.002	.020	.888
	Bush Meat Sold	.003	.003	.037	.848

Note: df_1=1; df_2=48

The highest f-value, mean and standard deviationon consumption of forest products are as follows: Snail ($F_{1, 48}$= 1.807, p > .05) and M±SD (2.0000±.00000) for male and (1.9444±.23570) for female as in tables 8 and 9.

Table 8: Descriptive Statistics – Forest Products for Consumption by Sex (N=50)

Forest Products For Consumption	Descriptive Statistics Test					
	Sex	n	Mean	Std. Deviation	95% CI Mean	
					Lower	Upper
Mushroom Consume	Male	32	1.9688	.17678	1.9050	2.0325
	Female	18	1.8889	.32338	1.7281	2.0497
Honey Consume	Male	32	1.9688	.17678	1.9050	2.0325
	Female	18	1.8889	.32338	1.7281	2.0497
Fruit Consume	Male	32	1.7813	.42001	1.6298	1.9327
	Female	18	1.7778	.42779	1.5650	1.9905
Snail Consume	Male	32	2.0000	.00000	2.0000	2.0000
	Female	18	1.9444	.23570	1.8272	2.0617
Bush Yam Consume	Male	32	1.3750	.49187	1.1977	1.5523
	Female	18	1.5556	.51131	1.3013	1.8098
Bush Meat Consume	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.9444	.23570	1.8272	2.0617

Note: CI = Confidence Interval

Table 9: Analysis of Variance – Forest Products for Consumption by Sex (N=50)

Forest Products for Consumption		Analysis Variance Test			
		Sum of Squares	Mean Square	F	Sig.
Sex	Mushroom Consume	.073	.073	1.284	.263
	Honey Consume	.073	.073	1.284	.263
	Fruit Consume	.000	.000	.001	.978
	Snail Consume	.036	.036	1.807	.185
	Bush Yam Consume	.376	.376	1.509	.225
	Bush Meat Consume	.017	.017	.220	.641

Note: df_1=1; df_2=48

The highest f-value, mean and standard deviationon major sources of income are as follows: Family income ($F_{1,48}$= 2.829, p > .05) and M±SD (1.9688±.17678) for male and (1.8889±.32338) for female as in tables 10 and 11.

Table 10: Descriptive Statistics – Respondents Sources of Income by Sex (N=50)

Sources of Income	Descriptive Statistics Test					
	Sex	n	Mean	Std. Deviation	95% CI Mean	
					Lower	Upper
Family for Income	Male	32	1.9375	.24593	1.8488	2.0262
	Female	18	1.7778	.42779	1.5650	1.9905
Gift for Income	Male	32	1.9688	.17678	1.9050	2.0325
	Female	18	1.8889	.32338	1.7281	2.0497
Forest Product for Income	Male	32	1.6875	.47093	1.5177	1.8573
	Female	18	1.7778	.42779	1.5650	1.9905
Farming for Income	Male	32	1.4688	.50701	1.2860	1.6515
	Female	18	1.6667	.48507	1.4254	1.9079
Wage for Income	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.9444	.23570	1.8272	2.0617

Note: CI = Confidence Interval

Table 11: Analysis of Variance – Respondents Sources of Income by Sex (N=50)

Sources of Income		Analysis of Variance Test			
		Sum of Squares	Mean Square	F	Sig.
Sex	Family for Income	.294	.294	2.829	.099
	Gift for Income	.073	.073	1.284	.263
	Forest Product for Income	.094	.094	.451	.505
	Farming for Income	.451	.451	1.810	.185
	Wage for Income	.017	.017	.220	.641

Note: df_1=1; df_2=48

The highest f-value, mean and standard deviationon forest products collection interval are as follows: Monthly interval ($F_{1,48}$= .485, p > .05) and M±SD (1.9063±.29614) for male and (1.8889±.32338) for female as in Tables 12 and 13.

Table 12: Descriptive Statistics – Forest Products Collection Interval Response by Sex (N=50)

Forest Products Collection Interval	Descriptive Statistics Test					
	Sex	n	Mean	Std. Deviation	95% CI Mean	
					Lower	Upper
Yearly Products	Male	32	1.9063	.29614	1.7995	2.0130
	Female	18	1.8889	.32338	1.7281	2.0497
Monthly Products	Male	32	1.8125	.39656	1.6695	1.9555
	Female	18	1.8889	.32338	1.7281	2.0497
Weekly Products	Male	32	1.7188	.45680	1.5541	1.8834
	Female	18	1.7222	.46089	1.4930	1.9514
Daily Products	Male	32	1.5313	.50701	1.3485	1.7140
	Female	18	1.5556	.51131	1.3013	1.8098

Note: CI = Confidence Interval

Table 13: Analysis of Variance – Forest Products collection Interval Response by Sex (N=50)

Forest Products Collection Interval		Analysis of Variance Test			
		Sum of Squares	Mean Square	F	Sig.
Sex	Yearly Products	.003	.003	.037	.848
	Monthly Products	.067	.067	.485	.490
	Weekly Products	.000	.000	.001	.980
	Daily Products	.007	.007	.026	.872

Note: df_1=1; df_2=48

Discussion

Socio-economic characteristics of sampled respondents

The majority of respondents interviewed were males 65% with the most dominant age group being 40 and above years 45%. The educational level of respondents was low with 40% having only primary education while 20% had non-formal education. Bulk majority of respondents were farmers 56% followed by herbalist 16% and hunters 10% (Table 1). The family size ranging from 2-5 children accounted for 54% of total respondents. In rural areas of Sierra Leone, women and children are most times use as labor in farming and other labor intensive jobs. Therefore, youth are encouraged to marry at an early age in order to build up their families for a sustainable future work force and this explains why 60% of respondents were married. Majority of the respondents were subsistence farmers engage in rice, potato and cassava farming. The reason for this was believed to have bearing with illiteracy level of the respondent's parents,

poverty and societal influence. The high level of illiteracy could also have a direct link with traditional beliefs, family population and the occupational status of the respondents. For instance, only the educated get civil service job even at the village level in most part of Sierra Leone with Njama Township not being an exception. In most rural setting of Sierra Leone like Njama Township, it is believed that schooling is a waste of time especially for women. Therefore, parents are less concerned about their children academic progress but instead are concerned about their ability to get married and work hard on their farms. The majority of Sierra Leoneans have no formal education; two-thirds of women aged15-49 and half of men aged 15-49. Overall, 35.5% of women and 51.5% of men are literate (SLDHS, 2014)

Major livelihood function

Over 56 % of respondents said energy ($F_{1.48}$=.720 > .05; M±SD (1.3750 ± .49187) males and M ± SD (1.5000±.51450) in the form of fuel wood and charcoal is one major livelihood function the forest is providing for them (Table 2 & 3). Energy is the highest supported livelihood function with more males than females engaged in its collection but there is no significance difference between males and female. In rural settings like Njama, Township where electricity is permanently unavailable and its very close to a forest reserve; firewood and charcoal is the only source of energy for cooking food stuff and other edible food commodities. Firewood is a principal source of energy and a key player of rural livelihood in poor and remote communities like Njama. In conformity with the above findings, Arnold (1972) affirmed that firewood accounted for half of Africa continent energy supply and a major livelihood contributor.In the Northern, Urban and central province of Zambia for instance, 20 percent of all households use charcoal mainly for domestic heating, cooking and baking while on the average, a household consumes 100 kg of dry wood per month (Jumbe et al., 2009). Cash income was the second most livelihood function provided by the forest. About 20% of the respondents said income was earned by the sale of collected forest products. Since Njama is very close to the highway, poles, firewood, and timbers, wild honey, bush meat are illegally exploited and brought to the high way for sale. Forest products like snail, nuts, fruits, mushroom, honey, poles, firewood, charcoal, wooden chairs, walking stick, mortar and pestle, medicinal herbs and bamboo are sold for financial income and this income greatly contribute to the livelihood of local people (FAO, 1989).About 32% of respondents confirmed that they sell poles for construction ($F_{1,48}$ = .596, p > .05, Table 6 & 7) collected from the forest serve as the main products sold to derived financial income mostly along highways However, there was no significance difference between males and females selling poles for income. This product is used in Sierra Leone to support concrete buildings as well as roofing materials where one cannot afford to buy lumber. Fuel wood 26% and Timber 20% are among the most traded forest products for financial income. In East Mau Forest Ecosystem Kenya, firewood is the most collected product by households and each household collect an average of 122.00 back-loads (4,100.00 kg) of firewood per year worth

about KES 25,000.00 (US$ 280.00) accounting for 5.7% of forest income (Langat et al., 2016). The absence of electricity adds value on fuel wood in every second in Njama and Sierra Leone as a whole. In Hammer District, Southeastern Ethiopia, Income from fuel wood collection was the second most important forest income; it accounted for 47 and 36% of the annual forest income at AGPAS and PAS (Fikir et al., 2016).Food and shelter functions account for 10% each of the livelihood support of the forest. Getaham (1974) andShackeleton, (2004; 2006) reported that forest products has been known and utilized especially by rural people for food especially in periods of food shortage. About 10% of the respondents said they sell bush yam for financial income (Figure 3). Chileshe, (2005) and Packham (1993) from the Miombo woodlands stated that mushrooms, tubers, fruits, leafy vegetables and insects are widely consumed by the rural households because these foods enrich their starch-based diet with necessary vitamins and mineral. These forest based collected food are often available at the beginning of the raining season when food shortage is low they serve as the gap fillers. About 48% of respondents consume yam ($F_{1,48}$ = 1.807, p > .05) as the major consumable product dug from the forest especially in the raining season followed by fruits 20%, mushroom 7% and bush meat 8% (Table 8 & 9). In Sierra Leone, bush yam is partially a staple food for rural indigenes during the raining season when shortage is everywhere.Langat et al., (2016) from East Mau Forest Ecosystem Kenya support this findings from the African perspective by reporting that households obtained foods products such as indigenous fruits (34.0%), mushrooms (49.3%), game meat (47.1%), and honey (51.6%) from public forest compared to other sources (own farms, neighbors, and markets). In rural Brazil, majority of the indigenous locals depend on consumable forest products for their daily survival from products such as babossu, palm kernel, fruits, nuts, leaves and barks of some trees, bush yams, bush meat, honey, mushroom, and wild snails (May, 1985). It was also discovered that some consumable forest products also serve medicinal purpose for most respondents in the study area. Considering the poverty level of the average rural Sierra Leoneans, consumable forest product play a major role in sustaining food security and supporting rural livelihood.

The main source of income of respondents at Njama community is farming 44% ($F_{1,48}$= 1.810, p > .05) (followed by forest products sales 28% (($F_{1,48}$= .451, p > .05). Subsistence farming is still the main source of income and employment in rural areas of Sierra Leone. Intermittently, farming help sustain locals during the dry season while the forest help sustain them during the raining season when food is most times less. The few surplus or left over from the farming activities during the dry season are sold for financial income to address other family needs. The forest serves as the free loan giver to locals especially in the raining seasons for food and dry seasons for pole and other products harvesting or collection (Shackleton, 2004; 2006). According to the World Fact book, (2018), agriculture alone account for 60.7%of Sierra Leone's Gross Domestic Products.On the contrary, In Hammer District, Southeastern

Ethiopia, Income from livestock production was highest followed by crop production and forest products (Fikir et al., 2016). Other sources of income were families 12% and wages 8%. Wages through jobs are less popular in the rural settings in Sierra Leone because of two things; one it requirement and two; it low monthly salary that sometimes delays or not paid on time. It was found that almost half of the respondents collected forest products on a daily basis with 28% collecting on a weekly basis (Table 12 & 13).The highest f-value, mean and standard deviation on forest products collection frequency are as follows: Collecting forest products on daily basis ($F_{1,48}$ = .485, p > .05) and M±SD (1.9063±.29614) for male and (1.8889±.32338) for female as in tables 12 and 13. There is virtually no significance difference between males and females engaged in periods of forest products collection. Since Singamba forest reserve is located close to Njala Township visiting the forest is a common and everyday practicing for hunters, herbalists, blacksmiths and women. In summary, medicine, income, food, building materials, and traditional society bush were the most important function of Singamba forest reserve to the community. The absence of health facilities, job, and recreational areas were the reason why most of the respondents depend on forest resources for their livelihood.

Conclusion and recommendation

In conclusion, the Singamba forest reserve is serving as a livelihood reservoir for the Njama Township for the past decades and that over 70% of the Township benefits from products derived from the forests. The ability of the forest to meet the daily needs of the surrounding communities especially Njama could be attributed to it reserved status that prevent heavy logging or farming on the said reserved. The reserve is seen by most as a blessing to the community, therefore its protection has been every body's business aside from the forest guards. The close proximity of Njama Township to the highway encourages trade in poles, fuel wood, honey, bush yams etc. This study has served as a bench mark for further studies on the livelihood function of Singamba forest in detail. It is recommended that more protection measures be employed in order for the forest to continue it functions and services.

Acknowledgement

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The forest seeds of Telangana

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Abstract

The obtainable statement is rigorous on the forest seed development of original remedial medicinal plants curing in skin diseases by idyllic people of study area from Mahabubnagar dist of Telangana, India. A total of 100 species were recorded as usual beneficial in producing of seeds. Of individual's species, represented scientific name, family, common names, flowering period and fruiting periods in detailed are discussed. The tremendous, herbs, shrubs, trees were in the in sequence are calculated. In the present results the importance of the forest curative plants insight has been observed. In the table details were given. This diversity information might donate meticulously in contemporary drug devious or in government policies to encroachment contemporary novel drug invent systems in rural origin areas, and in the enrichment of advance formulations with reference to rural curative medicinal pants.

Introduction

Forests are the sources for county. In India different climatic condition would be seen. All 29 Indian states have their own government and the 7 Union territories come under the jurisdiction of the Central Government. As most of the other countries India too has a national emblem - The lion capital. Apart from India's national emblem, each of its States and Union Territories have their own state seals and symbols which include state animals, birds, trees, flowers etc.[1] A list of state trees of India is given below. See Symbols of Indian states and territories for a complete list of all State characters and seals.

Trees in India known for their grandeur and majesty are like the green pearl in the Indian crown. Trees occupy the important place in the history of India. Trees have always been associated with wisdom and immorality in India. Hindu literature describes a celestial tree as having its roots in the heaven and its branches in the underworld that unites and connects beings of every kind. Banyan is the National Tree of India. India's medicinal are no less diverse. Peepal, banyan (Bodhi tree), banana, and Tulsi are some of the plants that hold special cultural and religious significance in India. Indian Rosewood, Kikar, Aleo Vera, Ashwagandha, Cork, Brahmi, Sal, Khair and Garden Asparagus are some of the popular trees grown in India.

Forests are the source for seeds. So in the present work the maximum available information has been collected from field and forest department of the Telangana State.

Methodology

A number of scenery trips were undertaken in study area and sources (Fig. 1). At each one time of trip, diverse ethnic and forest or rural people's information was collected in different seasons. The information was accrued after discussions with several users like village head, elder women and other local informants. Repeated interviews through questionnaires were made in diverse villages to substantiate the information. Plant specimens were collected and identified with regional floras (Gamble J S. 1928, Pullaiah T and Chennaiah. 1997, Pullaiah T and Moulali D A. 1997, Pullaiah T. 2015).

Telangana is a state in the south of India. It is situated on the centre-south stretch of the Indian peninsula on the high Deccan Plateau. It is the twelfth largest state and the twelfth-most populated state in India with a geographical area of 112,077 km^2 (43,273 sq mi) and 35,193,978 residents as per 2011 census. On 2 June 2014, the area was separated from the northwestern part of Andhra Pradesh as the newly formed 29^{th} state with Hyderabad as its historic permanent capital. Its other major cities include Warangal, Nizamabad, Khammam and Karimnagar. Telangana is bordered by the states of Maharashtra to the north, Chhattisgarh to the east, Karnataka to the west and Andhra Pradesh to the east and south. The terrain of Telangana region consists mostly of hills, mountain ranges, and thick dense forests distribution of 27,292 sq. km. As of 2018, the state of Telangana is divided into 31 districts.

Telangana is situated on the Deccan Plateau, in the central stretch of the eastern seaboard of the Indian Peninsula. It covers 112,077 square kilometres (43,273 sq mi). The region is drained by two major rivers, with about 79% of the Godavari River catchment area and about 69% of the Krishna River catchment area, but most of the land is arid. Telangana is also drained by several minor rivers such as the Bhima, the Maner, the Manjira and the Musi.

The annual rainfall is between 900 and 1500 mm in northern Telangana and 700 to 900 mm in southern Telangana, from the southwest monsoons. Various soil types abound, including chalkas, red sandy soils, dubbas, deep red loamy soils, and very deep black cotton soils that facilitate planting mangoes, oranges and flowers.[46]

Climate

Telangana is a semi-arid area and has a predominantly hot and dry climate. Summers start in March, and peak in May with average high temperatures in the 42 °C (108 °F) range. The monsoon arrives in June and lasts until September with about 755 mm (29.7 inches) of precipitation. A dry, mild winter starts in late November and lasts until early February with little humidity and average temperatures in the 22–23 °C (72–73 °F) range.

Ecology

The Central Deccan Plateau dry deciduous forests ecoregion covers much of the state, including Hyderabad. The characteristic vegetation is woodlands of *Hardwickia binata* and *Albizia amara*. Over 80% of the original forest cover has been cleared for agriculture, timber harvesting, or cattle grazing, but large blocks of forest can be found in Nagarjunsagar-Srisailam Tiger Reserve and elsewhere. The more humid Eastern Highlands moist deciduous forests cover the Eastern Ghats in the eastern part of the state.

Forests are the source for seeds. So in the present work the maximum available information has been collected from field and forest department of the Telangana State. The present work had been undertaken, in this report a number of the important forest seed producting plants, which commonly helpful in various purposes.

Results

The obtainable statement is rigorous on the forest seed development of original remedial medicinal plants curing in skin diseases by idyllic people of study area from Mahabubnagar dist of Telangana, India. A total of 100 species were recorded as usual beneficial in producing of seeds. Of individual's species, represented scientific name, family, common names, flowering period and fruiting periods in detailed are discussed. The tremendous, herbs, shrubs, trees were in the in sequence are calculated. In the present results the importance of the forest curative plants insight has been observed. In the table details were given. This diversity information might donate meticulously in contemporary drug devious or in government policies to encroachment contemporary novel drug invent systems in rural origin areas, and in the enrichment of advance formulations with reference to rural curative medicinal pants.

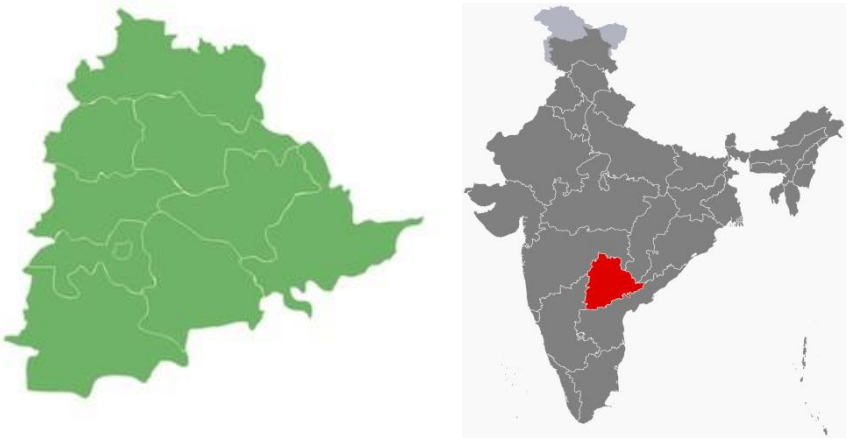

Fig. 1. Specific Study area i.e., Telangana State, India.

Table 1: the forest seeds of Telangana

Sl. No	Scientific name	family	Vernacular names	flowering available	Seeds available
1.	*Acacia auriculiformis*	Mimosaceae		Dec-Jan	Jan-Mar
2.	*Acacia chundra*	Mimosaceae	Lalkhair (Hindi) Chnadra (Telugu)	Jan-Aug	Jan-Mar
3.	*Acacia Ferruginea*	Mimosaceae	Inupa thumma	Apr-May	Nov-Feb
4.	*Acacia leucophloea*	Mimosaceae	White barkard Tella thumma	July-Nov	Nov-Dec
5.	*Acacia mangium*	Mimosaceae	Adavithumma	Feb-Mar	May-Jun

6.	*Acacia nilotica*	Mimosaceae	Babul Nalla thumma	June-Sept	Apr-May
7.	*Adina cordifolia*	Rubiaceae	Haldu Bandaru	Jun-Aug	Feb-May
8.	*Aegle marmelos*	Rubiaceae	Bel, Stone apple Maaredu	Mar-May	Apr-May
9.	*Ailanthus excels*	Simaroubaceae	Maharukh Peddamaanu	Jan-Feb	Apr-May
10.	*Albizzia amara*	Mimosaceae	Narlingi Konda Chiga	Apr-Jun	Nov-Feb
11.	*Albizzia lebbeck*	Mimosaceae	Siris Dirsenam	May-Aug	Dec-Feb
12.	*Albizzia odoratissima*	Mimosaceae	Black siris Chinduga	Apr-Jun	Dec-Jan
13.	*Albizzia procera*	Mimosaceae	White siris Chigra	May-Aug	Apr-May
14.	*Alstonia scholaris*	Apocynaceae	Devils tree Eda-kulu	Nov-Dec	May-Aug
15.	*Anacardium occidentale*	Anacardiaceae	Cashew nut Jeedi mamidi	Dec-Jan	Apr-May
16.	*Annona squamosa*	Annonaceae	Custerd apple Seethaphal	Jun-Jul	Sept-Oct
17.	*Anogeissus latifolia*	Combretaceae	Axle wood Chirumaanu	Jun-Jul	Jul-Aug
18.	*Anthocephalus chinensis*	Ruhiaceae	Kadam Kadhamamu	May-Jun	Aug-Oct
19.	*Artocarpus heterophyllus*	Moraceae	Lack fruit tree Panasa	Nov-Dec	Jul-Aug
20.	*Azadirachta induca*	Miliaceae	Neem Veepa	Mar-Apr	Jun-Aug
21.	*Barringtonia acutangula*	Lecythidaceae	Hijal Kadami	Jun-Jul	Dec-Jan
22.	*Bauhinia purpurea*	Ceacalpiniaceae	The geranium tree Peddari	Sept-Dec	Jan-May
23.	*Bauhinia racemosa*	Ceacalpiniaceae	Kanchan Aare	Feb-May	Nov-Dec
24.	*Bauhinia variegate*	Ceacalpiniaceae	Kachar Deva Kanchanam	Feb-Apr	May-Jun
25.	*Bombax ceiba*	Bombacaceae	Silk cotton tree Buruga	Feb-Mar	Mar-May
26.	*Borassus flabellifer*	Palmae	Palmyra, Thaati	Mar-Apr	Aug-Sept

27.	*Boswellia serrata*	Burseraceae	Indian obliganum tree Anduga	Jan-Mar	May-Jun
28.	*Bridelia retusa*	Euphorbiaceae	Koramaddi	May-jul	Dec-jan
29.	*Buchanania lanzan*	Anacardiaceae	Cudappa almond Morli	Apr-may	May-Jun
30.	*Butea monosperma*	Papilionaceae	Fleem of the forest Moduga	Feb-Apr	Apr-may
31.	*Callistemon viminalis*	Mirtaceae	Bottle brush	Mar-Jun	Aug-Sept
32.	*Careya arborea*	Lecythedaceae	Wild guava Budadhermi	Mar-Apr	Jun-Jul
33.	*Cassia fistula*	Ceacalpiniaceae	Indian Leburnum Reela	Apr-May	Mar-Apr
34.	*Cassia siamea*	Ceacalpiniaceae	Iron wood Seema thangedu	Feb-Mar	Mar-Apr
35.	*Casuarina equisetifolia*	Casuarinaceae	Hourse tail oak Sarugudu	Feb-Apr Sep-Oct	Jun-Dec
36.	*Ceiba pentandra*	Bomraceae	White silk cotton tree Thella burugu	Dec-Jan	Mar-Apr
37.	*Chloroxylon sweitenia*	Meliaceae	Satin wood Billudu	Mar-Apr	May-Aug
38.	*Cochlospermum religiosum*	Cochlospermaceae	Yellow silk cotton Konda goggu	Mar-Apr	May-Jul
39.	*Dalbergia latifolia*	Ceacalpiniaceae	Indian Rose wood Jittegi	Jun-July	Dec-Mar
40.	*Dalbergia sissoo*	Ceacalpiniaceae	Sissu Sissam	Mar-Apr	Dec-Jan
41.	*Delonix regia*	Ceacalpiniaceae	Gulmohar Erra Thurai	Apr-Jul	Aug-Oct
42.	*Dendrocalamus strictus*	Poaceae	Male bamboo Yeduru	Nov-Dec	Mar-Apr
43.	*Derris indica*	Papilionioideae	Ponga oil plant Kaanuga	Apr-Jul	Feb-May
44.	*Dillenia indica*	Dilleniaceae	Elephant apple Kalinga	Jun-Aug	Oct-Feb
45.	*Diospyros melanoxylon*	Ebenaceae	Tendu Beedi Aaku	Apr-Jun	Mar-Apr
46.	*Dolichandrone atrovirens*	Bignoniaceae	Niruddi	Mar-Dec	Jan-Apr

47.	*Emblica officinalis*	Euphorbiaceae	Amla Usiri	Mar-Apr	Oct-Feb
48.	*Eucalyptus camaldulensis*	Myrtaceae	Nilagiri Neelagiri	Jun-Jul	Dec-jan
49.	*Eucalyptus tereticornis*	Myrtaceae	Nilagiri Neelagiri	Apr	Oct May
50.	*Feronia limonia*	Rutaceae	Wood apple Velaga	Feb-Mar	Apr-May
51.	*Ficus bengalensis*	Moraceae	Banyan Marri	Apr-Jun	Apr-Jun
52.	*Gliricidia maculate*	Leguminosae	Gliricidia Maadri	Nov-Dec	Jan-Feb
53.	*Gmelina arborea*	Verbenaceae	Gamhar Gummudu	Feb-Mar	Apr-Jun
54.	*Grevillea robusta*	Proteacea	Silveroak Parana	May-Jun	Jul-Aug
55.	*Hardwickia binata*	Ceacalpiniaceae	Anjan Narayepi	Jul-Sep	Apr-Jun
56.	*Holoptelea integrifolia*	Urticaceae	Indian elm tree Nemali naara	Jan-Feb	Apr-May
57.	*Lagerstroemia parviflora*	Lythraceae	Lendi Chenangi	Apr-Jun	Dec-Feb
58.	*Lannea coromandelica*	Anacardiaceae	Wodier Gumpani	Feb-Apr	May-Jul
59.	*Leucaena leucocephala*	Mimosaceae	Subabul Nagari	Nov-Feb	Nov-Feb
60.	*Madhuca longifolia var. latifolia*	Sapotaceae	Mahua Ippa	Feb-Apr	Jun-Jul
61.	*Mallotus philippinensis*	Euphorbiaceae	Sendhuri Kumkuma	Nov-Jan	Feb-May
62.	*Mangifera indica*	Anacardiaceae	Mango Mamidi	Jan-Mar	Apr-Jun
63.	*Manikara hexandra*	Sapotaceae	Cyelone wood Pala	Nov-Jan	Apr-Jan
64.	*Melia azedarach*	Miliaceae	Parsian lilac Thuruka veepa	Apr-Jun Dec (Rare)	Jul-Aug
65.	*Michelia champaca*	Magnoliaceae	Champa Sampengamu	Apr-May	Aug-Sept
66.	*Mimusopa elengi*	Sapotaceae	Indian Medlar Pogada	Feb-Apr	Feb-Jul
67.	*Mitragyna parviflora*	Rubiaceae	Kelikadam Batta ganupu	Ju-jul	Nov-Jan

68.	*Moringa oliefera*	Moringa	Drum stick tree Munaga	Jan-Mar	Apr-Jun
69.	*Morus alba*	Moraceae	White mulbary Reshma chettu	Mar-Jun	Jun-Aug
70.	*Ougeinia oojeinensis*	Ceacalpiniaceae	Sandan Vandanam	Feb-Mar-May	May- Jun
71.	*Parkinsonia aculeata*	Ceacalpiniaceae	Jerusalem Thorn Seema Thumma	Apr-May	Jul-Sept
72.	*Peltophorum pterocarpum*	Ceacalpiniaceae	Yellow gold mohar Konda chintha	Throughout the year	Throughout the year
73.	*Pithecellobium dulce*	Mimosaceae	Madras thorn Seema Chintha	Jan-Mar	Mar-May
74.	*Polyalthia longifolia*	Annonaceae	Debe daru Asoka	Feb-May	Jun-Aug
75.	*Prosopis julifolia*	Mimosaceae	Mesquite Sarkaari thumma	Feb-Mar	Apr-Jun
76.	*Pterocarpus marsupium*	Papilioniodeae	Bijasal Yegisa	Jun-Oct	Dec-May
77.	*Pterocarpus santalinus*	Papilioniodeae	Redsender Erra Chandanam	Apr-May	Feb-Mar
78.	*Samania saman*	Mimosaceae	Rain Tree Nidra Ganneru	May-Jun	Mar-Apr
79.	*Santalum album*	Santalaceae	Sandle wood Srigandham	May-Jun	Oct-Dec
80.	*Sapindus emarginatus*	Sapotaceae	Soap nut tree Kunkudu	Feb-Apr	Feb-Apr
81.	*Saraka asoka*	Ceacalpiniaceae	Asoka tree Asoka	May-Jun	Aug-Sept
82.	*Schleichera oleosa*	Sapindaceae	Lak tree kusum Pusuku	Mar-Apr	Jun-Jul
83.	*Semecarpus anacardium*	Anacardiaceae	Marking nut Nalla jeedi	May-Jun	Dec-Mar
84.	*Sesbania grandiflora*	Papilioniodeae	Sesban Avisha	Dec-Jan	Apr-May
85.	*Soymida febrifuga*	Meliaceae	Indian Red wood Somi	Feb-Mar	May-Jun
86.	*Spondias pinnata*	Anacrdiaceae	Wild mango Adavi Mamidi	Dec-Feb-Mar	Feb-Mar
87.	*Sterculia urens*	Sterculiaceae	Kateera Gum Tree Tapasi	Dec-Mar	Apr-May
88.	*Sterospermum*	Bignoniaceae	Kalagoru	Apr-Jun	Mar-May

	suaveolens		Thadlapala		
89.	*Strychnos nux-vomica*	Loganiaceae	Nux vomica tree Visha Musti	Aug-sept	Dec-Jun
90.	*Strychnos potatorum*	Loganiaceae	Cleaning nut tree Chilla	Feb-May	Oct-Mar
91.	*Syzygium cumini*	Myrtaceae	Jaamun Neeredu	Mar-May	Sept-Oct
92.	*Tamarindus indica*	Ceacalpiniaceae	Tamarind tree Chintha	Sept-Oct	Oct-Dec
93.	*Tectona grandis*	Verbenaceae	Teak Teeku	Aug-Sept	Jan-Mar
94.	*Terminalia alata*	Combretaceae	Laurel Nallamaddi	May-Jun	Feb-Apr
95.	*Terminalia arjuna*	Combretaceae	Thellamaddi Yerumaddi	Apr-Jul	Feb-May
96.	*Terminalia bellerica*	Combretaceae	Bahera Thani	Apr-Jun	Nov-Feb
97.	*Terminalia catappa*	Combretaceae	Indiaan almond Bodam	Feb-May	Jun-Jul
98.	*Terminalia chebula*	Combretaceae	Harra Karaka	Apr-Jun	Jan-Mar
99.	*Xylia xylocarpa*	Mimosaceae	Irul Konda Thangedu	Mar-Apr	Mar-Apr
100.	*Zizyphus mauritiana*	Rhamnaceae	Ber Regu	Apr-Oct	Oct-Mar

Conclusion

The current work outcome will be possessions on future biodiversity conservation. Successively, works into initiations are needed to undertake widespread education about their importance of wild seeds and their species. A very few of the wild forest plants are available. So, the efforts must be betrothed to safeguard for conservation of wild plants and their seeds, plants and also the countryside intellect for prospect forest species development.

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Diversity of macro-fungi in Central India-XV: *Ganoderma colossus* causing butt rot in *Feronia elephantum*, kaitha

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Abstract

The present article reports a butt rot caused by a basidiomycetous fungus, *Ganoderma colossus*. The fungus is recorded on dead tree of *Feronia elephantum* from tiger reserve, Panna, Madhya Pradesh.

Introduction

Kaitha, *Feronia elephantum* Corrêa =*Feronia limonia* (L.) Swingle is a deciduous, slow-growing, erect tree belongs to family Rutaceae. It is well known for its traditional uses. The tree remains a vital source of drugs for traditional uses and various parts of the plant used as astringent, in constipation, tonic for liver and lung, diuretic, carminative and cardio-tonic.

Polyporus colossus Fr. was established by E.M. Fries in 1851 later on it was transferred to genus *Ganoderma* as *G. colossus* (Fr.) C.F. Baker. It is a bracket forming fungus placed in the family Ganodermataceae (basidiomycete), previously it was placed in the genus *Tomophagus* (Murrill, 1905). The species causes white rot in butt region of trees.

Ganoderma colossus causing butt rots in kaitha tree (*Feronia elephantum* Corrêa) at Panna Tiger Reserve, Panna, and Madhya Pradesh is reported in the present article.

Materials and methods

Specimens were collected from Panna Tiger Reserve area, Panna, Madhya Pradesh, India.. The slides were prepared in lactophenol and cotton blue and observed under advance Research Microscope, make Leica, Germany and photomicrographs were taken with a digital camera attached to the microscope. Identification of fungi was done with the help of literature (Al-Bahry et al. 2004; Bose, 1919; Dhancholia et al. 1987, Parihar et al. 2013; Tiwari et al. 2013). The specimens were deposited in the Mycology Herbarium, Tropical Forest Research Institute, Jabalpur and got accession numbers.

Results and Discussion

***Ganoderma colossus* (Fr.) C.F. Baker (Figures 1-8)**

=*Dendrophagus colossus* (Fr.) Murrill, *Bull. Torrey bot. Club* 32(9): 473 (1905)

=*Polyporus colossus* Fr., *Nov. Symb. Myc.*: 56 (1851)

=*Polyporus hollandii* Massee, *Bull. Misc. Inf.*, Kew: 163 (1901)

=*Tomophagus colossus* (Fr.) Murrill, *Torreya* 5: 197 (1905)

(Ganodermataceae, Polyporales, Incertae sedis, Agaricomycetes, Agaricomycotina, Basidiomycota, Fungi)

Taxonomic description

Sporophores, perennial, dimidiate, semicircular, bulky, 270-430 x 175-250 x 65-92mm, soft when fresh, on drying becoming light in weight. Pileus dull to shiny (laccate), marsh yellow to approximately buff brown towards the base and cream towards the margin, cuticle present, cutis cracks up on drying, margin thick and cream in colour. Context soft when fresh, cream or pale ochraceous, 55-82mm. Hymenium poroid, white to cream when fresh, ochraceous to pale brown when dry, pores 2-4 per mm, quit thick walled. Pore tube concolorous with pore surface, i.e. cream when fresh and pale brown up to 15-30mm deep. Hyphal system dimitic, generative hyphae hyaline, thin-walled with clamps, branched, 2.0-4.5µm wide, skeletal hyphae pale yellow to hyaline, thick-walled, solid, 3.5-6.0µm wide. Basidia clavate, measuring 25-28 x 12-13.5µm, sterigmata 4.5-6µm long. Basidiospores ovoid, yellow-brown, measuring 16-19 x 11-13µm.

Collections examined

On bases of dead tree of *Feronia elephantum* Corrêa (kaitha), Tiger reserve, Panna, Madhya Pradesh, 20/07/2018, *Mangifera indica* L., Kondagao, CG, 3/10/2008 and Cuttack, Odisha, on *Terminalia tomentosa* (Roxb.) Wight & Arn, Kantabhanji, Orissa, 25/8/2009, on *Ficus bengalensis* L., Viruda, Odisha, 8/9/2009, Tropical Forest Research Institute, TF 4046, 1937, 2277, 2338 and 2573.

Distribution: The species is distributed in America, Africa, West Indies and India (Assam, Madhya Pradesh, Maharashtra, Meghalaya, Punjab, Uttarakhand and West Bengal).

Ganoderma colossus develops bracket-like, spongy, sessile basidocarps, which were yellowish above and brown below and causes branch death. It is a pantropical species and has been reported on a range of plant species (Table 1). For example, it was recorded on *Delonix regia* from Vietnam (Kleinwachter et al., 2001) and Oman (Al-Bahry et al. 2004), on *Phoenix canariensis*, *Ficus carica* and *Celtis laevigata* from USA (Adaskaveg & Gilbertson, 1988). It is also reported as root and stem rot pathogen of pine, eucalyptus and *Callitris* in South Africa (Luckhoff, 1955). Records of *G. colossus* were also available from countries like; Saudi Arabia on date palm; Malaysia and Sierra Leone on oil palm, from Pakistan on bamboo and on *Gmelina arborea* from Nigeria (Al-Bahry et al. 2004). This fungus has also been observed infecting *Ficus altissima* in Oman (Elshafie et al., 2004). From India, *G. colossus* was recorded on wood logs from Hooghly, West Bengal (Bose, 1919; Dhancholia et al., 1987); on *Ficus bengalensis*, *Mangifera indica* and *Terminalia tomentosa* from Odisha (Tiwari et al., 2013), on *Delonix regia* and *Ficus religiosa* from Kodema, Jharkahnd and on living tree of *Ficus* sp. (Parihar et al., 2013).

Table 1: *Ganoderma colossus* reported on different tress

S.N.	Name of tree species	Place/ country	Reference
1.	*Callitris* spp. (Cupressaceae)	South Africa	Luckhoff (1955)
2.	*Celtis laevigata* Willd.	USA	Adaskaveg & Gilbertson (1988)
3.	*Delonix regia* (Bojer ex Hook.) Raf.	Oman, Vietnam	Al-Bahry et al. (2004); Kleinwachter et al. (2001)
4.	Eucalyptus	South Africa	Luckhoff (1955)
5.	*Feronia elephantum* Corrêa	Panna, Madhya Pradesh, India	This article
6.	*Ficus altissima* Blume	Oman	Elshafie et al. (2004)
7.	*Ficus bengalensis* L.	Odisha, India	Tiwari et al. (2013)
8.	*Ficus carica* L.	USA	Adaskaveg and Gilbertson (1988)
9.	*Ficus religiosa* L.	Jharkahnd , India	Parihar et al. (2013)
10.	*Ficus* sp.	Jharkhand and Rajasthan, India	Parihar et al. (2013)
11.	*Gmelina arborea* Roxb.	Nigeria	-
12.	*Mangifera indica* L.	Kondagao, CG and Odisha, India	Tiwari et al. (2013)
13.	*Phoenix canariensis* Chabaud.	USA	Adaskaveg & Gilbertson (1988)
14.	Pine	South Africa	Luckhoff (1955)
15.	*Terminalia tomentosa* (Roxb.) Wight & Arn	Odisha, India	Tiwari et al. (2013)

Figs. 1: ***Ganoderma colossus*** habit, on dead tree of *Feronia elephantum*

Figs. 2-3: *Ganoderma colossus* on *Feronia elephantum*, 2 fruit bodies upper and 3 lower surfaces

Figs. 4-5: *Ganoderma colossus*, habit on fallen tree of *Ficus bengalensis*

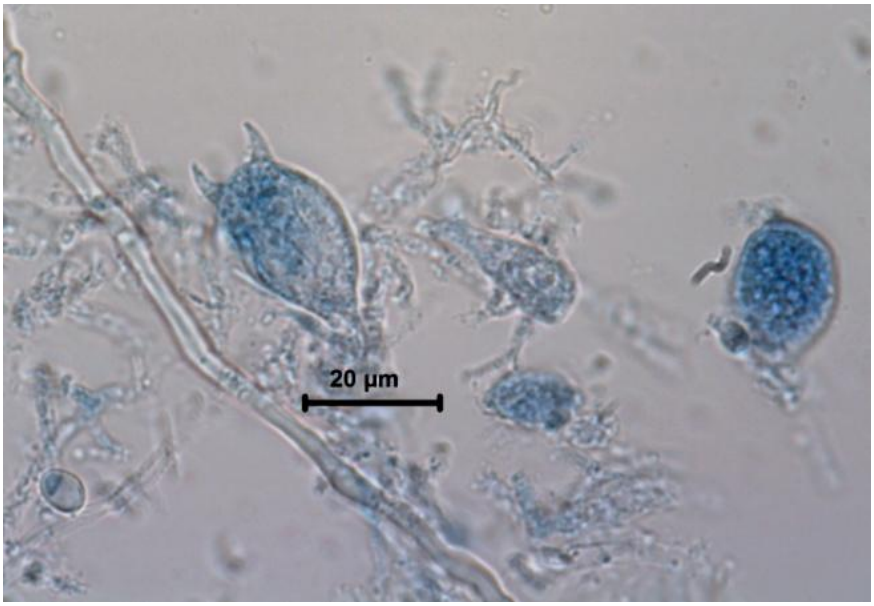

Fig. 6: *Ganoderma colossus* on *Feronia elephantum*, basidia along with arbortiform skeletal hyphae

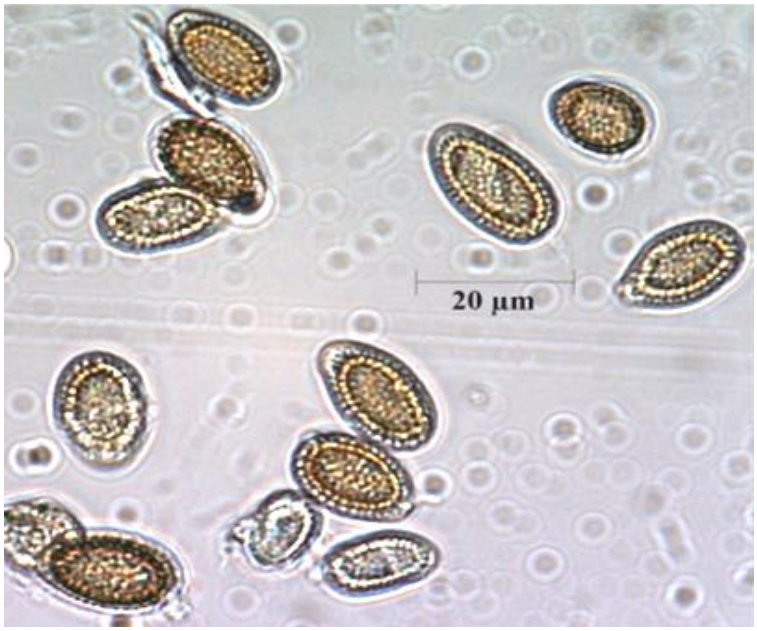

Fig. 7: *Ganoderma colossus,* basidiospores

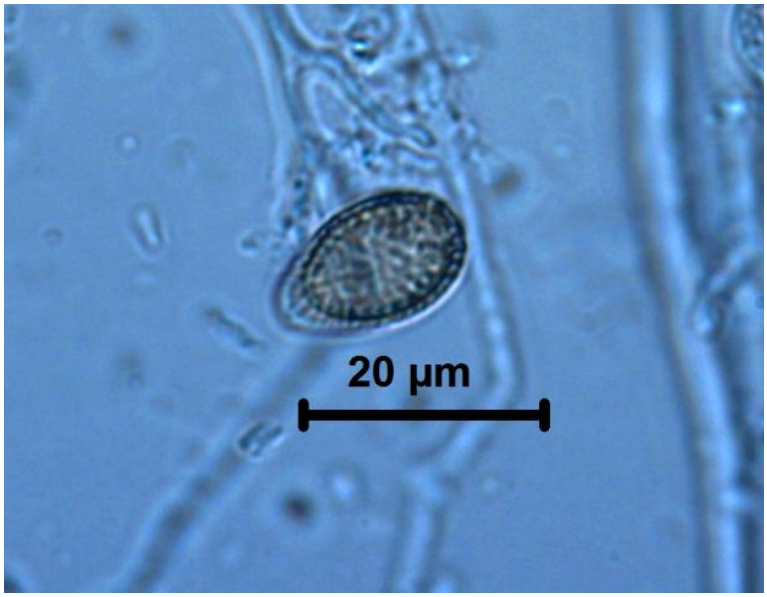

Fig. 8: *Ganoderma colossus,* basidiospores (enlarge)

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Heavy outbreak of leaf skeletonizer *Phazaca theclata* on *Haldina cordifolia*

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Haldu, *Haldina cordifolia*, syn. *Adina cordifolia*, is a flowering plant in the family Rubiaceae, the sole species in the genus *Haldina*. A large deciduous tree, up to 40 m tall by 2.2 m in diameter. It is native to southern Asia, from India east to Yunnan and Vietnam and south to Peninsular Malaysia. The flowers may be insignificant individually but can be seen as attractive when they bloom together in inflorescences with a circumference of 20–30 mm. It is usually blossoms during winter (dry season) months. The bark of the tree acts as an antiseptic. An important timber tree so far only planted on a small scale (Anon., 1959). Such economically important local forest tree species, Literature pertaining to *H. cordifolia*, entomology is very scanty fragmentary and incomplete. According to Browne (1968) an Beeson (1941) reported the larvae of *Phazaca theclata* (Syn. *Dirades theclata*) on the host plants - *Adina cardifolia* and *Burttavya nyasica.* Senthil Kumar and Murgesan (2015) reported the larva of *Spodoptera litura* (Fab.) on *Mitragyna parviflora*. Another species *M. speciosa* is attacked by a caterpillar of commander butterfly, *Moduza (Limenitis) procris* Cram (Anon. 1959).

The present study is a new addition in this regard and account is based on the field and laboratory observations of authors. Recent survey was conducted during August, 2018 in natural forest area, Beat Kirar, compartment no. RF-385; Jamudi compartment no. RF-380; Badhar compartment no.RF-387, Anuppur range, Anuppur Forest Division, Madhya Pradesh. It was observed that the trees of *H. cordifolia* were severely attacked (about 80-90 per cent) by some lepidopterous larvae (leaf skeletonizer). These larvae were then collected and reared on its host plant *H. cordifolia* in laboratory under the prevailing environmental conditions until pupation. These pupae were then allowed to emerge the adult moth stage.

The study revealed that *H. cordifolia* suffers seriously from the attack of skeletonizer, identified as *Phazaca theclata* (syn *Dirades theclata*) Gue. (Lepidoptera: Uraniidae) after comparing the morphology of adult moth with determined specimen preserved under accession No. 271 in Insect Repository, TFRI, Jabalpur for Insects. It was observed that a violoceous grey moth with brown-whitish head and thorax abdomen chreous except at base, forewing biolaceous grey, a large triangular patch out lined with double brown lines on the costa beyond the middle, a similar oval spot with darker centre on marginal fuscous lumules. Hind wing with basal half violaceous grey,

darkest at inner margin, the outer half pale chreous brown. The greyish, larval frequently appears over large area as a skeletonizer of *H. cordifolia* from July or August. It was recorded that the young larvae are gregarious in habit. The leaf is eaten from the margins towards the midrib but only superficially so that it appears coarsely skeletonize the trees (Figs.1-4). Pupation takes place on the ground or on the dead leaf. The cocoon is covered with particles of soil of dust of dry leaf. The life cycle is about a month and has a pupal period of 4-5 days towards the end of August-September.

This insect pest can be controlled by the application of the following methods:

- Removal of overcrowded leaf crowns and criss-cross branches to allow enough air and sunlight.
- *Bacillus thuringiensis* (BT) 1% (1 gm per lit. of water) or cypermethrin 10 EC 0.01% (1ml/lit of water)can be sprayed after 15 days interval.
- In natural forest areas, egg parasitoid, TFRI-Tricho cards (@ 1card per ha)can be released for protection of trees.

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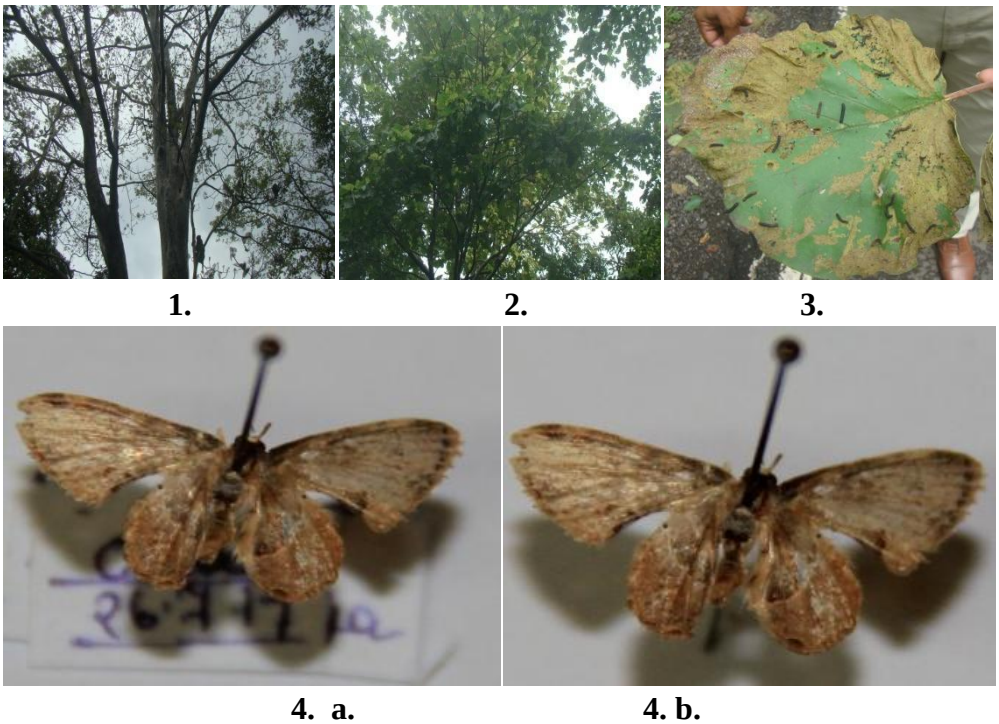

1. 2. 3.

4. a. 4. b.

Figs. 1, 2: Damaged tree of *H. cardifolia;* 3: Leaf attacked by skeletonizer *Phazaca theclata;* 4 (a & b): Adult moth male and Female

ग्लोबल वार्मिंग के दुष्प्रभाव

ममता पुरोहित, पूर्णिमा श्रीवास्तव एवं राजेश कुमार मिश्रा
उष्णकटिबंधीय वन अनुसंधान संस्थान
(भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार)
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साल-दर-साल बदलते मौसम, बढ़ते तापमान और जलवायु परिवर्तन से न केवल वैज्ञानिक वरन् आम आदमी भी हैरान है। ग्लोबलवार्मिंग शब्द अब अपरिचित नहीं रह गया है। सभी यह जानने लगे हैं कि ग्लोबलवार्मिंग के कारण ही हर साल पृथ्वी का तापमान बढ़ रहा है और ऋतु परिवर्तन का चक्र अनिशचित हो गया है, कहीं पर सूखा तो कहीं पर बाढ़ सामान्य सी बात हो गयी है। आज ऐसा कोई भी देश नहीं है जो ग्लोबलवार्मिंग के दुष्प्रभाव से खुद को बचा पाया हो। समय के साथ-साथ जिस तरह पेड़-पौधे व पशु-पक्षियों की बहुत सी प्रजातियाँ लुप्त हो गई हैं और लुप्त होने की कगार पर हैं यदि पृथ्वी पर जलवायु परिवर्तन इसी तरह लगातार होता रहा तो एक दिन मानव जाति के अस्तित्व पर भी प्रश्न चिन्ह लग जायेगा। वर्ष 2006-07 प्राकृतिक और पर्यावरण की दृष्टि से अन्तर्राष्टक्राhय स्तर पर वायुमण्डल में हो रहे बदलाव और उसके कुप्रभावों की चर्चा से अत्यधिक महत्वपूर्ण रहा। विभिन्न राज्यों में इस दौरान असंख्य झुलसे और मरे हुए वृक्ष देखे गए। वृक्ष प्रजातियों में यह प्रभाव शीशम, सिरस, सेमल, कचनार, पीपल, खैर, अमलताश, रतनजोत आदि पर देखा गया। जहाँ कृषि फसलों में मसूर, गेहूँ, बरसीम, सरसों आदि पर पाले का प्रभाव देखा गया वहीं उद्यान प्रजातियों जैसे केला, आम, पपीता, लीची पर पाले का प्रभाव आंशिक और पूर्ण रूप से दर्ज किया गया। परिणाम स्वरूप अनाज और फल उत्पादन में कमी हुई, वृक्षों के तने पर गाठें बनने से लकड़ी की गुणवत्ता पर प्रभाव पड़ा और ऊपरी हिस्सा झुलसने से लकड़ी की उत्पादकता में कमी आई ।

धीरे-धीरे पृथ्वी के पर्यावरण के तापमान में वृद्धि हो रही है। पृथ्वी का यह बढ़ता तापमान पूरी दुनिया के लिए चिन्ता का विषय बन चुका है। कहीं अत्यधिक वर्षा तो कहीं अत्यधिक सूखा पड़ने के कारण कृषि फसलों का उत्पादन नहीं हो पा रहा है जिससे अनाज के मूल्यों में वृद्धि हो रही है। तापमान बढ़ने से बहुत सी पादप प्रजातियों का विकास मुश्किल हो जाता है जिससे वह लुप्तप्राय हो रहीं हैं।

ग्लोबलवार्मिंग क्या है ?

ग्लोबलवार्मिंग से आशय है धीरे-धीरे पृथ्वी के तापमान में वृद्धि होना (साल-दर-साल पृथ्वी का तापमान बढ़ रहा है) जिससे मानव, पशु-पक्षियों, कृषि एवं मौसम जगत पर विपरीत प्रभाव उत्पन्न होना है।

ग्लोबलवार्मिंग के कारण-

1. धरती का अंधाधुंध उत्खनन।
2. जंगलों के नष्ट होने से पर्यावरण असंतुलन।

3. प्लास्टिक/पोलिथीन के अत्यधिक उपयोग से बढ़ा प्रदूषण।
4. लगातार बढ़ता औद्योगिकीकरण।
5. ग्रीन हाउस गैसों (कार्बन डाय आक्साइड, सल्फर डाय आक्साइड, नाइटिक्रक आक्साइड आदि) के उत्सर्जन में लगातार वृद्धि।

ग्लोबल वार्मिंग के दुष्प्रभाव -

2. पर्यावरण के तापमान में वृद्धि हो रही है।
1. नई-नई बीमारियाँ पैदा हो रही है।
2. पृथ्वी का तापमान बढ़ने से ग्लेशियरों के पिघलने की दर प्रतिवर्ष बढ़ रही है जिससे बहुत से देशों में बाढ़ का गंभीर खतरा पैदा हो गया है। अमेरिका के भू-वैज्ञानिक सर्वेक्षण दल की एक रिर्पोट के अनुसार मोंटाना ग्लेशियर नेशनल पार्क के 150 ग्लेशियरों में से अब इनकी संख्या मात्र 25 रह गई है।
3. वारिस चक्र में बदलाव के कारण गर्मी, वारिस और ठंड के मौसम की अवधि में भी बदलाव आ रहा है।
4. कुछ हिस्सों में अति वर्षा तो कुछ हिस्सों में अति सूखा पड़ रहा है। सूखे के कारण देश-विदेश के कुछ हिस्सों में खेती करना असंभव होता जा रहा है।
5. पर्यावरण में विषाक्त गैसें उत्पन्न हो रही है।
6. विभिनन प्रकारों के त्वचा एवं एलर्जी संबंधी रोग बढ़ रहें है।
7. पशु-पक्षियों की प्रजातियों के लुप्त होने का खतरा बढ़ रहा है।
8. ओजोन परत में कमी आ रही है।
9. पर्यावरण के तापमान में वृद्धि होने के साथ-साथ हवा के संचरण में बदलाव आ गया है।
10. आग लगने, तूफान तथा बाढ़ आने का खतरा एवं चक्रवात की आवृति बढ़ रही है।
11. कार्बन मोनो आक्साइड की अधिकता से साँस लेने में परेशानी के साथ अन्य असाध्य रोगों की संख्या बढ़ रही है।
12. समुद्र का जल स्तर बढ़ने से जलीय जीवों के जीवन पर भी बुरा असर पड़ रहा है।
13. नदियाँ सूख रही हैं तथा जल स्तर बहुत नीचे जा रहा है।

उपरोक्त दुष्प्रभावों से धरती के पर्यावरण को बचाने तथा पारिस्थितकी तंत्र को

संतुलित बनाने के लिए नीति निर्धारकों, विशेषज्ञों, पर्यावरणविज्ञों तथा सरकार एवं निजी निकायों को ग्लोबलवार्मिंग से निपटने के लिए ठोस कदम उठाने होंगे। इस हेतु-

1. वांछित प्रशासनिक, वित्तीय एवं वैज्ञानिक दिशा-निर्देश तैयार कर उसके अनुसार कार्ययोजनाओं का निस्पादन करना होगा।
2. विकसित देशों की सहायता से जलवायु परिवर्तन संबंधी मुख्य बिंदुओं एवं आवश्यक दिशा - निर्देशों को लागू किया जाये जिससे ग्रीन हाउस गैसों के उत्सर्जन में रोकथाम हो सके।
3. गैर पारंपरिक उर्जा के स्त्रोतों पर ध्यान देकर सकारात्मक कदम उठाने होंगे।

पर्यावरणविदों के अनुसार ग्लोबलवार्मिंग के कारण आकस्मिक घटनाओं जैसे अत्यधिक बर्फबारी, कृषि चक्र और उसकी पैदावर में कमी, पाला पड़ना, वनोपज कम होना, चारे की कमी आदि से जनजीवन अस्त-व्यस्त होगा, पशु-पक्षियों का जीवन और वनस्पति प्रजातियों पर खतरा बना रहेगा। जलवायु परिवर्तन से पारिस्थितकी तंत्र असंतुलित हो रहा है, प्राकृतिक आपदाओं की पुनरावृति से जन-जीवन, वानस्पतिक सम्पदा, पशु-पक्षियों की भिन्न-भिन्न प्रजातियों का अस्तित्व लुप्तप्राय हो रहा है। प्रत्येक नागरिक का यह कर्त्तव्य है कि हम वर्तमान और आने वाली पीढ़ियों को हरे-भरे जंगल, पीने का पानी, खाद्यान्न, शुद्ध हवा और धरती के पर्यावरण को सुरक्षित तापमान देने के लिए निजी और सामुदायिक प्रयास करें।

देश-विदेश की सरकारों को चाहिए कि गैर सरकारी संगठनों को साथ में लेकर कारगर

कार्ययोजनाओं को ग्रामीण, शहरी, औद्योगिक क्षेत्रों आदि में क्रियान्वित करें तथा संगोष्ठियों, कार्यशालाओं, रैलियों आदि के माध्यम से जन-जन को जागरूक करें। विश्व स्तर पर देश-विदेश की सरकारों को एक मंच पर आकर विचार-विमर्श के पश्चात प्रभावशाली निर्णय लेने होंगे तभी भविष्य में सकारात्मक परिणाम मिल सकेगें ।

Diversity of macro-fungi in Central India-XVI: *Colus pusillus*, a member of Phallaceae from Maharashtra

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Abstract

The present article reports *Colus pusillus*, a member of Phallaceae from Maharashtra. It is saprophytic macro fungus earlier reported from soil containing decaying wood chips, from Kolkata, West Bengal.

Introduction

Colus pusillus is a species of fungus in the family Phallaceae. It is found in Australia, it is also known as the craypot stinkhorn or basket stinkhorn. This name is with reference to the unique appearance of the fruiting bodies which consist of vivid red, wrinkled arms that branch and connect to form a cage-like structure reminiscent to that of the related species, *Clathrus ruber*. This fungus is saprobic and makes frequent appearances on garden mulch as a result. Like all stinkhorns, the fruit body of *C. pusillus* begins as an egg-like structure. Eggs are typically off-white, with a red/purple tinge and a faint latticed pattern on the surface. They are anchored to the substrate by one or more root-like thickened mycelial strands, the rhizomorphs. The membrane of the egg soon ruptures, releasing the rapidly expanding mature receptacle, which can reach a height of 15cm. The interior of the cage is covered by an unevenly distributed glebal slime, which contains the fungal spores. This slime is olive-green and has a foul smell, which attracts insects which dispersed fungus' spores to a suitable location. 16 species of *Collus* are known till date (http://www.indexfungorum.org, page visited on 18/9/2018) out of them 9 were transferred to another genera, *Pseudocolus* and *Lysurus*.

Materials and methods

Specimen was collected from soil surface, Nerulsaigaon, Sindhudurg, Sawantwadi, Kudal forest range (N15^{0}59'51.07'' E73^{0}39'15.04''), Maharashtra. The slides were prepared in lactophenol and cotton blue and observed under advance Research Microscope, make Leica, Germany and photomicrographs were taken with a digital camera attached to the microscope. Identification of fungi was done with the help of literature (Berkeley 1845; Dring 1980; Leelavathy et al., 1981; Mohanan 2011; Tiwari et al. 2013). The specimens were deposited in the Mycology Herbarium, Tropical Forest Research Institute, Jabalpur and got accession numbers.

Results and Discussion

Taxonomic description

***Colus pusillus* (Berk.) Reichert (Figures 1-6)**

≡*Clathrus pusillus* Berk.

=*Clathrella pusilla* (Berk.) E. Fisch.

(Phallaceae, Phallales, Phallomycetidae, Agaricomycetes, Agaricomycotina, Basidiomycota)

Also known as the craypot stinkhorn or basket stinkhorn which refer to unique appearance of the fruiting bodies, consist of vivid red, wrinkled arms that branch and connect to form a cage-like structure.

Fruit body begins as egg-like structures which are typically off-white, with a red/purple tinge and a faint latticed pattern on the surface; attached to the substrate by one or more root-like rhizomorphs. The membrane of egg ruptures to release the rapidly expanding mature receptacle; interior of cage is covered by an unevenly distributed glebal slime, which contains spores. Fruit body cylindrical or obovate 3-3.5cm in diameter; columns up to 3-4cm high, wrinkled transversely, beautiful bright ruby red, forming juncture above the net with sub-pentagonal meshes, extremely brittle and scarce able to support their own weight with 4-5 arms. Hymenium attached to the inner side of the columns and network through their whole extent. Basidiospores, minute, oblong–elliptical, smooth, measuring 3.5-7.5 x 1.5-2.5µm; spore print, olive- brown. Similar species: *Clathrus crispus*, *C. ruber*, *Colus hirudinosus*.

Collection examined

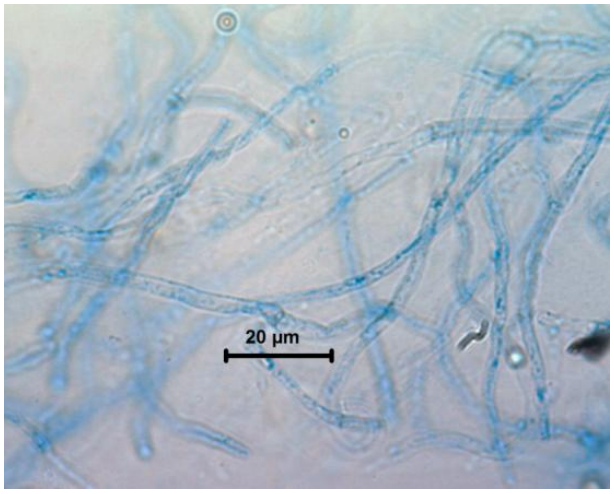
On soil surface, Nerulsaigaon, Sindhudurg, Sawantwadi division, Kudal forest range, N15^{0}59'51.07'' E73^{0}39'15.04'', 12/07/2018 AJK Asaiya and Vimal Pandro; Mycol Herbarium, Tropical Forest Research Institute, TF 4057

1

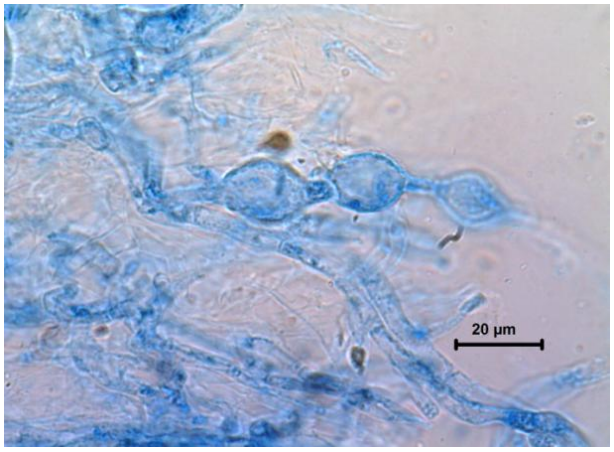
Fig. 1. *Colus pusillus*: fruit body growing near another fungus, *Pisolithus tnctorius*

2

Fig. 2. *Colus pusillus*: fruit body in habit

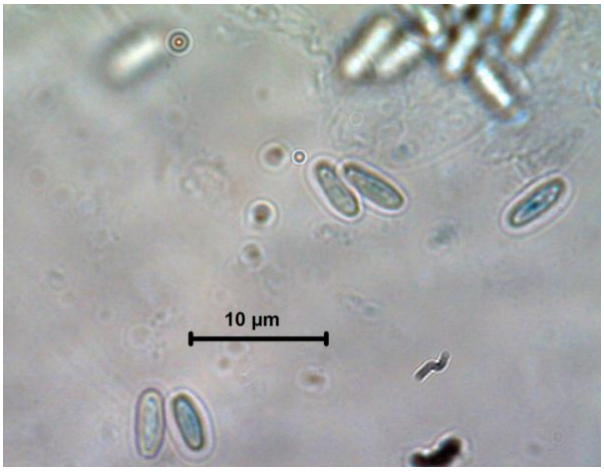


3



4

Fig. 3-4. *Colus pusillus*: hyphae and swollen hyphae



5

Fig. 5. *Colus pusillus*: basidiospores

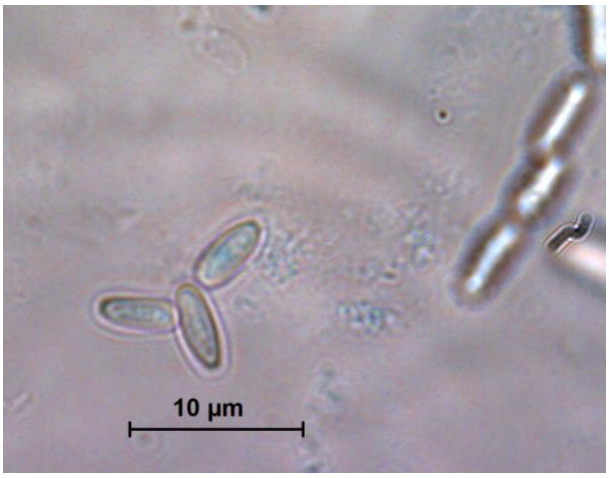


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Fig. 6. *Colus pusillus*: basidiospores (Enlarged)

Table 1: World-wide distribution of known *Colus* species

S. No.	Name of fungus	Habit	Distribution	Reference
1.	*Colus giganteus* Dörfelt & Bumžaa	On the ground	Mongolia	Dörfelt and Bumžaa (1986)
2.	*Colus hirudinosus* Cavalier & Séchier ≡*Clathrus hirudinosus* (Cavalier & Sechier) Tul.	- in pastureland, near pine, on soil, among grasses	Midi, Corsica (France); Cataluna, Andalucia (Spain); Ticino (Switzerland); Palestine, Thailand (Asia); Algeria,	Cavalier and Séchier (1835); Dring (1980); Akata and Gürkanl (2018)

			Nigeria (Africa); Jamaica (America); Turkey (Europe)	
3.	*Colus muelleri* E. Fisch. ≡*Clathrella muelleri* (E. Fisch.) Sacc. & P. Syd. =*Simblum muelleri* (E. Fisch.) Lloyd	On the ground	Australia	Lloyd (1909)
4.	*Colus pusillus* (Berk.) Reichert ≡*Clathrus pusillus* Berk.	wood chips; on the ground	Kolkata, West Bengal, India Western Australia	Leelavathy et al. (1981) In Dring (1980)
5.	*Colus stahelii* (E. Fisch.) Reichert ≡*Clathrella stahelii* E. Fisch.	On the ground	Surinam, South America	In Dring (1980); Reichert (1940)
6.	*Colus subpusillus* Dring	On the ground	Ghana	Dring (1980)
7.	*Colus treubii* (C. Bernard) Reichert ≡*Clathrella treubii* C. Bernard	On humus	Java	Lloyd (1907)

Discussion

Colus pusillus (Berk.) Reichert ≡*Clathrus pusillus* Berk., is distributed in Southern Europe, northern Africa, parts of Asia, Western Australia. In the present study it is being reported from Sawantwadi, Maharashtra. Earlier it was reported on decaying wood chips in soil, from Kolkata, West Bengal (Leelavathy et al., 1981b). Volva of *Colus pusillus* is nearly cylindrical or obovate, wrinkled transversely, beautiful bright ruby red, springing from four to eight together from a point at the base, and forming by their juncture above a net with sub-pentagonal meshes, extremely brittle and scarce able to support their own weight. Hymenium attached to the inner side of the columns and network through their whole extent, except occasionally at the base. This beautiful species resembles in many respects with *Colus hirundinaceus*, which is the most widely occurring species (Table 1). The network resembles closely that of *Clathrus cancellatus*, in the smaller specimens it is confined to the apex, but specimens occur in which the six ribs merely unite above, and thus form five oblong meshes. It is also reported on decaying wood chips in soil (Leelavathy et al., 1981).

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