(ISSN 2395 - 468X)

Year - 2016 Vol. 3, No. 10 Issue: October 2016

Van Sangyan

A monthly open access e-magazine

Indexed in:

COSMOS Foundation (Germany)

Tropical Forest Research Institute

(Indian Council of Forestry Research and Education)

Ministry of Environment, Forests and Climate Change (MoEFCC)

PO RFRC, Mandla Road, Jabalpur – 482021. India

Van Sangyan

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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

Solanum nigrum Linn. and related species (Family Solanaceae), commonly known as 'Black nightshade' are worldwide weeds of arable land, gardens, rubbish tips, soils rich in nitrogen, in moderately light and warm situations which occur from sea to montane levels. They are, however, also widely used as leafy herbs and vegetables, as a source of fruit and for various medicinal purposes. Therefore, human consumption of their leaves and fruits as food is widespread, particularly in Africa and south east Asia. Unfortunately, there is also widespread confusion over the precise identification of the taxa involved, especially in those areas in which the species are most commonly used as food sources. S. nigrum has been extensively used in traditional medicine in India and other parts of world to cure liver disorders, chronic skin ailments (psoriasis and ringworm), inflammatory conditions, painful periods, fevers, diarrhoea, eye diseases, hydrophobia etc.

S. nigrum possesses various compounds, such as glycoalkaloids, glycoproteins, and polysaccharides that are responsible for diverse activities. It also contains polyphenolic compounds, such as gallic acid, catechin, protocatechuic acid (PCA), caffeic acid, epicatechin, rutin, and naringenin. Glycoalkaloids include solamargine, solasonine, and solanine that belong to the tropane group of compounds. It comprises 95 percent of the total alkaloid concentration present in the plant and is found naturally in any part. It is one of the plant's major natural defenses as it is toxic even in small quantities.

This issue of Van Sangyan contains an article on Studies on seed characteristics of solanum nigrum in response to application of organic manures, Azotobacter with different spacings. There are also useful articles, such as Ethnobotanical uses of plant species in Achanakmar-Amarkantak biosphere reserve, Ethnomedicinal uses of family Sterculiaceae in Uttar Pradesh. Importance of curative plants in the healing of skin diseases, DNA from ancient wood, Traditional and eco-friendly mat of Tamil Nadu, Gum karaya (Sterculia urens Roxb.), Antiseptic property of Allium cepa in Uttar Pradesh and biodiversity of Ratufa indica and Prunus cerasoides.

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

Looking forward to meet you all through forthcoming issues.

Dr. N. Roychoudhury
Scientist G & Chief Editor

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Studies on seed characteristics of *Solanum nigrum* Linn. in response to application of organic manures, *Azotobacter*

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Abstract

The present work entitled "Studies on seed characteristics of *Solanum nigrum* Linn. in response to application of organic manures, *Azotobacter* with different spacings" was carried out in experimental area of Department of Forest Products, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh during 2004-2006. The study area falls in mid hill zone of HP, where temperature ranges between 0-36°C and annual rainfall varies between 1000-1300mm. Seven different treatments viz. T_1 (control), T_2 (FYM), T_3 (*Azotobacter*), T_4 (FYM + *Azotobacter*), T_5 (Vermicompost). T_6 (Vermicompost + *Azotobacter*) and T_7 (Vermicompost + FYM) with three spacings viz. S_1 (30x30 cm) S_2 (30x45 cm) and S_3 (45x45 cm) were studied to observe the impact of these treatments on seed parameters viz. weight of 1000 seeds, germination per cent, root shoot length, fresh weight of seedling, dry weight of seedling. Organic manure, *Azotobacter* and spacing showed non-significant results on seed characteristics of *Solanum nigrum.*

Keywords: Seed characteristics, Treatments, Spacings, *Solanum nigrum*.

Introduction

The source of plant herbs have traditionally been our rich forests. However, due to extensive deforestation and over exploitation of our forest lands, the availability of such herbs has dwindled. About 95 per cent of the plant species are collected from the forest for preparation of medicines by pharmaceutical companies and as of now less than 40 species are under cultivation. A new interest among the drug companies in herbal preparation has precipitated greater attention and has revealed into commercial exploitation of important medicinal and aromatic plants. While it is imperative that such plants should be protected in their natural habitat, it is also necessary to cultivate the medicinal plants with such technical knowhow so as to maximize the production with better quality. Technologies have therefore, to be developed to overcome the problems of commercial cultivation (Kale *et al*. 2004).

Among various parts of our country, Western Himalaya is a big repository producing a large number of rare and valuable drug plants. About 8000 plants world wide have been reported to have medicinal properties and amongst Indian plants, the number goes up to 2500 of which about 1100 plants are used in Indian systems of medicine (Brahmavarcha, 1982). Out of these, 500 plants are commonly used in preparation of Ayurvedic, Unani and Homeopathic drugs. There are around 7,000 units engaged in manufacturing plant based drugs in India covering around 14,000 recipes (Chauhan, 1999). In recent years, India has emerged as one of the biggest suppliers of material (Holley and Cherls 1998). India is second amongst 12 world leading exporter countries (Lange, 1997).

It is also true that due to rising international demand, many important medicinal plant species are becoming scare while some are facing prospects of extinction (Bhojvaid, 2003).

Solanum nigrum Linn. Syn. *S. villosum* Miller, Gard (Bennet 1986) black nightshade in English, Kakamachi in Sanskrit and Makoi in Hindi (Anonymous 1976) is newly emerging medicinal crop of the family Solanaceae.

It is a herbaceous or suffrutescent weed, 30-45cm high, found throughout India in dry parts, upto an elevation of 2,100m. In Himachal Pradesh, the plant is found all over the state upto 2,600 m elevation. It is an erect or rhambling, sparingly or often much branched, usually glabrous herb, which is about 1m tall (Chauhan, 1999).

The herb has antiseptic and antidysenteric properties and is given internally for cardalgia and gripe. An infusion of the plant is used in enema in infants having abdominal upset. It is a house hold remedy for anthrax pustules and is applied locally. The plant is also credited with emollient, diuretic, and laxative properties and its decoction is regarded as an antispasmodic and narcotic. Berries are considered to posses, tonic, diuretic and cathartic properties and are useful in anasarca and heart disease. Immature green fruit of the plant contains four steroidal glycoalkaloids viz. solamargine, solasodine, α- and β-solanigrine; all of them yield solasodine as the aglycone (Anon, 1976). The National Medicinal Plant Board (NMPB), Govt. of India, New Delhi, has enlisted this species among 32 crops prioritized for commercial cultivation in the country. Keeping in view the demand from the industries with meager work on the cultivation of this species, the present study was undertaken with objective of studies on seed characteristics of *Solanum nigrum* Linn. in response to application of organic manures, *Azotobacter* with different spacings.

Material and methods

The investigations were carried out in the experimental area of Department of Forest Products, Dr. Y.S. Parmar University of Horticulture and Forestry Nauni, Solan (H.P) during 2005-2006. The study area falls in the mid hill zone of Himachal Pradesh having 1235m Altitude, $30^0$52'N Latitude and $70^0$11'E Longitude. The area gets on an average 1000-1300 mm rainfall. The experiment on effect of organic manures, *Azotobacter* and spacing on growth of *Solanum nigrum* was laid out in Randomized Block Design (Factorial) having seven treatments with three replication viz. T_1 (Control), T_2, (FYM @ 5t/ha) T_3, (*Azotobacter* inoculation), T_4 (FYM @ 5t/ha + *Azotobacter* inoculation), T_5 (Vermicompost @ 2t/ha), T_6 (Vermicompost @ 2t/ha + *Azotobacter* inoculation) and T_7 (Vermicompost + FYM @ 1t/ha + 2.5 /ha). *Azotobacter* was isolated from soil with *Azotobacter* count of 10^8-10^9 c/a/ml. The plant roots were dipped in *Azotobacter* solution. The nursery plots of size 1.8m X 1.8m were made. The plants were transplanted in the field with spacing S_1 (30 x 30cm) and 36 plants in each plot, S_2 (30 x 45cm) with 24 plants in each plot and S_3 (45 x 45cm) with 16 plants in each plot. *Azotobacter* was isolated from Nauni soil with *Azotobacter* count of 10^8-10^9 c/a/ml. The plant roots were dipped in *Azotobacter* solution before planting. FYM, vermicompost were broadcasted while preparing the plots and mixed with the soil through ploughing. The seeds collected from different treatments and their replications were kept separately to carry out further studies on

following seed parameters viz. weight of 1000 seeds, germination per cent, root shoot length, fresh weight of seedling, dry weight of seedling.

1000 seeds from each treatment were taken and their average was recorded as weight of 1000 seeds. The germination test was carried out as per ISTA procedure (Anonymous, 1985). 100 seeds from each treatment were taken and the test was carried out in three replications, having 2100 seeds per replication for 21 treatments. The seeds were allowed to germinate in the petridishes using autoclaved sand and the final count was taken on 28 days. Germination percentage was worked out by using following formula.

Germination (%) =

$$\frac{\text{Number of seeds germinated}}{\text{Total No.of seeds}} \times 100$$

The root shoot length of the seedling was measured from the tip of the shoot to the lower tip of the primary root and was reported as mean root shoot length. Fresh weight of seedlings of each treatment was recorded by using electronic balance. Fresh seedlings were dried at 60°C in an oven over 96hrs until constant weight was attained. Dry weight of seedling was recorded by using electronic balance. Analysis of variance was worked out and Critical Difference ($CD_{0.05}$) at five per cent level of significance was calculated as suggested by Cochran and Cox (1967).

Results and discussion

In the present studies, it has been observed that combination of organic manure and biofertilizer is non- effective on seed parameter viz. weight of 1000 seeds, germination per cent, root shoot length, fresh weight of seedling, dry weight of seedling.

The data on weight of 1000 seeds is presented in Table-1. The data showed non-significant effect for all the treatments and their combinations. However, maximum weight of 1000 seeds was observed for two treatments T_6 and T_5 (0.339 g) and minimum was recorded for T_1 (0.337 g). The maximum weight of 1000 seeds (0.343 g) was recorded for S_3 (45 x 45 cm) and minimum (0.335 g) was obtained for two planting densities i.e. S_1 and S_2. The interaction study revealed maximum weight of 0.352 g for 1000 seeds in T_6 S_3 combination (Vermicompost + *Azotobacter* at 45 x 45 cm) and minimum weight of 1000 seeds (0.332 g) for two combinations i.e. T_6 S_1 (Vermicompost + *Azotobacter* at 30 x 30 cm) and T_6 S_2 (Vermicompost + *Azotobacter* at 30 x 45 cm).

Similarly, data appended in Table-1 revealed non-significant effect for all the treatments and their combinations. Maximum germination per cent 77.40 (8.79) per cent was noticed in T_6 and minimum germination per cent of 76.77 (8.76) per cent was found in two treatments i.e. T_1, and T_2. Among plant densities, minimum germination per cent of 77.24 (8.78) per cent was obtained for S_1 (30 x 30 cm), which was at par with 76.84 (8.76) per cent was recorded for S_3 (45 x 45 cm). The interaction study revealed maximum germination per cent of 77.77 (8.82) per cent for T_5 S_1 (Vermicompost at 30 x 30 cm) and minimum germination per cent of 76.09 (8.72) per cent for T_1 S_3 (control at 45 x 45 cm).

Data shown in Table-1 indicated non-significant values for all treatments. However, maximum root shoot length was recorded in T_6 (1.351 cm) while minimum root shoot length of seedlings was

observed in T_1 (1.341 cm). Similarly different spacing had non-significant on this parameter. Maximum root shot length was observed in S_3 (1.355 cm) and minimum in S_1 (1.340 cm). Among interactions maximum root shoot length of 1.373 cm was noticed in T_3 S_3 combination (*Azotobacter* at 45 x 45 cm) and minimum root shoot length of 1.317 cm was recorded in T_3S_2 combination (*Azotobacter* at 30 x 45 cm).

Fresh weight seedling also observed non-significant values for all treatments and their combinations. However, exposition of Table-2 showed maximum average fresh weight of seedling (2.089 mg) in T_6 (Vermicompost + *Azotobacter*) and minimum of 2.056 mg in T_1 (control) as shown in Table-2. Maximum average fresh weight of seedling (2.097 mg) was recorded in S_3 (45 x 45 cm) and minimum (2.055 mg) was found in S_1 (30 x 30 cm). In case of interactions, T_2 S_3 (FYM at 45 x 45 cm) observed highest value of 2.143 mg while T_2 S_1 (FYM at 30 x 30 cm) noticed lowest value of 1.997 mg.

The data presented in Table-2 indicated non-significant values for organic manures treatments. The maximum average dry weight of seedling was observed for three treatments (0.341g) as T_6 (Vermicompost + *Azotobacter*) T_7 (Vermicompost + FYM) and T_3 (*Azotobacter*).

The minimum dry weight of seedlings (0.340g) was obtained for four treatments as T_1 (control), T_2 (FYM), T_4 (FYM + *Azotobacter*) and T_5 (Vermicompost). Among planting densities, maximum average dry weight of seedling (0.347 g) was obtained for S_3 (45 x 45 cm) and minimum (0.335) was recorded for S_1 (30 x 30 cm).

Among interactions, T_1 S_3 combination (control at 45 x 45 cm), T_2 S_3 combination (FYM at 45 x 45 cm), T_3S_3 combination (*Azotobacter* at 45 x45 cm), T_4 S_3 combination (FYM + *Azotobacter* 45 x 45 cm), T_5S_3 combination (Vermicompost at 45 x 45 cm) and T_7 S_3 combination (Vermicompost + FYM at 45 x 45 cm) showed highest value 0.347 mg and minimum dry weight of seedlings was obtained is (0.334g) for two treatments as T_2 S_1 combination (FYM at 30 x 30 cm) and T_5 S_1 combination (Vermicompost at 30 x 30 cm).

Seed exhibit a wide range of variation in their shape, size, colour and seed coat surface. Acknowledge of seed characteristics is advantageous for regeneration. Seed germination is resumption of active growth by embryo resulting into emergence of young plant. The process of seed germination is influenced by many factors. So seed quality interpretation is one of the important factors, which determines the strength of a protection system (Ahmad, 2006). Keeping this in view, seed studies have also been conducted. In the present studies, it is observed that organic manures, *Azotobacter* and spacing showed non-significant results in almost all the seed characteristics viz. weight of 1000 seeds (g), germination percent, root shoot length (cm), fresh weight of seedling (mg), dry weight of seedling (mg) and germination percentage.

The non-significant variation in all of the seed characteristics may be attributed to lesser variation due to physical environment and more stability in these parameters.

Conclusion

The study suggest that there is no singnificant effect of organic manures, *Azotobacter* and spacing on seed characteristics viz. weight of 1000 seeds

(g) germination percentage, root shoot length (cm), fresh and dry weight of seedlings (mg).

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Table-1: Studies on seed characteristics viz. weight of 1000 seeds, germination per cent and root shoot length of *Solanum nigrum* Linn. in response to application of organic manures, *Azotobacter* with different spacings.

Treatments	Weight of 1000 seeds (g)				Germination per cent (%)				Root shoot length (cm)			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
Control (T_1)	0.335	0.337	0.340	0.337	77.69 (8.81)	76.52 (8.75)	76.09 (8.72)	76.77 (8.76)	1.327	1.347	1.350	1.341
FYM (T_2)	0.337	0.336	0.342	0.338	76.67 (8.76)	76.63 (8.75)	77.00 (8.77)	76.77 (8.76)	1.337	1.347	1.350	1.344
Azotobacter (T_3)	0.336	0.336	0.342	0.338	77.38 (8.79)	76.41 (8.74)	77.42 (8.79)	77.07 (8.78)	1.353	1.317	1.373	1.348
FYM + Azotobacter (T_4)	0.334	0.335	0.344	0.338	76.70 (8.76)	77.66 (8.81)	76.67 (8.76)	77.01 (8.77)	1.353	1.343	1.337	1.344

Vermicompost (T_5)	0.337	0.336	0.343	0.339	77.77 (8.82)	77.40 (8.79)	76.33 (8.74)	77.17 (8.78)	1.347	1.350	1.337	1.344
Vermicompost + *Azotobacter* (T_6)	0.332	0.332	0.352	0.339	77.32 (8.79)	77.66 (8.81)	77.21 (8.79)	77.40 (8.79)	1.333	1.350	1.370	1.351
Vermicompost + FYM (T_7)	0.336	0.336	0.342	0.338	77.13 (8.78)	77.49 (8.80)	77.14 (8.78)	77.25 (8.79)	1.330	1.343	1.370	1.348
Mean	0.335	0.335	0.343		77.24 (8.79)	77.11 (8.78)	76.84 (8.76)		1.340	1.342	1.355	
	SE_d (±)	$CD_{(0.05)}$			SE_d (±)	$CD_{(0.05)}$			SE_d (±)	$CD_{(0.05)}$		
Treatment (T)	NS				NS				NS			
Spacing (S)	NS				NS				NS			
TxS	NS				NS				NS			

Values in parenthesis are square root transformed values.

Table-2: Studies on seed characteristics viz. fresh weight of seedling and dry weight of seedling of *Solanum nigrum* Linn. in response to application of organic manures, *Azotobacter* with different spacings.

Treatments	**Fresh weight of seedling (mg)**				**Dry weight of seedling (mg)**			
	S_1	**S_2**	**S_3**	**Mean**	**S_1**	**S_2**	**S_3**	**Mean**
Control (T_1)	2.070	2.057	2.040	2.056	0.336	0.338	0.347	0.340
FYM (T_2)	1.997	2.067	2.143	2.069	0.334	0.339	0.347	0.340
Azotobacter (T_3)	2.040	2.127	2.077	2.081	0.335	0.339	0.347	0.341
FYM + Azotobacter (T_4)	2.027	2.107	2.077	2.070	0.337	0.336	0.347	0.340
Vermicompost (T_5)	2.083	2.063	2.093	2.080	0.334	0.339	0.347	0.340
Vermicompost + *Azotobacter* (T_6)	2.133	2.007	2.127	2.089	0.336	0.340	0.346	0.341
Vermicompost + FYM (T_7)	2.037	2.093	2.120	2.083	0.335	0.340	0.347	0.341
Mean	2.055	2.074	2.097		0.335	0.339	0.347	
	SE_d (±)	$CD_{(0.05)}$			SE_d (±)	$CD_{(0.05)}$		
Treatment (T)	NS				NS			
Spacing (S)	NS				NS			
TxS	NS				NS			

Ethnobotanical uses of plant species in Achanakmar-Amarkantak biosphere reserve

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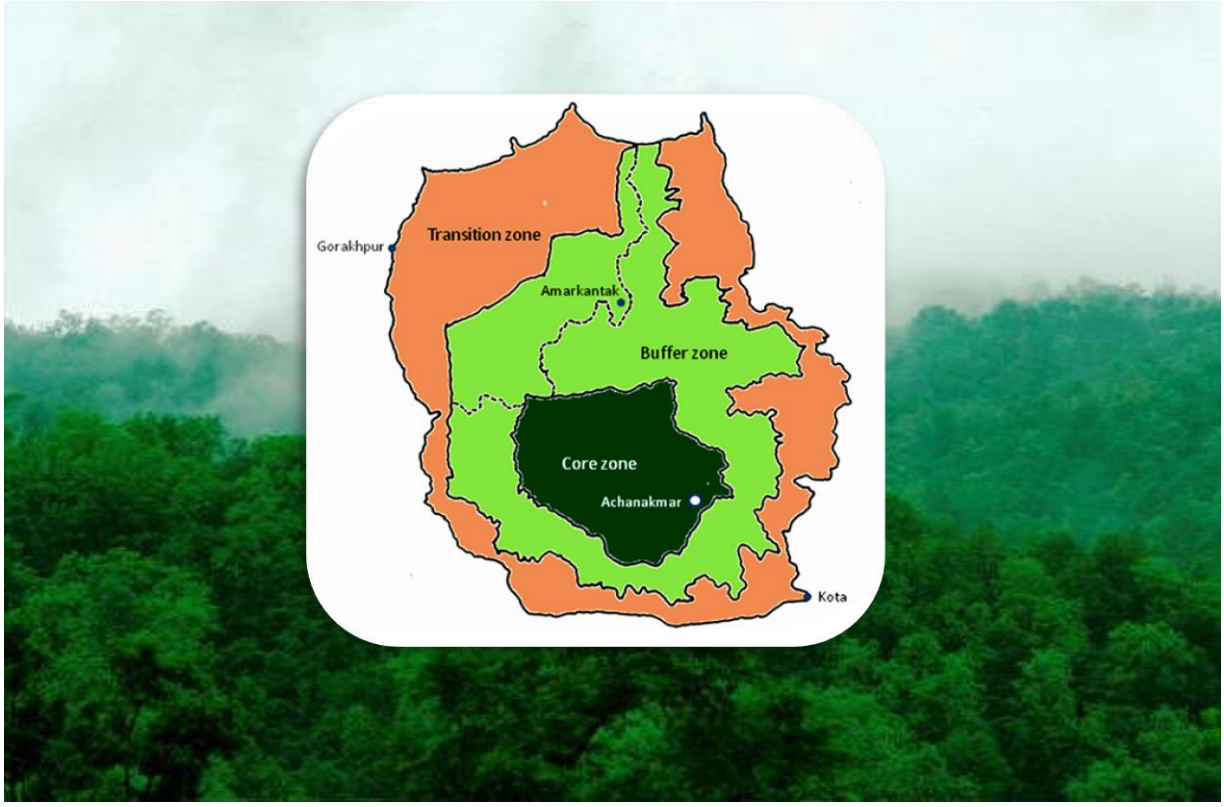
Abstract
The article presents a list of 184 species of plants consisting of 24 species of pteridophytes and 160 species of angiosperms showing the ethnobotanical uses by the tribal of Achanakmar-Amarkantak biosphere reserve.

Introduction
Achanakmar-Amarkantak Biosphere Reserve is the first biosphere reserve of Chhattisgarh State and 14th biosphere reserve of the country, declared by Government of India during the year 2005, vide No. 9/16/99 CS/BR dated 30th March 2005 (Anon, 2007a). It lies between latitude 22^0 15' to 20^0 58' N and longitude 81^0 25'N to 82^0 5'E and is spread from Maikal hill ranges to the junction of Vindhyan and Satpura hill ranges in a triangular shape. Achanakmar-Amarkantak biosphere reserve is the most dramatic, ecologically diverse, least developed and least disturbed area falls under Deccan Peninsula biogeographic zone of tropical dry and moist deciduous forests biome of India and spread over in Chhattisgarh and Madhya Pradesh with topography ranging from high mountains, shallow valleys and plains (UNESCO-MAB, 2012, http://www.unesco.org/mab).
The biosphere reserve supports three major river systems of central Indian region, viz. Narmada, Sone and Johilla and their tributaries. Its boundaries start from Kota and Lormi forest ranges of Bilaspur district in (Chhattisgarh) south to Rajendragram forest range of Anuppur district (Madhya Pradesh) in the north and Belgahana forest range of Chhattisgarh in the east to Dindori forest range of Dindori district in Madhya Pradesh (Fig.1). The total geographical area of biosphere reserve is 38, 35.51 sq. km (Anon, 2007a, b). It consists of three distinct zones, viz. core zone with an area of 551.55 sq. ha. in Chhattisgarh state, buffer zone with an area of 1,95,587.5 sq. ha. in Madhya Pradesh and Chhattisgarh, and outer most transition zone with an area of 132808.5 sq. ha. in both the states. The core zone has 22 villages with a population of 7,709 inhabitants whereas the buffer zone and transition zones have 396 revenue and forest villages in both States with a population of 4, 48, 021 inhabitants as per population census of 2001. It is home to primitive tribal communities like Baiga, Gonds, Panikas, Kol, Dhanaur, besides other communities. In all, 27 communities, mostly tribal, scheduled castes and other backward classes, live in the biosphere reserve (Anon, 2012). Non- wood forest produce collection plays a vital role in the economy of the inhabitants.



Ethnobotanical uses of plant species

Socio-economic studies indicate that indigenous traditional knowledge plays an important role in sustainable development and enhancement of socio-economic status of tribal peoples of Achanakmar-Amarkantak biosphere reserve. Singh *et al*. (2004) have reported ethnomedicinal and indigenous knowledge of pteridophytes, *Dryopteris cochleata* and *Tectaria coadunate* among the tribal communities of Achanakmar-Amarkantak biosphere reserve. Singh and Dixit (2005) have identified and reported ethnomedicinal vaule of 22 species of pteridophytes in Achanakmar-Amarkantak biosphere reserve. Singh et al. (2005) have reported ethnomedicinal usage of eight pteridophytes by the local tribes of Achanakmar-Amarkantak biosphere reserve. Tiwari and Bharat (2008) have studied 33 natural dye-yielding plants and indigenous knowledge of dye preparation in Achanakmar-Amarkantak biosphere reserve. Bondya et al. (2009) have collected information on exploitation of 47 ethno-medicinal plants and their marketing status in Achanakmar-Amarkantak biosphere reserve. Bhat and Tiwari (2011) have collected indigenous knowledge of six communities of Achanakmar-Amarkantak biosphere reserve on utilization, conservation and sustainability of 36 species of NTFP. Singh et al. (2011) have documented utilization of 26 tree species by local inhabitants of Achanakmar-Amarkantak biosphere reserve. Sahu (2011) has reported 20 plants species used by Gond

and Baiga women in ethnogynaecological disorder in Achanakmar-Amarkantak biosphere reserve. Kapale (2012) has documented 55 forest plant species with their different uses Baiga tribes in Achanakmar-Amarkantak biosphere reserve. Malviya et al. (2012) has studied antibacterial activity of five ethnomedicinal plants of Achanakmar-Amarkantak biosphere reserve. Shukla et al. (2012) have reported applications and uses of 10 threatened medicinal plants of Achanakmar-Amarkantak biosphere reserve. Based on the above information, a long list of 184 species of plants consisting of 24 species of pteridophytes and 160 species of angiosperms showing the ethnobotanical and ethnomedicinal uses are presented in table 1.

Table 1. Ethnobotanical uses of pteridophytic and angiospermic plant species reported from Achanakmar-Amarkantak biosphere reserve.

Sl. No.	Name of Species	Local Name	Family	Useful part	Uses	Reference
Pteridophyte						
1	*Adiantum capillus-veneris* L.	Hansraj	Adiantaceae	Whole plant	Medicine	Bondya *et al.* (2009)
2	*Adiantum philippense* (L)	Kalijhant	Adiantaceae	Root and Leaf	Medicine	Kapale (2012)
3	*Dryopteris cochleata* (D. Don) C. Chr.	Bhanki	Aspidiaceae	Rhizome	Medicine	Singh *et al.* (2004, 2005), Bondya *et al.* (2009)
4	*Dryopteris* sp.	Jatasankari	Aspidiaceae	Root and leaf	Medicine	Kapale (2012)
5	*Tectaria coadunata* (Wall. ex Hook. et Grev.) C. Chr.	Jata Shankri	Aspidiaceae	Rhizome, stem and stripe	Medicine	Singh *et al.* (2004, 2005), Bondya *et al.* (2009), Kapale (2012)
6	*Bechnum orientale* L.	Hastajori	Blechnaceae	Leaves	Medicine	Singh *et al.* (2005)
7	*Alsophila balakrishnanii* (Dixit et Tripathi) R.D. Dixit	Jatamanshi	Cyatheaceae	Roots	Medicine	Singh *et al* (2005), Bondya *et al.* (2009)
8	*Nephrolepis exaltata* (L.)Schott.	Fish bone fern	Davalliaceae	Rhizome	Medicine	Singh *et al* (2004, 2005)
9	*Nephrolepis cordifolia* (L.)C.Presl.	Nechii	Davalliaceae	Rhizome	Medicine	Singh *et al.* (2004, 2005)
10	*Dryopteris cochleata* (D.Don) C.Chr.	Jatashankari	Dryopterida-ceae	Rhizome, stem and stripe	Medicine	Singh *et al.* (2004), Singh *et al* (2005)
11	*Equisetum ramossissimum* Desf. Ssp. *debile* (Roxb. Ex Vauch) Hauch	Hadjod	Equisetaceae	Rhizome	Medicine	Singh *et al.* (2004) Singh *et al* (2005), Singh and Dixit (2005)
12	*Lygodium flexuosum* (L.) Sw.	Indrajau Kalijar	Lygodiaceae	Roots Leaf and Stem	Medicine	Bondya *et al.* (2009), Singh *et al.* (2005), Kapale

						(2012)
13	*Marsilea spp.*	Pan bhajee	Marsileaceae	Leaves	Vegetable	Kapale, 2012
14	*Ophioglossum reticulatum* L.	Van palak	Ophiglossa-ceae	Fresh leaves	Medicine	Singh *et al.* (2005)
15	*Pleopeltis macrocarpa* (Bory ex Willd.) Kaulf	-	Polypodiaceae	Whole plant	Medicine	Singh *et al.* (2004)
16	*Actinopteris radiate*(Sw.)Link	Mayurshikha	Pteridaceae	Leaves paste	Medicine	Singh *et al.* (2004)
17	*Cheilanthes albomarginata* C.B. Clarke	Glade fern	Pteridaceae	fronds	Medicine	Singh *et al.* (2004)
18	*Cheilanthes farinosa* (Forsk.) Kaulf.	Silver fern, Nanha	Pteridaceae	fronds	Medicine	Singh *et al.* (2004, 2005)
19	*Cheilanthes tenuifolia* (Burm.) Sw.	Dodhari	Pteridaceae	Rhizome	Medicine	Singh *et al.* (2005)
20	*Marselia minuta* L.	Caupatiya	Salviniaceae	Whole plant	Medicine	Singh *et al.* (2004)
21	*Selaginella bryopteris* (L.) Baker	Sanjivini	Selaginella-ceae	Leaf	Medicine	Singh *et al.* (2004) Singh and Dixit (2005), Singh *et al.* (2005), Kapale (2012)
22	*Selaginella ciliaris* (Retz.) Spring	Chhoti Sanjivan	Selaginella-ceae	Whole plant	Medicine	Singh *et al.* (2004), Singh and Dixit (2005)
23	*Selaginella repanda* (Desv. Ex Poir.) Spring	Sanjivini	Selaginella-ceae	Fronds	Medicine	Singh *et al.* (2004), Singh and Dixit (2005)
24	*Christella dentata* (Forssk.) Browsey & Jerry	Rakat bilar	Thelypterida-ceae	Roots	Medicine	Bondya *et al.* (2009)
Angiosperm						
25	*Ablemoschus moschatus* Medic	Kasturi Bhindi	Malvaceae	Seeds	Medicine	Bondya *et al.* (2009)
26	*Abroma angusta* Linn.	Ulatkambal	Sterculiaceae	Whole plant	Medicine	Kapale (2012)
27	*Abrus precatorius* Linn.	Gumchi	Fabaceae	Leaves	Medicine	Bondya *et al.* (2009)
28	*Abutilon indicum* (Linn.) Sweet	Kanghi	Malvaceae	Whole plant	Medicine	Kapale (2012)
29	*Acacia arabica* (Lamk.) Willd.	Babool	Mimosaceae	Leave Fruit Bark	Medicine	Bhat and Tiwari (2011)
30	*Acacia catechu* (Linn. f.) Willd.	Khair	Mimosaceae	Bark	Dye	Tiwari and Bharat (2008)
31	*Acacia leucocephloea* (Roxb.) Willd.	Safed kikar	Mimosaceae	Bark and Leaves	Dye	Tiwari and Bharat (2008)
32	*Acacia nilotica* (L.) Benth ex Brenan	Babul	Mimosaceae	Leaves, Fruits and Bark	Medicine	Bhat and Tiwari (2011)
33	*Acacia nilotica* (Linn.) Willd. ex Delile	Babool	Mimosaceae	Seeds	Dye	Tiwari and Bharat (2008)

34	*Achyranthus aspera* L.	Chirchitta	Amaranthaceae	Roots	Medicine	Sahu (2011)
35	*Acorus calamus* L.	Bach	Araceae	Rhizome	Medicine	Bondya *et al.* (2009)
36	*Adhatoda vasica*	Adusa	Acanthaceae	Seed and Fruit	Medicine	Kapale (2012)
37	*Aegle marmelos* (L.) Correa.	Bel	Rutaceae	Fruits	Food and medicine	Singh *et al.* (2011), Bhat and Tiwari (2011)
38	*Allium wallichii*	Van lahsun	Amaryllideceae	Whole plant	Medicine	Kapale (2012)
39	*Aloe vera* L.	Gwarpatha	Liliaceae	Leaves	Medicine	Sahu (2011)
40	*Alstonia scholaris* (L.)	Saptparni	Apocynaceae	Stem bark	Medicine	Sahu (2011)
41	*Amaranthus hybridus* L.	Lal bhajee	Amaranthaceae	Leaves	Vegetable	Kapale (2012)
42	*Amaranthus paniculatus* L.	Van Choulai	Amaranthaceae	Leaves	Vegetable	Kapale (2012)
43	*Amaranthus spinosus* L.	Katbhajee	Amaranthaceae	Leaves	Vegetable	Kapale (2012)
44	*Amaranthus viridis* L.	Purpuri bhajee	Amaranthaceae	Leaves and seeds	Vegetable	Kapale (2012)
45	*Amorphophallus campanulatus* Nicolson	Suran	Araceae	Corm	Food	Kapale (2012)
46	*Andrographis paniculata* Nees	Kalmegh	Acanthaceae	Whole plant	Medicine	Bondya *et al.* (2009), Kapale (2012)
47	*Anogeissus latifolia* (Roxb. ex DC.) Wallich ex Guill. & Perr.	Dhawra	Combretaceae	Roots and Bark	Medicine	Singh *et al.* (2011)
48	*Annona squamosa* (L.)	Sitaphal	Annonaceae	Leaves	Medicine	Sahu (2011)
49	*Argyreia nervosa* (Burm.f.)Boj.	Vidhara	Convolvulaceae	Leaf	Medicine	Kapale (2012)
50	*Ariseama* spp.	Van suran	Araceae	Tuber	Vegetable	Kapale (2012)
51	*Ariseama tortuosum* Schott	Van makka	Araceae	Fruit	Medicine	Kapale (2012)
52	*Artocarpus heterophyllus* Lam.	Kathal	Moraceae	Wood	Dye	Tiwari and Bharat (2008)
53	*Artocarpus lakoocha* Roxb.	Barhal	Moraceae	Wood	Dye	Tiwari and Bharat (2008)
54	*Asparagus racemosus* Willd.	Satavar	Liliaceae	Roots	Medicine	Bondya *et al.* (2009), Sahu (2011)
55	*Bambusa arundinacea* (Willd.)	Kareel	Poaceae	Young shoot	Vegetable	Kapale (2012)
56	*Bambusa vulgaris* Schard. ex-J.C. Wendl.	Bans	Poaceae	Stem	Foods and Medicine	Singh *et al.* (2011)
57	*Barleria prionitis* Linn.	Katsariya	Acanthaceae	Leaves and roots	Medicine	Kapale (2012)
58	*Bauhinia malabarica* Roxb.	Amti	Caesalpiniaceae	Bark and Leaves	Food	Singh *et al.* (2011)
59	*Bauhinia purpurea*	Koliari	Caesalpiniaceae	Young	Vegetable	Kapale (2012)

	L.	Bhajee		leaves		
60	*Bauhinia vahlii* Wight. and Arnott.	Mahul	Caesalpiniaceae	Stem bark and leaves	Medicine and Leaves used for making a Cup and plate	Singh *et al.* (2011)
61	*Bauhinia variegata* Linn.	Kachnaar	Caesalpiniaceae	Bark	Medicine	Bhat and Tiwari (2011)
62	*Berberis aristata* DC.	Daru haldi	Berberidaceae	Root and tubers	Dye	Tiwari and Bharat (2008)
63	*Bixa orellana* Linn.	Sinduri	Bixaceae	Seeds	Dye	Tiwari and Bharat (2008)
64	*Boerhaavia diffusa* L.	Patherchatta	Nyctaginaceae	Roots	Medicine	Sahu (2011)
65	*Bridelia retusa* (L.) Spreng.	Kasai	Euphorbiaceae	Fruits	Food	Singh *et al.* (2011)
66	*Bryonia alba.*	Shivlingi	Cucurbitaceae	Leaf	Medicine	Kapale (2012)
67	*Bryonopsis laciniosa* (L.)	Shivlingi	Cucurbitaceae	Seeds	Medicine	Bondya *et al.* (2009)
68	*Buchanania lanzan* Spreng.	Chironji, Char	Anacardiaceae	Fruits and Seed	Medicine and food	Bhat and Tiwari (2011), Singh *et al.* (2011)
69	*Butea monosperma* (Lam.) Kuntze	Palash	Fabaceae	Flowers, Barks	Dye and medicine	Tiwari and Bharat (2008), Bhat and Tiwari (2011), Sahu (2011)
70	*Butea superba* Roxb.	Palash lata	Fabaceae	Root tubers	Dye	Tiwari and Bharat (2008)
71	*Caesalpinia bonduc* (L.) Roxb.	Gataran	Caesalpiniaceae	Seeds	Medicine	Bondya *et al.* (2009)
72	*Cajanus scarabaeoides* (L.) du Petit Theu.	Ban Kurthi	Fabaceae	Seeds	Medicine	Bondya *et al.* (2009)
73	*Careya arborea* Roxb.	Kumbhi	Lecythidaceae	Flowers	Medicine	Bhat and Tiwari (2011)
74	*Casearia graveolens* Dalzell	Chilhi	Flacourtiaceae	Fruits	Beads, fish poison	Singh *et al.* (2011)
75	*Cassia alata*	Higlaj	Caesalpiniaceae	Bark	Medicine	Kapale (2012)
76	*Cassia fistula* Linn.	Amaltas	Caesalpiniaceae	Flowers, Leaves	Medicine	Bhat and Tiwari (2011), Sahu (2011)
77	*Cassia tora* L.	Charota bhaji	Caesalpiniaceae	Leaves	Vegetable and medicine	Kapale (2012), Sahu (2011)
78	*Celastrus paniculatus* Willd.	Kujri	Celastraceae	Seeds	Medicine	Bondya *et al.* (2009)
79	*Celosia argentea* Linn.	Phul bhajee	Amaranthaceae	Leaves	Vegetable	Kapale (2012)
80	*Centella asiatica* (Linn.)Urban syn. *Hydrocotyle asiatica* Linn.	Brahmi	Apiaceace	Leaf	Medicine	Kapale (2012), Bondya *et al.* (2009), Kapale (2012)
81	*Centratherum anthelminticum*	Vanjira	Asteraceae	Whole plants	Medicine	Kapale (2012)

82	*Chloroxylon swietenia* DC	Buruta	Rutaceae	Leaves	Medicine	Bhat and Tiwari (2011)
83	*Citrus aurantium* Linn.	Khatta nibu	Rutaceae	Fruits	Medicine	Bhat and Tiwari (2011)
84	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	Karra	Euphorbiaceae	Bark, Leaves, Roots and Fruits	Fish poison and medicine	Singh *et al.* (2011), Bhat and Tiwari (2011)
85	*Coccinia grandis* L.	Kundru	Cucurbitaceae	Fruits	Vegetable	Kapale (2012)
86	*Cocculus hirsutus* L. Diels	Jaljamni	Menispermaceae	Leaves	Medicine	Sahu (2011)
87	*Colocasia esculantum* L.	Boda kand	Araceae	Tuber	Vegetable	Kapale (2012)
88	*Coriandrum sativum* Linn.	Dhania	Umbelliferae	Leaves	Medicine	Bhat and Tiwari (2011)
89	*Costus speciosus* Linn.	Kevkand	Costaceae	Tuber	Vegetable	Kapale (2012)
90	*Crinum asiaticum* Linn.	Sudarshan	Amaryllidaceae	Whole plants	Medicine	Kapale (2012)
91	*Curculigo orchioides* Gaertn.	Kali musli	Hypoxidaceae	Tuberous root	Medicine	Bondya *et al.* (2009), Sahu (2011), Singh *et al.* (2011)
92	*Curcuma angustifolia* Roxb.	Tikhur	Zingiberaceae	Tubers	Dye and food	Tiwari and Bharat (2008), Singh *et al.* (2011)
93	*Curcuma aromatica* Salisb.	Ban haldi	Zingiberaceae	Tubers	Dye	Tiwari and Bharat (2008)
94	*Curcuma longa* Linn.	Haldi	Zingiberaceae	Tubers	Dye	Tiwari and Bharat (2008)
95	*Cuscuta reflexa* Ro xb.	Amarbel	Convolvulaceae	Seeds	Medicine	Sahu (2011)
96	*Cyperus rotundus* L.	Motha	Cyperaceae	Tuberous roots	Medicine	Bondya *et al.* (2009)
97	*Dalbergia sissoo* Roxb.	Sisham	Fabaceae	Bark	Medicine	Bhat and Tiwari (2011)
98	*Datura metel* Linn.	Kala Datura	Solanaceae	Roots	Medicine	Sahu (2011)
99	*Datura stramonium* Linn.	Dhatura	Solanaceae	Fruits	Medicine	Bhat and Tiwari (2011)
100	*Dendrocalamus strictus* Roxb.	Lathi bans	Poaceae	Whole plant	Medicine	Bhat and Tiwari (2011)
101	*Desmodium gangeticum* (L.) DC.	Saptaparni	Fabaceae	Roots	Medicine	Bondya *et al.* (2009)
102	*Dioscorea bulbifera* L.	Ganthiana	Dioscoreaceae	Tubers	Medicine	Bondya *et al.* (2009)
103	*Dioscorea globosa* Roxb.	Suari kand	Dioscoreaceae	Tuber	Vegetable	Kapale (2012)
104	*Dioscorea hispida*	Baichandi	Dioscoreaceae	Tuber	Vegetable	Kapale (2012)
105	*Diospyros melanoxylon* Roxb.	Tendu	Ebenaceae	Fruits and leaves	Food and Medicine	Singh *et al.* (2011), Bhat and Tiwari (2011)
106	*Dolichos biflorum* Linn.	Kulthi	Leguminosae	Seeds	Medicine	Sahu (2011)
107	*Dolichos* spp.	Jangali sem	Fabaceae	Fruits	Vegetable	Kapale (2012)
108	*Eclipta prostrata*	Gotari	Asteraceae	Whole	Medicine	Bondya *et al.*

	(L.)			plant		(2009)
109	*Elephantopus scaber* L.	Minjur jhuti	Asteraceae	Roots	Medicine	Bondya *et al.* (2009)
110	*Emblica officinalis* Gaertn. syn *Phyllanthus emblica* Linn.	Aonla	Euphorbiaceae	Fruit	Dye	Tiwari and Bharat (2008)
111	*Eulophia nuda*	Villai kand	Orchidaceae	Roots	Medicine	Kapale (2012)
112	*Euphorbia hirta* L.	Dudhi	Euphorbiaceae	Leaves	Medicine	Sahu (2011)
113	*Ficus bengalensis* L.	Bargad	Moraceae	Fruits, Leaves, bark	Medicine	Bhat and Tiwari (2011)
114	*Ficus carica* L.	Anjir	Moraceae	Fruits	Medicine	Sahu (2011)
115	*Ficus glomerata* Roxb.	Dumar	Moraceae	Fruit	Food and fruits	Singh *et al.* (2011), Kapale (2012)
116	*Ficus* spp.	Pakri	Moraceae	Young leaves	Vegetable	Kapale (2012)
117	*Gloriosa superba* L.	Kalihari	Liliaceae	Tubers	Medicine	Bondya *et al.* (2009)
118	*Gossypium arboreum* L.	Kapas	Malvaceae	Root bark	Medicine	Sahu (2011)
119	*Gymnema sylvestre* (Retz.) R. Br. ex Retz.	Gurmar	Asclepiadaceae	Leaf and Stem	Medicine	Kapale (2012)
120	*Hedychium coronarium* J.Koeing ex Retz.	Gulbakawli	Zingiberaceae	Flowers	Medicine	Bondya *et al.* (2009), Kapale (2012)
121	*Helicteres isora* L.	Maror phali	Sterculiaceae	Fruits	Medicine	Bondya *et al.* (2009)
122	*Heliotropium ovalifolium*	Jangali mooli	Boraginaceae	Leaves	Vegetable	Kapale (2012)
123	*Hemidesmus indicus* (L.) R. Br.	Anantmool	Asclepiadaceae	Roots	Medicine	Bondya *et al.* (2009), Sahu (2011)
124	*Holarrhena pubescens* (Buch-Ham) ex G. Don.	-	Apocynaceae	Seeds	Medicine	Bondya *et al.* (2009)
125	*Indigofera cassioides* Rottl. ex DC.	Neel	Fabaceae	Leaves and flowers	Dye	Tiwari and Bharat (2008)
126	*Indigofera tinctoria* Linn.	Neel	Fabaceae	Leaves and flowers	Dye	Tiwari and Bharat (2008)
127	*Kydia calycina* Roxb.	Barga	Bombacaceae	Leafs	Medicinal	Singh *et al.* (2011)
128	*Lagerstroemia parviflora* Roxb.	Senha	Lythraceae	Tender leaves Bark and Leaves are used in tanning.	Vegetable	Singh *et al.* (2011)
129	*Lannea coromandelica* (Houtt.) Merr.	Gunja	Anacardiaceae	Resin	Gum	Singh *et al.* (2011)
130	*Lawsonia inermis* Linn.	Mehndi	Lythraceae	Leaves	Dye	Tiwari and Bharat (2008)

131	*Litsea glutinosa* (Lour.) C.R. Robins.	Maida	Lauraceae	Bark	Medicine	Bhat and Tiwari (2011)
132	*Madhuca indica* J.f.Gmel	Mahua	Sapotaceae	Flower and Fruits	Vegetable and medicine	Kapale (2012), Bhat and Tiwari (2011)
133	*Madhuca longifolia* (J. Koenig) Macbrm var. latifolia (Roxb.) Chevalier	Mahua	Sapotaceae	Flower and Seeds	Oil and beverage	Singh *et al.* (2011)
134	*Mallotus philippensis* (Lam.) Muell. Arg.	Rori	Euphorbiaceae	Fruit and capsules	Dye and medicine	Tiwari and Bharat (2008), Singh *et al.* (2011)
135	*Mangifera indica* L.	Mango	Anacardiaceae	Fruits	Food	Singh *et al.* (2011)
136	*Melia azadirachta* Linn.	Bakain	Meliaceae	Bark, Fruits	Medicine	Bhat and Tiwari (2011)
137	*Michelia champaca* Linn.	Champa	Magnoliaceae	Wood	Dye	Tiwari and Bharat (2008)
138	*Miliusa tomentosa* (Roxb.) Finet & Gagnep.	Kari	Annonaceae	Gum and Bark	Medicine	Singh *et al.* (2011)
139	*Mimusops elengi* Linn.	Maulshri	Sapotaceae	Seed	Dye	Tiwari and Bharat (2008)
140	*Moringa oleifera* L.	Munga	Moringaceae	Flower, Fruit and Leaves	Vegetable	Kapale (2012)
141	*Moringa oleifera* Lan	Munga	Moringaceae	Fruits, Leaves	Medicine	Bhat and Tiwari (2011)
142	*Mucuna prurita* Hook.	Kewanch	Fabaceae	Seeds	Medicine	Bondya *et al.* (2009)
143	*Murraya paniculata* (L.) Jack.	Hatil	Rutaceae	Leaves	Medicine	Bondya *et al.* (2009)
144	*Myrica esculenta* Buch.-Ham. ex D.Don	Kay phal	Myricaceae	Bark	Dye	Tiwari and Bharat (2008)
145	*Oroxylum indicum* (L.) Vent.	Sanparan	Bignoniaceae	Seeds	Medicine	Bondya *et al.* (2009)
146	*Ougeinia oojeinensis* (Roxb.) Hochr.	Tinsa	Fabaceae	Bark and gum	Fish poison and Medicine	Singh *et al.* (2011)
147	*Peucedanum nagpurense* (Clarke) Prain	Tejraj	Apiaceae	Roots	Medicine	Bondya *et al.* (2009)
148	*Phyllathus emblica* Linn.	Amla	Euphorbiaceae	Bark, leaves and Fruits	Medicine	Bhat and Tiwari (2011), Singh *et al.* (2011)
149	*Pisidium guajava* L.	Bihi	Myrtaceae	Leaves	Medicine	Bhat and Tiwari (2011)
150	*Plumbago zeylanica* L.	Chitrak	Plumbaginaceae	Roots and leaves	Medicine	Bondya *et al.* (2009), Kapale (2012)
151	*Pterocarpus marsupium* Roxb.	Beejasal	Fabaceae	Bark, Pods,	Dye and medicine	Tiwari and Bharat (2008), Singh *et al.*

				Flower		(2011), Bhat and Tiwari (2011)
152	*Pueraria tuberosa* DC.	Patal kumhda	Fabaceae	Leaf and tubers	Medicine	Kapale (2012), Bondya *et al.* (2009)
153	*Punica granatum* Linn.	Anar	Punicaceae	Rind and Flower	Dye	Tiwari and Bharat (2008)
154	*Ricinus communis* Linn.	Arandi	Euphorbiaceae	Leaves, Fruits	Medicine	Bhat and Tiwari (2011)
155	*Rubia cordifolia* Linn. syn. *Rubia manjith* Roxb. ex Fleming	Pili, Manjistha, Maddar	Rubiaceae	Whole plant and roots	Medicine and dye	Kapale (2012), Bondya *et al.* (2009), Tiwari and Bharat (2008)
156	*Sapindus laurifoliatus* Linn.	Reetha	Sapindaceae	Leaves, Bark	Medicine	Bhat and Tiwari (2011)
157	*Schleichera oleosa* (Lour.) Oken.	Kusum	Sapindaceae	Leaf, fruits and seeds	Food and medicine	Singh *et al.* (2011), Bhat and Tiwari (2011)
158	*Schrebera swietenioides* Roxb.	Eksirafal	Oleaceae	Fruits	Medicine	Bondya *et al.* (2009)
159	*Semecarpus anacardium* L.f.	Bhilwa	Anacardiaceae	Resin and fruits	Medicine and dye	Singh *et al.* (2011), Tiwari and Bharat (2008), Bondya *et al* (2009), Bhat and Tiwari (2011)
160	*Shorea robusta* Gaertn.	Sal, Sarai	Dipterocarpaceae	Seeds, Shoots and Resin	Medicine, Fish poison	Bhat and Tiwari (2011), Singh *et al.* (2011)
161	*Smilax zeylanica* L.	Ram	Smilacaccae	Roots	Medicine	Bondya *et al.* (2009)
162	*Smithia conferta* Sm.	Fahu	Fabaceae	Leaves	Medicine	Bondya *et al.* (2009)
163	*Spilanthus paniculata* Wall. ex DC.	Akarkara	Asteraceae	Leaf	Medicine	Kapale (2012)
164	*Strychnos nux-vomica* L.	Kulcha	Loganiaceae	Seeds	Medicine	Bondya *et al.* (2009)
165	*Syzygium cuminii* (L.) Skeels	Jamun	Myrtaceae	Leaves, seeds, fruits and seeds	Food, medicine and dye	Singh *et al.* (2011), Tiwari and Bharat (2008), Bhat and Tiwari (2011)
166	*Tamarindus indica* Linn.	Imli	Caesalpiniaceae	Fruits	Medicine	Bhat and Tiwari (2011)
167	*Terminalia alata* Heyne ex Roth	Saja	Combretaceae	Bark and gum	Dye and Medicine	Tiwari and Bharat (2008), Singh *et al.* (2011)
168	*Terminalia arjuna* (Roxb.) Wight & Arn.	Arjuna, Kahua	Combretaceae	Bark	Dye and medicine	Tiwari and Bharat (2008), Bhat and Tiwari (2011)
169	*Terminalia bellirica* Roxb.	Behera	Combretaceae	Fruits	Medicine and dye	Singh *et al.* (2011), Tiwari and Bharat (2008), Bondya *et al.* (2009)
170	*Terminalia chebula* Retz.	Harra, Harad	Combretaceae	Fruits	Dye and medicine	Tiwari and Bharat (2008), Singh *et al.*(2011), Bhat and

						Tiwari (2011), Bondya *et al*. (2009)
171	*Thespesia lampas* (Cav.) Dalz. & Gibs.	Ban kapas	Malvaceae	Seeds	Medicine	Bondya *et al*. (2009)
172	*Uraria lagopodioides* (L.) Desv.	Iswarjata	Fabaceae	Roots	Medicine	Bondya *et al*. (2009)
173	*Urginea indica*	Van piyag	Liliaceae	Whole plant	Medicine	Kapale (2012)
174	*Vanda tessellata* (Roxb.) Hook. ex G. Don	Rasna	Orchidaceae	Whole plants	Medicine	Bondya *et al*. (2009)
175	*Ventilago denticulata* Willd.	Keonti	Rhamnaceae	Bark and roots	Dye	Tiwari and Bharat (2008)
176	*Vitex negundo* (Linn.)	Nirgundi	Verbenaceae	Roots	Medicine	Sahu (2011)
177	*Woodfordia fruticosa* (L.) Kurz.	Fulchuhi, Dhawai	Lythraceae	Flower and Leaves	Medicine	Bondya *et al*. (2009), Bhat and Tiwari (2011)
178	*Woodfordia fruticosa* (Linn.) Kurz.	Dhawai	Lythraceae	Flowers	Dye	Tiwari and Bharat (2008)
179	*Wrightia tinctoria* R.Br.	Indrajau	Apocynaceae	Seeds	Dye	Tiwari and Bharat (2008)
180	*Zanthoxylum alatum* Roxb.	Van dhania	Apiaceae	Leaf	Medicine	Kapale (2012)
181	*Zingiber roseum* (Roxb.) Rose.	Jangli adrak	Zingiberaceae	Rhizome	Medicine	Bondya *et al*. (2009)
182	*Zingiber zerumbet* (L.)	Van adrak	Zingiberaceae	Root	Medicine	Kapale (2012)
183	*Ziziphus mauritiana* lam.	Ber	Rhamnaceae	Leaves and bark	Dye	Tiwari and Bharat (2008)
184	*Zizyphus numularia* (Burm. f.) Wt. & Arn. Prodr.	Ber	Rhamnaceae	Bark	Medicine	Bhat and Tiwari (2011)

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Ethnomedicinal uses of family Sterculiaceae in Uttar Pradesh

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Abstract
In this paper highlights a brief description of Family Sterculiaceae is provided along with its ethnomedicinal uses. In the present paper 2 angiospermic plant species belonging to Sterculiaceae family and 2 genera have been enumerated from Uttar Pradesh with focus on their ethnomedicinal uses.

Keywords: Ethnomedicinal uses, Medicinal Plants, Sterculiaceae, Uttar Pradesh

Introduction

During my survey work on the medicinal plants of Uttar Pradesh, the author came across many populations of Sterculiaceae family members in Meerut, Bulandshahr, Hapur, Ghaziabad, Gautam Buddha Nagar Muzaffarnagar, Shamli, Baghpat, Bijnor, Saharanpur, Jyotiba Phule Nagar, Moradabad, Rampur, Bareilly, Shahjahanpur, Sitapur, Lucknow, Agra, Mathura, Kanpur District.

Uttar Pradesh lies between 23°52' and 29°45' North Latitutdes to 77°04'and 84°38 East Longitudes. The state covers a surface area of 240,928sq km and ranks fifth in terms of area in Country. Uttar Pradesh is divided into two geographical regions, which are Southern hills and Plateau and Ganga Plain. In shape is roughly rectangular. In Uttar Pradesh region temperature is recorded 45°C-21°C in summer while 32°C -4°C in winter. In this region, soil mostly loamy and in some area it is sandy loam, silty loam and clay loam occasionally meet within the area. The rainfall varies considerably from year to year. The maximum rainfall recorded during the monsoon in the month of July-September. Climatically the year may be divided into four seasons. The cold season from near the end of November to the beginning of March is followed by hot season, which continues till about the end of June, when the south-west monsoon arrives, the monsoon season lasting till September end. The air is dry for the most part of the year. In April and May, these are usually the driest months.

These species have been identified as members of Sterculiaceae family. The plants occur common and well known as a local small tree. These are found frequently in this area as a tree. Small trees are commonly found in cultivated field area and in natural form as wild in area of Uttar Pradesh. In this present study a brief description of species of Family Sterculiaceae is provided along with its ethno medicinal uses.

Study area

Uttar Pradesh lies between 23°52' and 29°45' North Latitutdes to 77°04'and 84°38 East Longitudes. The state covers a surface area of 240,928sq km and ranks fifth in terms of area in Country. Survey area comprises Meerut, Bulandshahr, Hapur, Ghaziabad, Gautam Buddha Nagar Muzaffarnagar, Shamli, Baghpat, Bijnor, Saharanpur, Jyotiba Phule Nagar, Moradabad, Rampur, Bareilly, Shahjahanpur, Sitapur, Lucknow, Allahabad, Agra, Mathura, Kanpur Dehat,

Kanpur Nagar, Kannauj and Jhansi District.

Materials and methods

The present paper is based on the survey and collection of the data from the native informants, who are Vaidhya or Hakim (Ayurvedic medicine practitioners) and rural people who have knowledge about Ayurvedic medicine with their local name. Oral interviews were held in villages and information recorded at the spot.

Medicinal plants were collected and preserved for the future use. The plants were pressed in old newspapers and blotting sheets for dehydration in strong ply board. The Species were changed to fresh sheets after an interval of 24 hours to 2-3 days depending on the weather conditions until the specimens were completely dry. The plant species were identified with the help of available floras. Doubtful medicinal plants are confirmed at the herbaria of Forest Research Institute (F.R.I.) and Botanical Survey of India (B.S.I.) Dehradun.

Perusal of literatures on medicinal plants, (Singh 1993; Tomar and Singh 2005; Tomar and Singh 2006; Tomar 2007; Tomar 2008 ; Prachi *et al.* 2009 ; Singh *et al.* 2009 ; Tomar 2009 ; Jain and Suryavanshi 2010 ; Tomar 2011; Tomar 2015; Tomar 2016 and Pedroza *et al.* 2016. In this present study a brief description of species is provided along with its medicinal use.

Enumeration

1. ***Abroma augusta* Linn. F.**

Description of Plant

A small tree. Leaves repand-denticulate. Flowers 5 cm. across, axillary. Capsules thrice as long as persistent calyx, glabrous.

Distribution

Tree is cultivated throughout India.

Ethnomedicinal uses

A decoction of *Abroma augusta* is used as an uterine tonic. It is claimed by local people of Bijnore, Bareilly, Meerut, Baghpat and Muzaffarnagar district.

Abroma augusta Linn. F.

2. ***Helicteres isora* Linn.**

Description of plant

A small tree. Leaves bifarious, palmately nerved, obovate, rough, and irregularly serrate. Flowers red turning to lead colour. Seeds tubercled.

Helicteres isora Linn.

Distribution

Tree occurs throughout India.

Ethnomedicinal uses

A decoction of *Helicteres isora* is used in diarrhea. It is claimed by local people of Meerut, Bulandsahar, Baghpat, Muzaffarnagar, Saharanpur district.

Acknowledgement

Author is thankful to his respected teachers Prof. (Dr.) Y. Vimala,

Department of Botany, C. C. S. University, Meerut and Late Dr. H. Singh, Department of Botany, Meerut College, Meerut (U.P.) for their sincere guidance.

Conclusion

In the present survey of family Sterculiaceae with their ethnomedicinal uses, these medicinal plants are collected and used to cure in various diseases by the rural and common people of Uttar Pradesh.

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Importance of curative plants in the healing of skin diseases

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Abstract
The obtainable statement is rigorous on the rural wisdom of original remedial medicinal plants curing in skin diseases by idyllic people of study area from Mahabubnagar dist of Telangana, India. A total of 28 species were recorded as usual beneficial plants treating in skin diseases. In the present paper, the importances of the rural curative plants are discussed.

Intrduction
According to WHO, 80% people of the world dependent on rural medicine for their primary health treatment. People living in the developing countries rely quite effectively on rural medicine for primary health care (Bannerman, 1982; Sullivan and Shealy, 1997, Singh, 2002). The art of herbal treatment has very deep root in Indian culture used the plants not only for curing diseases but also during several ceremonies. Today, there is an increasing desire to unravel the role of ethno-botanical studies in trapping the centuries old rural folk knowledge as well as in searching new plants resources of food, drugs etc (Jai, 1987). India is a repository of medicinal plants. At present about 65% of Indians are dependent on the rural system of medicine (Bhatt et al., 2002). Skin diseases like eczema, leucoerma, ringworm, scabies, and many other conditions are treated completely with herbal drugs. Hundreds of medicinal plant species worldwide are used in the rural medicine as a treatment for skin diseases caused by bacteria, fungi and viruses[6]. In India also there is a huge base of herbal treatment for skin diseases.

Methodology
A number of scenery trips were undertaken in southern villages of head-quarter Of Mahabubnagar districts (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, 1928; Pullaiah and Chennaiah, 1997; Pullaiah and Moulali, 1997; Pullaiah, 2015).

Mahabubnagar is the largest district (Figure 1) in Telangana in terms of area (18432.00 sq. km) covered. It is also known as Palamoor. The name was changed to Mahabubnagar in honour of Mir Mahbub Ali Khan Asaf Jah VI, the Nizam of Hyderabad (1869-1911 AD). The district was situated between 77° 15' and 79° 15'E, of the eastern longitudes and 15° 55' and 17° 20'N, of northern latitudes. Mahabubnagar is southern district of Hyderabad state under Nizam and bordered with River Krishna in the south and surrounded by the Guntur District of AP to the east, Kurnool district of AP to the south, Nalgonda and Ranga Reddy Districts to the north and Gulbarga and

Raichur Districts of the state of Karnataka to the West.

The district has population of 40, 53, 028 as per the 2011 census which accounts for 11.52% of the total population of the State with 15.34% decadal growth. The people of this district are economically backward. They can speak three languages, knowledge flows from one culture to other. The plant assortment is very rich and an excellent quantity of wild fruit plants are using in the nutritional medicinal resources. There is no detail documentation on anti-skin diseased plants from the specific study area. Hence, the present work has been undertaken and a number of important rural medicinal plants, which commonly used in healing in skin diseases, are reported.

Results

A total of 28 species were recorded as beneficial plants treating in skin diseases. (Table 1).

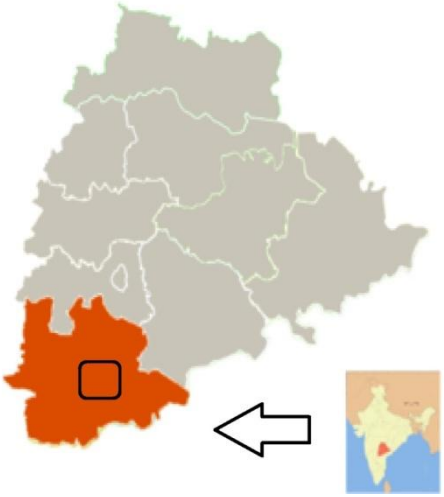

Figure 1: Specific Study area Mahabubnagar District, Telangana State, India.

Table-1: The important ethnic plants list in treating of skin diseases

Botanical name	Family	Habitat	Local name	Part Used
Abutilon indicum	Malvaceae	Climber	Thuthuru benda (Telugu), (Hindi).	Leaf
Acalypha indica	*Euphorbiaceae*	Herb	Maaredu (Telugu), Beel (Hindi).	Fruit
Achyranthes aspera	*Amaranthaceae*	Herb	Uttareni (Telugu), Aapang (Hindi).	Leaves
Adhatoda vasica	*Acanthaceae*	Shrub	Addasaramu (Telugu), Adoosa (Hindi).	Leaves
Annona squamosa	*Annonaceae*	Shrub	Seethaphalamu (Telugu), Seethaphal (Hindi).	Leaves

Argemone mexicana	*Papavaraceae*	Herb	Zeripothu Alamu (Telugu).	Latex
Aristolochia bracteolata	*Aristolochiaceae*	Herb	Eeshhwari (Telugu).	Bulb
Azadirachta indica	*Miliaceae*	Tree	Veepa(Telugu), Neem (Hindi).	Leaves
Barleria prionitis	Acanthaceae	Tree	Velakkaya(Telugu), Kabeet (Hindi).	Fruit
Breynia vitis-idaea	Euphorbiaceae	Climber	Madhu nashini (Telugu), Madhu nashini (Hindi).	Whole plant
Cassia fistula	Fabaceae	Herb	Gandham (Telugu), Chandan (Hindi).	Ripened Leaves
Cassia accidentalis	Fabaceae	Herb	Yaknayk aaku (Telugu).	Leaves
Celosia argentea	Amaranthaceae	Shrub	Gunugu (Telugu), Kaale Jaamun (Hindi).	Leaves
Citrullus colocyanthis	Cucurbitaceae	Climber	Thippa teega (Telugu), Amrutha (Hindi).	Leaf
Clerodendrum inerme	verbenaceae	Herb	Takkulapu chettu (Telugu), choti Aari (Hindi).	Flower
Daucus carota	Apiaceae	Herb	Karet (Telugu), Gajar (Hindi).	Leaves
Dillenia indica	Dilleniaceae	Tree	Kalinga (Telugu), Panchapaal (Hindi).	Flower
Diospyros montana	Ebenaceae	Tree	Kakaulmedu (Telugu), kaladhao (Hindi).	Leaves
Jatropha gossypifolia	Euphorbiaceae	Shrub	Adavi amudamu (Telugu), Arandi (Hindi).	Bark
Lepidogathis cristata	Acanthaceae	Shrub	Mullabanthi (Telugu), Bhukar zadi (Hindi).	Flower
Mucuna pruriens	Fabaceae	Tree	Durada Gondi (Telugu), Kooch (Hindi).	Leaves
Pongamia pinnata	Fabaceae	Tree	Kanugu (Telugu), Kaaranga (Hindi).	Seeds
Santalum	Santalaceae	Tree	Chandanam	Leaves

album			(Telugu), Chandan (Hindi).	
Strycnos nux-vomica	Loganiaceae	Herb	Musti (Telugu), Khajra (Hindi).	Bark
Tamarindus indica	Fabaceae	Tree	Chintha (Telugu), Emli (Hindi).	Leaves
Thevetia nerrifolia	Apocynacae	Shrub	Ganneru (Telugu), (Hindi).	Fruit
Wrightia tinctoria	Apocynaceae	Shrub	Ankudu (Telugu), Kapar (Hindi).	Leaves

Acknowledgement

Authors are thankful to rural, folkloric, ethnic peoples of surrounding villages of Mahabubnagar head quarter of Telangana state for donation their clandestine information.

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DNA from ancient wood

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Ancient DNA (aDNA) is the most important and informative biological component that scientists can find in archaeological areas. Ancient DNA analysis can be used synergetically with other identification methods like morphological and anatomical observations and microscopic analyses. DNA barcoding complements the microscopic techniques used in archaeobotany. In cases where morphological and anatomical characteristics are absent or inconclusive, DNA based genetic analysis can be solely used for identification.

DNA yields from wood samples tend to be lower than from leaf tissue. The extraction of DNA from wood has many obstacles and it becomes even more difficult when the wood sample is part of dead heartwood which contains very minute quantities of DNA. DNA degrades overtime and the success of DNA isolation from dead/decaying tissues may be low. While decaying wood is unlikely to yield suitable DNA, there have been several recent advances in the use of wood for genetic analysis.

Stability of cellular DNA

An alteration in the chemical structure of DNA definitely means loss of genetic information. In a cell, this can be caused by base substitutions during replication, or base changes resulting from inherent chemical instability of the bases/N-glycosidic bond, or due to alterations resulting from the action of other chemicals and environmental agents. These mechanisms are responsible for the occurrence of the following defects:

1. Inability of incorrect base to hydrogen bond with corresponding base in complementary strand (replication error, spontaneous deamination),
2. Missing bases (eg. depurination),
3. Altered bases (eg. thymine dimers),
4. Single strand/Double strand breaks by chemicals (peroxidases, cysteine), ionizing radiations, DNases etc., and
5. Cross linking between complementary bases (caused by antibiotics or reagents).

Essentially, DNA as genetic material has physical and chemical stability, in order that the genetic information carried is not lost, though it also possesses the capability for genetic change. In a cell, there are certainly a large number of chemical compounds that can attack a free base. Yet, complementary nature of double stranded DNA molecule facilitates repair mechanisms in living cells. The nature of the bases and the duplex structure of DNA provide extreme protection against chemical attack. The backbone provides structural stability to DNA molecules. The double-helix structure of DNA is more stable than single strands as its formation causes a net gain in entropy. The stability of DNA in living cells depends on a balance of interactions within the DNA double helix. The 2 main factors responsible for DNA stability are base pairing or hydrogen bonding between

bases of complementary strands, and base-stacking interactions occurring between adjacent bases. Hydrogen bonding with surrounding water molecules also contributes to the structural stability of DNA molecules.

Stability of DNA in dead tissues

In living cells, mutations occurring as a result of a replication error or due to chemical alteration of the base, can change the base sequence of DNA. In dead tissues like wood, intracellular repair mechanisms do not function and it results in altered genetic information being presented by the DNA molecule. The DNA molecules are subjected to post mortem degradation, primarily hydrolysis and oxidation.

External factors also play a role in DNA degradation. For instance, pH variations in the cell or its environment can cause apurination at low pH of about 4. The sugar-phosphate backbone of DNA is extremely stable, and the C-C bonds in the sugar are resistant to chemical attack at all conditions, other than strong acid and very high temperature. Very low pH (1 or less) is known to cause phosphodiester hydrolysis of both DNA and RNA. At high pH of about 13, RNA hydrolyzes to free nucleotides exceedingly rapidly, whereas, the absence of 2'OH in DNA stabilizes it. Hence DNA is comparatively stable than RNA at alkaline pH. However, absence of a base by depurination for instance, facilitates rapid phosphodiester hydrolysis at the 5' end of the deoxyribose in a DNA molecule. Generaly, at room temperature and pH of 8 to 9, there is no detectable hydrolysis of DNA.

Inherent molecules present inside the cell, like nucleases, can also cause damage to the cell's DNA. Nucleases are enzymes that depolymerize nucleic acids, but their activity is controlled in living cells by means of molecular signalling mechanisms. Whereas, in dead tissues like ancient wood samples, these controlling mechanisms are absent and the enzymes are free to degrade the cellular DNA.

Isolating DNA from ancient wood

Many researchers have explored the possibility of isolating DNA from ancient wood samples. DNA has been extracted from samples of modern papyri (writing sheets made with strips from the stem of *Cyperus papyrus*) varying in age from 0-100 years BP and from ancient specimens from Egypt, with an age-span from 1,300-3,200 years BP. The results showed that the DNA half-life in papyri is about 19-24 years. This means that the last DNA fragments will vanish within no more than 532-672 years from the sheets being manufactured.

DNA has been successfully isolated from wood samples of *Dipterocarpaceae* and the main factors influencing the isolation success from processed and unprocessed wood were found to be size of the DNA fragment and processing status of the wood. The possibility of identifying an endangered tropical timber species (*Gonystylus bancanus*) by extraction of whole genomic DNA from processed wood and inner bark samples and using DNA sequencing technology has been explored. Whole genomic DNA was also extracted from herbarium samples of *Shorea* and *Lithocarpus* during the study. Though very challenging, the extraction of DNA from wood samples of *Gonystylus* spp. which were stored either by drying or by soaking in water/ethanol/saline has been shown to be possible using the CTAB method with modifications.

Preservation of samples through waterlogging is thought to be unfavourable for DNA preservation. Logically,

removing moisture from the sample inhibits the enzymes that would breakdown DNA by hydrolysis and prolongs the length of time DNA can be successfully extracted. Alternatively, in some cases, water logging has been shown to preserve the samples. Waterlogged plant remains with a hardy exocarp, can be a good source of ancient DNA. Anoxic conditions in water and the presence of antioxidant molecules can preserve archaeological remains and the DNA contained from degradation. Ancient *Olea europaea* L. and *Crataegus monogyna* Jacq. seeds, a *Pinus* sp. pollen cone, a *Quercus petraea* (Mattuschka) Liebl. Acorn and gymnosperm woody fragments, found in underwater archaeological remains, have clearly been identified by DNA barcoding.

Designing protocol for DNA extraction from ancient wood

Degeneration of DNA begins immediately after death of a plant cell, and the size of DNA fragments which can be amplified is expected to continuously decrease. In specially designed laboratories using contamination-exclusion techniques, DNA fragments of up to 500bp from ancient sources of timber that was up to 3600 years old had been amplified. Technical adjustments of DNA isolation protocols are needed for plant fossil remains, such as post-purification procedures designed to remove PCR inhibitors, which are rich in wood.

Many protocols and commercial kits are available for extraction of DNA from wood; but only some of them prove successful, while others result in poor quality or contaminated DNA which may not be suitable for further analysis. To avoid this, there are some considerations to be followed while extracting DNA from ancient wood. DNA is most commonly extracted from wood samples by using the CTAB method or DNAeasy Mini Plant Kit (QIAGEN) with modifications. CTAB/DTAB methods, silica-based methods and DNA extraction kits were developed taking into account that plant parts are rich in secondary byproducts, sugars and other potential inhibitors of PCR. Modifications, such as the use of PTB (N-phenacyl thiazolium bromide), are suggested in cases where Maillard products are expected.

Several measures relying on the preservation of biomolecules other than nucleic acids have been proposed in order to estimate whether the presence of aDNA is likely in a given fossil sample. Amino acid racemization was introduced in 1996 as an indication of preservation of macromolecules like DNA. The study on DNA decay rate in papyri also established that racemization of aspartic acid and DNA decay are linked, which can be used to quantify DNA damage or deduce the amount of high quality DNA that can be isolated from a sample.

Authenticated DNA extraction from ancient wood remains requires controlled experimentation and measures to prevent contamination. Designing experiments should include blind testing, independent replicates, extensive contamination controls and rigorous statistical tests. A systematic experiment with a blind testing design should be set up in different laboratories which are independent replications. This is one of the strongest criteria of authenticity and the results should be reproducible in different laboratories. Because of the possibility of pre-laboratory contamination, independent lab verification is required.

To prevent contamination, laboratories should be equipped with filter systems for incoming air, overpressure systems, decontamination by UV-light and special protective gear for the experimenters. To avoid contaminating DNA, inner portions of the wood should be used after scraping away the outer layer in a sterile manner. Blank extractions can be performed as a negative control. Wood from known sources can also be used as a positive control for extraction. Also during identification using modern reference specimens, contamination with modern DNA can occur and in principle, archaeological plant remains can contaminate each other, for example in storage assemblages. In plant aDNA research, ensuring the authenticity of the sequences and the exclusion of contaminants is possible by using species-specific primers in cases of morphologically identified plant taxa.

Strict separation of pre- and post-PCR areas, an inverse relationship between amplification success and target length, reproducibility within the same individual, and preferential amplification of plastid DNA over single copy nuclear DNA are several different strategies for establishing authenticity. The results should be subjected to rigorous statistical tests. Sample size is an important factor during standardization of the protocols.

Conclusion

Although ancient DNA studies have been ongoing since the mid-1980s, high-throughput sequencing technologies now allow researchers to investigate ancient genomes more comprehensively than ever before. The success of any DNA extraction protocol depends on the number of steps involved, time required, cost, concentration and purity of DNA obtained, ease and efficiency of DNA purification. Keeping these considerations in mind, the best method for extracting DNA from any wood sample, either processed wood or ancient wood can be developed for large scale investigations. A foolproof protocol designed for ancient DNA isolation should work for all species irrespective of the storage duration and conditions.

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Traditional and eco-friendly mat of Tamil Nadu

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Introduction

Mat weaving is one of the ancient creative of man by joining grass with grass enlacing with leaves. Mats were used for day-by-day various purposes like sleeping mats, worshipping mats, covering the floors, hanging on walls, etc. in rural areas for the time immemorial. It is also ecofriendly in nature which significantly contributes to the sustainable employment and income to the rural communities of all over country.One such unique fine quality Pattamadai Paai in Tamil Nadu.

Pattamadai mat

Pattamadai Mat or Pattamadai Paai are made with Kora grass (*Cyperus corymbosus Rottb*.) occurs on along the banks of the river Tamiraparani in Thirunelveli district in Tamil Nadu. A unique alluvial soil and combined with mild climate enhance this special Kora grass. The art and craft of weaving and blending intricate designs of Pattamadai mats are considered unique to this region. Lebbai and Rowther Muslim communities who are known for weaving of fine Kora grass mats for the several generations. *Pattu pais*of Pathamadai`s fineness ranges from 80 to 140 (counts) wrap threads for every nine inches of total warp width, the higher the count, the fine is the mat. It is unique over the centuries due to exquisite or supple or lustrous silken mats and some of the super fine mats could be folded like a *sarees*. The soft *Pattu pais*of Pathamadai are traditional gifts for important functions. It have won world fame due to the admiration of celebrities like Queen Elizabeth- II, Mickail Gorbachev (USSR President) and also great Indian leaders. It is geological indication in the South India during 2012-2013. There are many factors involved for their delicate feature and highly valued as follows.

Raw materials

Korai grass

Korai grass/ Sedge grass (*Cyperus corymbosus Rottb*.) is belong to Cyperaceae which is naturally grows along the banks of the Tamiraparani River. *Korai* grass`s stem has 90- 120 cm with 5-8 mm thicked grass cutted at base. These grasses are harvested in the months of September/ October and February/ March. The inner stem portion was scoop out using knife. While, outer portion of the stem is used for weaving fine quality mat as cut into fine strands.

Natural dyes

The natural dyes usually do not directly interact with *Korai* grass, so mordant (binding compounds) required fixing the mat and also preventing colour either washing out or fading away. Commonly alum (25g/ 5 liter) used as mordant which helps to increase evenness, brightness deeper shade with good wash fastness of mat. The dried and polished mats are soaked in mordant for 30 minutesand then dried. After drying it is ready for adding natural dye in the Pattu Paai.

Natural dyes were extracted from plant sources.Leaves of *Lawsonia inermis* Linn. (Green), *Indigofera tinctoria* Linn. (Indigo), Stems of *Rubia cordifolia* Linn.

(Golden yellow), *Arnebianobilis* Reichb.f. (Red), Woods of *Caesalpinia sappan* Linn. (Red orange), *Acacia catechu* Willd. (Maroon), fruit rinds of *Punica granatum* Linn. (Black) fruits of *Terminalia chebula* Retz. (Black), seeds of *Bixa orellana* Linn. (Orange) flower of *Cassia auriculata* Linn. (Yellow) are some of the plants often used for natural dye.Almost all parts of plants like root, bark, leaf, fruit, wood, seed, flower, etc., produce dyes. Natural dye yielding plants are crushed boiled and kept in water for a day. Coloured extracts were separated and used for dyeing the mat by soaking. It is shade dried in order to fix the colour in the mat.

Production techniques

Mat weaving or mat creating is quite complex, painstaking and time consuming process. It needs lot of time and patience. The mat production techniques are described as follows:-

Preparation of *Korai* grass

The striped *Korai* grass is dried in the hot sun which gives a lustrous yellowish green colour. Yellowish green coloured grass strips is boiled in a pot containing water and again dried in the sunlight. The longer the *Korai* will be gives the thinner the weft strands. The sun dried grass strips were made into bundles and then soaked in the running water for three to seven days. It will swell up to three times and again sundried. The outer layer is separated and sorted out into the different grades.

Dyeing

Dyes are gives more attractive to the any products. Most commonly natural colours such as red, green and black are used for making high valued mats traditionally. With the advent of synthetic dyes, it is used more widely due to easy application and availability. However for natural dyed mats there is huge demand in international markets.

Weaving

The weaving of Pattamadai pai or Pattamadai mat are fallows alike basket weaving on floor loom. First, the weft of the Pattamadai mats covers the wrap (usually cotton or even silk threats) entirely and pattern formed with striped effect of its own. The number of warp threads will increases the finer quality mats. Sometimes four strands of 100 count are taken together to produce a great strengthened single thread. One end of wet grass inserted in hole of long line needle like stick. By using stick grass is passed into the loom and then twisted to give uniform roundness and strength by hand both the stick and grass ends. While the reed is placed against several for keeping in its position. While completing the weaving compressed to remove the unevenness. After completion of weaving it again dried in the sun. It is finished with a polishing stone to giving the extra lusture.

Quality and price of *Korai* mats

Quality and the number of counts in the mat which deciding the cost. *Korai* mat with 140 count (180 x 75 cm) considered as superior and number one in quality which cost upto Rs. 5000/- while the cost of 120 count range from Rs. 2000-3000/- the cost of 100 counts range from Rs. 1000-1500/- which is also regarded as the fine quality mat.

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Gum karaya (*Sterculia urens* Roxb.): A potential gum tree

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Abstract
Results of the present study demonstrated that mixture of natural gums could becontains about 60 per cent neutral sugars (rhamnose andgalactose) and 40% acidic sugars (glucuronic acid and galacturonic acids). Gum karaya is mostly used as aningredient in the preparation of emulsions, lotions, denturefixative powders, bulk laxatives, as a pulp binder in thepreparation of thin papersand suspensionproperties. Traditionally, India is the largestproducer and exporter of gum karaya and Europe is the largestimporter of the gum karaya. As gum karaya is vital for tribal economy and its trade value is substantial, there is a pressing need to develop a scientific and sustainable tapping method to increase the yield and ensure the survival of the tapped trees

Keywords: *Sterculiaurens*, Karaya gum, Gum tapping, Propagation, Uses and Pharmacology

Introduction

Tree gum exudates of the natural acid polysaccharide haveattracted significant attention among researchers because of theirimmense potential application in the food industry, biomedicineand material science. Among the different tree gum polysaccharides,Gum Karaya (GK) is an important partially acetylated naturalpolysaccharide having a branched structure with a high molecularmass of 16×10^6 Da and is grouped under the substitutedrhamnogalacturonoglycan (pectic) type of tree gum.

Distribution

It is a native of tropical Himalayas and Southern India. Globally distributed in India (Assam, Bihar, Eastern and Western peninsula, Northeast of Belgaum, Maharashtra and southern Gujarat (Kumar, 2016; Kumar and Desai, 2016)), Sri Lanka, Australia, Pakistan, Panama and Malaysia. Karaya gum has been used commercially as adulterant or alternative for tragacanth gum for last 100 years. Gum procured is being processed into different grades as per the requirements ofthe buyers and exported through Mumbai to different countries i.e., U.S.A., U.K,Japan, France, Germany, Italy, Singapore, Thailand, and Malaysia. Almost100% of the Gum Karaya procured in the state and even in the country isexported, since its domestic consumption is negligible.Annual World Production is estimated at 5500 Tons, while India'sshare is around 3000 - 3500 tons. Senegal, Sudan and Pakistan are emerging as other important suppliers. Currently, the gum is used in a variety of products including cosmetics, hair sprays and lotions to provide bulk.

Description

Sterculiaurens is a medium to large sized deciduous tree belonging to the family ofSterculiaceae, which grows wildly deciduous forests of dry rockyhills lands having tropical climateat elevations between 300 - 750 meters. Dry, tropical deciduous forests, often associated with *Boswelliaserrata*, on hilltops, exposed

ridges, rocky crevices, eroded slopes and similar habitatswith several industrial application and upto 15 m height with 48 cm diameter (Kumar et al., 2013). The trunk appears whitish or pinkish after leaf fall, such peeled bark makes trunk appear like a beautiful carved marbled structure (Fig. 1). Leaves on long petioles, crowded at the ends of branches, palmately 5-lobed, 20-30 cm diameter; tomentose beneath, glabrous above, entire, acuminate; stipules caducous.It is reported that the flowering season- December to January month; fruiting season- April to June while flower is greenish yellow having unpleasant odour, a few bisexual flowers mixed with large number of male flowers. Seed oblong brown coloured 6 mm long; 3-6 in each follicle and seed weight varied from 5291 to 6360 seeds/kg (Chacko et al., 2002). The ripe fruits are collected from the tree when they start to dehisce. Seeds are recalcitrant nature and can't store for more than a year while maximum seed germination (77-88 %) has recorded overnight soaking in normal water as pretreatment. The seeds are roasted and eaten by Madhya Pradesh tribes. The de-hulled seeds consist of 35% protein and 26% oil. Theseed oil is reported to be edible and also used in soap manufacture (Yesodharanand Sujana, 2007).

The bark gives a fibre and wood makes a poor fuel. The majority of commercial karaya gum is obtained from *S. urens*, all parts of tree excude a soft gum when injured. Karaya gum is produced by charring or scarring the tree trunk and removing a piece of bark or by drilling holes into the trunk. The gum seeps from the scars and is collected, washed, and dried. The gum is then graded. A mature tree may yield 1 to 5 kg of gum per season (Verbeken et al., 2003). Chemicalcomposition of *Sterculia urens* seed from different regions withvarying protein content (11.5-30.8%) and oil (24-29%) has been reported by Vishakha and Bhargava (1999). Chemical, mineralcomposition and protein solubility of defatted Sterculiaurens seedflour was studied by Narsing Rao and Rao (2010) who found thatthe seed was a rich source of protein (20%) and crude fat (29%). Satyanarayana, Subhashini Devi, and Arundhati (2011) reportedthat *S. urens* seed is a rich source of protein, lipid andcarbohydrates.

Propagation

Seed - germination takes 10 - 15 days and gives nearly 100 % seedlings that reach 15 – 20 cm in height n three months. A physical dormancy caused by the hard seed coat of the mature seeds of many species in this genus can be overcome by scarifying the seed. This is carried out by cutting away or abrading some of the seed coat to allow the ingress of water, though great care must be taken not to damage the embryo. The aril surrounding the seed should also be removed - this is easiest when it has been softened through soaking in water. The seeds germinate optimally at temperatures between 20-30 °C. They can be sown in a nursery seedbed or in containers. A germination rate of about 95%, occurring within about 2 weeks can be expected if the seed has been properly treated.

Fig. 1: Phenology of *Sterculiaurens*. (A). Rocky hills in natural forest, Gang's district of Gujart; (B). Threats due to road construction; (C). Exploitation of gum with unscientific tapping techniques; (D & E). The trunk appears whitish or pinkish after leaf fall, such peeled bark makes trunk appear and (F). Tapping of gum from gum yielding trees without unscientific tapping techniques

Gum tapping

Tapping of gum from gum yielding trees is done by blazing andstripping off the tree bark. Maximum amount of gum is produced within first 24hours of blazing and continued for few days. It solidifies in the form of gum tears.Except during rainy season tapping can be resorted to throughout the year.Though the gum exudes from the blazes all the year around; the flow is morecopious in the hot weather. The best quality of gum is produced during Januaryto June. In rainy season the gum produced is either washed off and does not getdried easily and also poor in quality i.e., darker in colour with high moisturecontent and impurities. Blazing of the trees has an important bearing on the tree health and heavytapping is believed to impair the seed fertility and thus regeneration. Therefore, tapping should be done with the least possible harm to the trees. Precaution should be taken while tapping gum, the Gum Karaya tree should be of at least 3 ft. in girth andblazing should be confined to main stem above 3 ft. from the ground level. The blazes of the rows should be alternate and depth of the blaze should notexceed 1/2" till second layer is exposed and each blaze should be a semicirclewith 6" wide base. In the 2nd and 3rd year, tapping can be continued by extending the 1st yearblaze, 5 cm, above the previous years treated area. Old wounds should notbe reopened. In order to keep the longivity of the tree and for better quality of gum, tapping should not be done continuously and trees should be given longperiods of rest before retapping so that the blazed portion gets enough time toheal and resume normal activity. Excessive tapping of the tree may alsodeteriorate the gum quality. The wound is completely

healed 60 days after tapping. The yield has increased about 20 to 30 times over the control and about 10 times more than the traditional tapping methods used by the local people. There was a marked difference in the yield among individual trees, presumably due to heterozygosity.

Karaya gum producing states

Andhra Pradesh, Maharashtra, Gujrat, Orissa, Rajasthan, Karnataka and Bihar.

Uses and pharmacology

Karaya gum is not digested or absorbed systemically. The major use of Gum Karaya is as a bulk laxative in viewof its ability to form a mucilaginous gel on contact with water. For their use, the

Gum is ground to a granule size of 8-30mesh. These granules have a capacity toabsorb and after and swell to 70-100% times their original value. The Gum has also been used in alimited way as a wet end additive in paper manufacture in conjunction with starches. It is used extensively in various totally unrelated industries because ofthe properties such as water absorbing / moisture absorbing, gel and film forming, adhesiveness abilities. It is highly resistance to hydrolysis by mild acids anddegradation by most of the microorganisms.

Industrial applications

In petroleum and gas producing industries the GumKaraya is used in formulations of drilling fluids in removing calcareousdeposits in the wells. Gum Karaya added to the lime-base drilling fluids toprevent water loss after reducing its viscosity by heating at 90 ^{0}C for 10 hrs.

Paper and pulp

Gum Karaya is used in the paper industry for themanufacturing of certain special quality papers. It deflocculates the fibres andserves as binder for fibres. Use of Gum Karaya results in light weight sheetsof improved formation and strength.

Leather and allied products

In leather industry it is employed as aningredient of dressing compositions and in proportions for accelerating thetannin action weighing compositions. Gum Karaya is also used in themanufacture of collagen fibre material.

Miscellaneous industrial products

Low grade gum served as a moreefficient binder in the briquette (a block of compressed coal dust).

Textile

Gum Karaya in powder form is used as a binding material in many ofthe textile industries.

Agroforestry uses

A useful plant for reclaiming and reforesting bare, rocky land.

Medicinal uses

Gum Karaya also used for constipation, liverticular diseaseand as laxative. Also used to osmotic aids through gum which is from powder,paste, ring, disk, a sheet board advantageous only the other adhesive plastersand cements specially immediately after postsurgical core of skin / sensitiveskins or in soothing to skin, less likely to produce softness, darker supportmicrobial growth.Sores and Wound: It found that the application of powdered Gum Karayastimulated granulation and healed the resistant bed sores in few patients.Gum Karaya powder packed in to open wounds increased the normalgranulation tissue and also resulted in good epidermal in growth.Gum Karaya is also used in dentine adhesive, medical adhesive tapes for thetreatment of stomatities and also used in preparation of pressure-sensitivemasking tapes, medical jellies, pastes.The gum is also used to treat throat infections.

Cosmetics

The film forming property of Gum Karaya makes it useful in thehair setting preparations of hair dressing lotions and finger wave lotions for thebeauty trade.

Food industry

Sugar: Acceleration of settling rates of first carbonation juice in beetsugar manufacture can be accelerated by the addition of small amount ofa dilute solution of a natural gum such as Gum Karaya. The addition ofgum / stabilizer improves the quality of juice.

Meats: Gum Karaya serves as a less adhesive water absorber in thefinal ground meat products and as an emulsifier and binder during meatprocessing. Gum also gives the product a smooth appearance. Duringmeat processing such as chapping, curing, smoking, cooking, chilling, theadded Gum Karaya acts as an emulsifying and binding agent byabsorbing moisture and stored product.

Salad dressings: In salad dressing Gum Karaya is used as a stabilizer byincreasing the water, oil emulsion and thereby preventing or slowingseparation.

Sauces, Condiment Bases, Ketchups, Sweet pickle and liquor: In the aboveitems Gum Karaya acts as a stabilizer on 0.1% to 1% by increasing theviscosity. It retards the movements of solid particles or liquids of differentdensity.

Baked Foods: A mixture of karaya and arbic gums gave some goodresults as an emulsifying agent, Gum Karaya mixture and biscuits improvesthe appearance, symmetry, grain and tenderness whereas in bread itincreases the volume and improves the softness, symmetry, extreme,cream color, taste, odour.

Karaya gum can be used in making synthetic pulp for fruit juices because of itscold water swelling property.

Other uses

Also used in linoleum, Ice creams, Jellies, Varnishes, Inks,Rubber compositions, Oil cloth, Paper coating, Polishes and Engravingprocess.The bark can be stripped off the tree easily and yields a useful fibre suitable for making coarse cloth and ropes.

Export policy

Exports are presently canalised through Tribal Co-operativeMarketing Development Federation (TRIFED), under the ministry of Tribal affairs, Govt. of India, New Delhi, State Tribal Development Cooperative Corporations, and Forest DevelopmentCorporations are having monopoly procurement rights on the collection of gum intheir respective states.

Threats of *Sterculia urens*

1. Exploitation of gum with unscientific tapping techniques.
2. In adequate and unsutticient studies on Seed Source Variation (SSV) and Seed Viability (SV) and Seed Germination (SG).
3. Relatively slow growth of tree and tapping of gum at various stages of tree growth hinders the overall performance of the species.
4. Individuals outside the protected areas are comparatively more prone to become threatened due to lack of protection to the species.
5. In the absence of cultivation of these trees in regular plantation, there is a grave concern about the loss of wild germplasm of *S. urens*.

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Antiseptic property of *Allium cepa* Linn. (Piyaz) in Uttar Pradesh

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Abstract
In the present article a brief description of *Allium cepa* Linn. (Lilliaceae) is provided along with its antiseptic properties.

Keywords: *Allium cepa*, Antiseptic property, Antifungal, Piyaz

Introduction

Many of the researchers agree the onion has been cultivated for 5000 years or more. Since onions grew wild in various regions, they were probably consumed for thousands of years and domesticated simultaneously all over the world. Onion skin dye has been used for egg and cloth coloring for many years in the Middle East and Europe. Onion cultivation starting around 3,500 BC, ancient civilizations that used them soon became really dependent on this great vegetable. Onions were easy to grow on any kind of soil, any type of weather ecosystem, and were easy to store, dry, and preserve during winters. The basic abilities of onion also proved to be very useful to Egyptians, Babylonians, Hindu and ancient Chinese civilizations Folk healers are used the onion to prevent infection. Species is commonly found in all places of cultivated field areas in Uttar Pradesh. It is widely cultivated as vegetable.

During my survey work on the medicinal plants of Uttar Pradesh, the author came across many populations of Lilliaceae family member in Meerut, Bulandshahr, Hapur, Ghaziabad, Gautam Buddha Nagar Muzaffarnagar, Shamli, Baghpat, Bijnor and Saharanpur District.

Uttar Pradesh lies between 23°52' and 29°45' North Latitutdes to 77°04'and 84°38 East Longitudes. The state covers a surface area of 240,928sq km and ranks fifth in terms of area in Country. Uttar Pradesh is divided into two geographical regions, which are Southern hills and Plateau and Ganga Plain. In shape is roughly rectangular. In Uttar Pradesh region temperature is recorded 45°C-21°C in summer while 32°C -4°C in winter. In this region, soil mostly loamy and in some area it is sandy loam, silty loam and clay loam occasionally meet within the area. The rainfall varies considerably from year to year. The maximum rainfall recorded during the monsoon in the month of July-September. Climatically the year may be divided into four seasons. The cold season from near the end of November to the beginning of March is followed by hot season, which continues till about the end of June, when the south-west monsoon arrives, the monsoon season lasting till September end. The air is dry for the most part of the year. In April and May, these are usually the driest months.

These species have been identified as members of Lilliaceae family. The onions occur common and well known as a local vegetable. These are commonly cultivated in field areas of Uttar Pradesh. In this present study a brief description of species of Family Lilliaceae is provided along with its medicinal use.

Materials and Methods

The present paper is based on the survey and collection of the data from the native informants, who are Vaidhya or Hakim (Ayurvedic medicine practitioners) and rural people who have knowledge about Ayurvedic medicine with their local name. Oral interviews were held in villages and information recorded at the spot.

Medicinal plants were collected and preserved for the future use. The plants were pressed in old newspapers and blotting sheets for dehydration in strong ply board. The Species were changed to fresh sheets after an interval of 24 hours to 2-3 days depending on the weather conditions until the specimens were completely dry. The plant species were identified with the help of available floras. Doubtful medicinal plants are confirmed at the herbaria of Forest Research Institute (F.R.I.) and Botanical Survey of India (B.S.I.) Dehradun.

Perusal of literatures on medicinal plants, (Singh 1993; Tomar and Singh 2005; Tomar and Singh 2006; Tomar 2007; Tomar 2008 ; Prachi *et al.* 2009 ; Singh *et al.* 2009 ; Tomar 2009 ; Jain and Suryavanshi 2010 ; Tomar 2011; Tomar 2015; Kour (2016); Tomar 2016 and Pedroza *et al.* 2016. In this present study a brief description of species is provided along with its medicinal use.

Botanical description of species

Onion plant is a perennial herb growing to about 1.2 m, with 4 to 6 hollow, cylindrical leaves. Bulbs large. Leaves radical, hollow, bifarious. Flowers many, white, in dense umbels with both flowers and bulbils On top of the long stalk, greenish-white flowers are present in the form of solitary umbels growing up to 2.5 cm wide. The seeds of the plant are black and angular. The underground bulb, which is used medicinally, is comprised of fleshy leaf sheaths forming a thin-skinned capsule. The onion is used as vegetable crops.

Bulbs of red onions

Chemical composition

Onion contains alliin and similar sulfur compounds, including allylalliin and methyl and propyl compounds of cysteine sulfoxide. Sulfur and other compounds of *A. cepa* have been analyzed.

Folklore

Allium cepa (Piyaz) is used to prevent infection. Juice (5ml.) onion is applied to inhibit the growth of bacteria. The same dosage is also applied as an antifungal activity.

Result and discussion

This knowledge is handed down to generations through word of mouth and is extensively used for the treatment of bacterial infection. Thus antiseptic property is checked growth of bacterial infection.

Acknowledgement

Author is thankful to his respected teachers Prof. (Dr.) Y. Vimala, Department of Botany, C. C. S. University, Meerut and Late Dr. H. Singh, Department

of Botany, Meerut College, Meerut (U.P.) for their sincere guidance.

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Know your biodiversity

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***Ratufa indica* Erxleben**

Ratufa indica commonly known as Indian Giant Squirrel and Shekru (Local Name) is a maroon and buff colored giant squirrel endemic to India especially to Western Ghats and is very dependent on the canopy connectedness for its survival. These squirrels are included under family Sciuridae and order Rodentia whose descendants are known to be living since last 30 to 40 million years ago. The Sciurids are capable of occupying different niches from temperate to tropical regions of the world. They are diurnal and chiefly herbivorous feeding on plants, seeds, fruits, leaves and occasionally on small vertebrates and insects.

The species of *Ratufa indica* is widely distributed in Indian peninsula. They are arboreal and spending most of its time in trees and very rarely come down on the ground. They prefer mixed deciduous, evergreen, tropical and rain forests. Indian giant squirrel is omnivorous. Their feeding and nesting activity is mainly in top to mid canopy. Leafy trees with canopy continuity and liana growth are preferred for nesting and many times large nesting trees also served as feeding trees. An individual will often have 2 to 5 nests in a small area of forest, which are used as sleeping quarters, with one being used specifically for giving birth and nursing the young. They also used tree holes as shelter. *Ratufa indica* play an important role in seed-dispersal. They disperse the seed of the plant that they consume as they defecate. Seeds form a majority portion of their food item, including bark, pith, flowers, nuts, bird eggs, insects, fruit pulp and figs were consumed as per the availability.

They build large globe-shaped nests of twigs and leaves, placing them as possible in the trees. They prefer tall profusely branched trees for the construction of nests. Using its long tail for stability, this squirrel can leap from tree to tree and jumps of up to 6 meter. They are mostly active in the early hours of the morning and in the evening, and resting in the midday.

The weight of Indian giant squirrel is between 1.5 to 2.0 kg. Head to body length measures about 25 to 45 cm**.** The length of tail is about 20 to 40 cm. They have two or three tone color scheme with shades of black, brown, and deep red. Ears of *Ratufa indica* are short and round. They have pronounced and broadened hands with an expanded inner paw for gripping. Cheeks, chest, front of the forelimbs and underparts are white, cream or orange in color. The eyes are bright dark or light brown. The nose and lips are pink in color. They have some long hairs behind the nose and

mouth. The tail is long and strong, the color of tail is light brown to creamy white on the tip. Both sexes are almost similar, but females can be distinguished from males by their three sets of mammae. The Giant Squirrel's large tails used for balancing, running, jumping and quick movements.

They are typically wary, shy and solitary animals. They are rarely seen in pairs during breeding seasons. Breeding occurs throughout the year, or several times during the year. Males actively compete for females during the breeding season and pairs may remain associated for longer period of time. Average number of offspring is 1 or 2. The gestation period is between 29 to 35 days. The average lifespan of Indian giant squirrel is 20 years.

It is protected under schedule-II of wildlife protection act, 1972 and given status Least Concern (LC) in International Union of Conservation of Nature (IUCN) Red List. Presently *Ratufa indica* is a state animal of Maharashtra. However, throughout its range, it is facing threats to its survival from habitat loss and persecution by local people. Beside this due to deforestation, the already limited habitat of *Ratufa indica* is reduced considerably. Different agencies such as IUCN, CITES etc. are trying to reduce further fragmentation of their habitat.

***Prunus cerasoides* D. Don**

Prunus cerasoides, known as the Wild Himalayan cherry, sour cherry and locally as Pajja is a deciduous cherry tree found in East Asia, South Asia and Southeast Asia. It belongs to the family Rosaceae and the order Rosales. Its range extends in the Himalayas from Himachal Pradesh in north-central India, to Southwest China, Burma and Thailand. It grows in the temperate forests from 1,200–2,400

meters in elevation.

Tree grows up to 30 meters. The bark glossy, ringed, smooth and peels off in thin horizontal strips. The leaves are elliptic, long pointed, with toothed margin. They are short-stalked, 5-8 cm long. The tree usually flowers in autumn and winter. Flowers are hermaphroditic, pinkish white, long stalked and often paired or in few-flowered clusters at the end of branches. Petals 5, obovate spreading outwards. Fruit 1.3-1.6 cm long, ovoid, yellow and turns red when ripens. *Prunus cerasoides* is cultivated as an ornamental tree. The tree thrives in well-drained and moisture-retentive loamy soil, in an open, sunny, and sheltered location.

Like other members of the *Prunus* genus, it is shallow rooted and is likely to produce suckers if the root is damaged. It produces hydrogen cyanide, a poison. This toxin is found mainly in the leaves, seed and bark, and is readily detected by its bitter taste. It is usually present in too small a quantity to do any harm but very bitter seed or fruit should not be eaten. Although, in small quantities, it stimulates respiration and improves digestion, and also claimed to be of benefit in the treatment of cancer. In excess, however, it can cause respiratory failure and even death.

Prunus cerasoides has been identified as a 'framework species' for restoring evergreen forest in seasonally dry climates. It is cultivated within its native area, mainly in India and Myanmar. The seed requires two to three months cold stratification and is best sown in a cold frame as early in winter as possible. The seed grows rather slowly and can sometimes take about 18 months to germinate depending on the conditions.

The tree has a range of uses including edible fruit, seed and gum, various medicinal applications, a timber, dyestuff, tannins and beads. Fruit can be eaten raw or cooked. Gum is chewed. Seeds can be eaten raw or cooked and used in the manufacture of necklaces. The fruits and the leaves give a dark green dye. The wood is hard, strong, durable and aromatic, and branches are used as walking sticks. Decoction of stem bark is concentrated at low temperature and used to cure joint pains, bleeding and weakness of the uterus. The powder of the plant is applied in the form of paste in the treatment of skin diseases, to improve the complexion of skin, to treat herpes. The heartwood of the plant is used to treat vomiting, nausea and gastritis. The dried powder is given in dosage of 3-5 g to treat renal stones.

In Himachal Pradesh it is worshipped in all auspicious occasions by the inhabitants. People never cut the whole tree and use only its twigs in rituals as the wood are forbidden to be used as fuel. The plant is strongly recommended for plantation as rich source of pollen and nectar to honeybees besides its religious value. Thus, it is common to observe quite old trees of *Prunus cerasoides* in the area. Yet IUCN has categorized this plant under least concerned category but this plant is facing quite devastating threats to its survival due to habitat loss and abrupt deforestation and already limited habitat of *Prunus cerasoides* is being reduced extensively. Thus there is an urgent requirement to look after and conserve these plant species.

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Tropical Forest Research Institute

Published by:

Tropical Forest Research Institute
(Indian Council of Forestry Research & Education)
(An autonomous council under Ministry of Environmnet, Forests and Climate Change)
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