



Botanical  
Survey  
of India

# ENVIS

(Environmental Information System)

NEWS LETTER

## EDITORIAL

ENVIS Centre dealing with Plant Ecology in the Botanical Survey of India, Ministry of Environment and Forests, was renamed in January, 1996 as ENVIS Centre on Plant Diversity, to meet the task of disseminating information on Plant Diversity to a wide range of users through the Computer Network. The new activity in the existing information services and databases will provide readily available as much information as possible on Plant Diversity, stored in the ENVIS Database Centre, Botanical Survey of India. Information about the data bases of the ENVIS Centre, B.S.I. is now available through Internet on B.S.I. Web with the establishment of E-mail facilities in the Centre.

The ENVIS Newsletter series enters its second year of publication, bringing out its third volume. In this volume, the Wetland Plant Diversity section deals with the information on "Singara Nut" and the section dealing with the Diversity of Rare and Endangered Plants, information on Tree Ferns, *Commiphora wightii*, *Dregea volubilis* and *Bauhinia scandens* have been reviewed in this volume.

(P.K. HAJRA)  
DIRECTOR

Place: Calcutta

Date: July, 1996

BOTANICAL SURVEY OF INDIA



Ms. Amarjit Kaur Ahuja, Joint Secretary, Govt. of India, Ministry of Environment and Forests, is engaged in discussion regarding the developmental activities of the Botanical Survey of India with the Director, Dr. P.K. Hajra.

## TREE FERNS OF THE GENUS *CYATHEA* Sm. AND ITS USES

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Tree ferns attract mankind for their beautiful large foliage. About 650 species of tree ferns occur in the world, out of which only 16 (sixteen) species occur in India. Its natural abode is in the tropical and sub-tropical regions of the world; however, some of the species are reported from temperate region also. Most of the species of tree ferns used to grow under forest cover, besides streams and nullhas. In nature, species of tree ferns are found with varying degrees of tolerance to direct sunlight and wind.

A number of field studies

conducted in Arunachal Pradesh, Meghalaya and Sikkim reveals interesting uses of this genus alongwith their local names. In Arunachal Pradesh different species of tree ferns have different local names viz; *Cyathea andersoni* as 'TANGE' (Adi), *Cyathea brunoniana* as 'TASHI' (Adi) and *Cyathea henryi* as 'YEP TAGOR TAGAR' (Adi) and in Meghalaya as 'TYRKHANG' (Khasi). The local name of tree ferns in Sikkim is 'KUNG TUNGOK' (Lepcha) and 'RUKH UNIO' (Nepali).

Informations gathered on local uses of tree ferns are given statewise:

## Arunachal Pradesh

Stem of *Cyathea andersoni* are used in piggery as a pig food.

The Adi tribe of Subansiri District of Arunachal Pradesh use the stem and pinna of *Cyathea brunoniana* as: Fig 1.

Very small pieces of stem are tied in a banana (*Musa*) or in Arum or Taro (*Colocasia*) leaf / leaves and pressed under a heavy stone to squeeze out water from the pieces. In course

of time, the stone is being lifted and subsequently dried in sunlight. Then the dried pieces are made into powder and mixed up with water to make paste. The paste thus formed is tied in a leaf (used before) and boiled in water or alongwith the preparation of rice and eaten.

Moreover, pinna of *Cyathea brunoniana* is used for worshipping ghosts. The pinna is tied in a stick following a strange phyllotaxy by a priest (NYBO) uttering mantras and kept behind the house.

## Meghalaya

Except pot making from the stem of *Cyathea chinensis* and *Cyathea gigantea*, no other uses of the plants are known from the state.



*Cyathea brunoniana* (Hook.) C.B. Clarke - a tree fern species without spines from Subansiri District of Arunachal Pradesh.

## Sikkim

### A. Species with spines:

Small pieces of stem of *Cyathea chinensis* and *Cyathea spinulosa* are eaten as a vegetable by removing adventitious roots and incidentally the croziers are not eaten due to inaccessible spine. Fig 2



*Cyathea chinensis* Cope 1. - a tree fern species with spines showing non-edible croziers.

The stem of *Cyathea chinensis* and *Cyathea spinulosa* are used to make pots for cultivation of ornamental plants.

The stem of *Cyathea chinensis* used as wooden post 'Thamba' or 'Khuti' for construction of huts and small cottages.

### B. Species without spines :

Small pieces of *Cyathea andersoni*, *Cyathea brunoniana*, *Cyathea gigantea* and *Cyathea Khasyana*, being boiled in water (as per the availability of cited species) and thereafter outer covering of boiled crozier being removed, are subsequently fried in mustard oil and eaten. Fig 3.



*Cyathea brunoniana* (Hook.) C.B. Clarke - showing edible crozier.

The stem of *Cyathea brunoniana* also used as wooden post 'Thamba' or 'Khuti' for construction

of huts and small cottages. Fig 4



Stem of *Cyathea brunoniana* (Hook.) C. B. Clarke used for the construction of hut in Sikkim.

The stems of the *Cyathea gigantea* also used to make pots for cultivation of ornamental plants. Fig 5



A Lepcha boy and pots containing orchids and roses made up of tree ferns.

The stem of species without spines are bitter and hence not eaten.

#### ACKNOWLEDGEMENTS

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We are also thankful to Sri Sujit Deb for typing out the script.

## THE 'WATER-CHESTNUT' OR 'SINGHARA NUT'

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Among the valuable economic water plants 'water-chestnut' or 'singhara-nut' is one of the most amazing plants in respect to its variability, distribution and socio-economic aspect. The extensive fossil remains of the nuts during the tertiary period consider the genus to be an ancient one. It is highly polymorphic and widely distributed over the central and South-East Europe, temperate and tropical Asia and Africa. The 'water-chestnut' is under cultivation since time immemorial throughout the different parts of the world and presumably the diversity through extensive cultivation and wide range of utilization are directly linked with the evolution of human civilization for the quest of food and medicine which is evident from 'Charak Samhita' as 'Sringatak' known as 'Paniphal' in Bengal and 'Singara' in Hindi. The kernels are sweet, delicious, farinaceous and its flavour resembles that of chestnut. Besides many medicinal and commercial values of the fruit, it provides a good source of starch, minerals, vitamins and sometimes serves as a staple food to the local people for certain period of the year.

'Water-chestnut', the genus *Trapa* L. belonging to the family Trapaceae was originally placed to the family Onagraceae and later under Hydrocharitaceae. But recent embryological, anatomical and taxonomical evidences support its inclusion in a separate family Trapaceae. The name



*Trapa natans* var. *bi-spinosa* (Roxb.) Makino

'*Trapa*' is derived from the Greek word 'Kalkitrapa' which is an ancient weapon with four spikes, and 'natans' means floating on water. Botanical name of *Trapa natans* is probably ascribed in an allusion of its floating habit and the fruits armed with four spines. The botanical history of the genus *Trapa* was found as early as in 1689 by Van Rheed in his 'Hortus Malabaricus'. Linnaeus (1753) established the genus *Trapa* based on the species *Trapa natans*. Savage catalogue as well as Linnaean



Fruits showing one, two, three and four spines.

type (Microfiche no 158.2) at CAL could not provide definite clue regarding its type locality. However, it is presumed to be a European plant.

Roxburgh (1820) described two species namely *T. bispinosa* collected from fresh water in West Bengal and *T. quadrispinosa* collected from Sylhet and distinguished them with the help of two or four armed spiny fruits. DeCandolle (1844) recognised *T. natans*, *T. bispinosa* by straight nature of spines and

*T. bicornis* by curved spines. Clarke (1879) in Hook. f. F1. Brit. India described two species *T. natans* and *T. bispinosa* distinguished by the presence of two spines and four spines on the fruit. Van Steenis (1954) in F1. Malesiana reported *T. bicornis* and *T. maximowczii* var. *cochinchinensis* based on two or four horned nuts. Brenan (1953) in Fl. Tropical East Africa described the species *T. natans* under two varieties viz. var. *africana* Brenan and var. *bispinosa* (Roxb.) Makino on the

basis of four horned and two horned nuts respectively. Subramanyam, K (1962) dealt with two species—*T. bispinosa* and *T. maximowczii*. T.G. Tutin *et al.* (1968) in F1. Europea reported the genus *Trapa* as monotypic and proposed the species *Trapa natans* ascertaining the presence of 2, 3 or 4 horned nuts in the same population.

Table-1 shows the distinguishing characters on which different authors established different species genus *Trapa*.

**TABLE-I**

NAME OF THE SPECIES	LEAF CHARACTER	FRUIT CHARACTER
<i>T. natans</i>	Leaves sparingly villose beneath, toothed at upper parts, glabrous or densely hairy beneath.	Fruits with 4-2 spines
<i>T. bispinosa</i>	-----Do-----	Fruits with 2-strong equal opposite thorns, spiny or barbellate at apex
<i>T. quadrispinosa</i>	-----Do-----	Fruits with two opposite pairs of thorns, spiny at apex.
<i>T. maximowczii</i>	Leaves less villous, spotted black at the base.	Fruit tetrahedral. Thorns four, dagger like.
<i>T. bicornis</i>	Leaves green, not spotted black, entire to subdentate.	Fruits triangular, spines two, curved not pointed.

The present investigation based on field studies in different parts of West Bengal, Bihar and Orissa at different seasons reveals that there is a great variation in the density of hairs on the undersurface of leaves and also in size, shape and numbers of spines on the nuts even in the same population. Some of the variations are also noted due to seasonal changes of water and edaphic factor. During our field study the nuts with one, two, three and four horns have been collected even in the same population from different localities. The population study of *Trapa* in four

localities namely HindMotor, Kamarkundu, Jhanja, Jaleswar reveals that in 2 meter x 2 meter quadrat, out of 200 nuts in average, 110 represents two horned, 60 represents four horned, 25 represents three horned and 5 represents one horned. The presence of one horned nut may be due to suppression or abortion of other horns. In comparatively silted and low water temperature, undersurface of the leaves becomes densely hairy where the water condition is not remaining fresh. The above field investigations thus strengthen the views that the age old cultivation accompanied by

aquatic habit and distribution over a greater range of altitude may be facilitated the plant to produce many cultivated forms and strains. Thus it seems unjustified to give recognition of a number of taxonomic status (species, subspecies or variety) based on rather variable morphological characters connected with unlimited intermediate forms and as such, the Indian gathering is proposed here only under *Trapa natans* var. *bispinosa* (Roxb.) Makino.

*Trapa natans* var. *bispinosa* (Roxb.) Makino, is a floating herb. Stems submerged, stoloniferous, ascending in water with two types

of adventitious roots: fixing roots on muds and free floating roots on water. Leaves dimorphic: submerged leaves opposite with root like filiform segments, 8-15 mm long and floating leaves rosulate, 5-11.5 cm. long, rhomboidal, serrate, dentate, acute, obtuse or lobbed at apex, truncate at base, densely hairy beneath, glossy green above; petioles 2.8 - 7.8 cm. spongy aerenchymatous, swollen, green or reddish purple. Flowers 8 mm across, white axillary solitary, opening above water; calyx 4-lobed, all four lobes or at least two modified into spine on the fruit, petals 4, sessile, inserted on the margin of cupshaped sinuous, 3 mm across; stamens 4, dorsifixed, filament and anther length ratio 1:1; carpel 2.5-3 mm long, ovary semi inferior, 2 celled. Fruit a bony nut

with four distinct angles all of which or at least one spinous, radicle protrudes from a cylindrical beak at the top. Seed single, triangular, cordate, exalbuminous, embryo with very unequal cotyledons, one small scale like and the other large and fleshy. Detailed studies on floral morphology and embryology of *Trapa bispinosa* Roxb. have been done by Prof. Mohan Ram.

The genus is widely scattered over the globe and found mostly throughout the tropics of the old world. In China *T. bicornis* grows in a fairly large scale. In India *T. bispinosa* grows commonly in almost all the places specially in the valley of Srinagar, Agra, Ajodhya, punjab, U.P. , M.P., West Bengal and Manipur. Geographical range of its distribution extends

from Central Europe to Persia, upper Nile, Malesia, China and South-East Asia. In Asiatic region it is known locally as 'Singara nut' or 'Paniphal' or 'Jalphal' and outside Asia it is known as 'Hornaud Jesuit's nut' or 'water chesnut' or 'water callrops'. Although it is cultivated in many parts of the world but nowhere else it is said to thrive so well as in the alluvial lacustrine silt of Srinagar. Extensive cultivation of this species in Srinagar is famous through out the eastern regions and the products seem to be one of the major food stuff of the local people living around the valley. In West Bengal, Bihar and Orissa it is extensively cultivated in all the lakes, tanks and Jheels.

Table II shows the distribution of different species in India and outside India.

**TABLE-II**

NAME OF THE SPECIES	DISTRIBUTION IN INDIA	DISTRIBUTION OUTSIDE INDIA
<i>T.natans</i>	Jammu Kashmir, West Bengal, Andhrapradesh, Rajasthan, Meghalaya, Manipur, Assam.	Bangladesh, Persia, Europe, China, Japan, Nepal, America, USSR.
<i>T. bispinosa</i>	Almost all over India specially, valley of Srinagar, Punjab , Uttar Pradesh, Madhya Pradesh, West Bengal, Assam, Bihar, Orissa, Andhra pradesh, Rajasthan, Tamil Nadu, Tripura, Maharastra, Manipur	Central Europe to Persia, Upper Nile, Malesia, China, South East Africa & Pakistan.
<i>T. quadrispinosa</i>	Throughout West Bengal, Tripura	Bangladesh, Sri Lanka.
<i>T. maximowezii</i>	West Bengal, Bihar, Tripura.	U.S.S.R (valley of Zavitaja river), Malesia.
<i>T.bicornis</i>	.....	China, Malesia.

**CHEMICAL CONSTITUENTS OF KARNEL**

Chemical analysis of the karnel of *Trapa* shows many important organic and inorganic components which have the nutritive value to be

equal to that of rice. Biologically, proteins of the 'water chesnut' is found to be higher than that of wheat protein. The fruit shell contains mainly 10% tannin, small quan-

tity of Leucoanthocyanin and other chemical constituents. Table-III shows the detailed chemical constituents and nutritive value of the karnel.

**TABLE-III****CHEMICAL CONSTITUENTS OF KARNEL.**

ORGANIC		INORGANIC	
Carbohydrate	23.3%	Moisture	70.0%
Protein	4.7%	Ca	20 mg/100gm
Fat	0.3%	P	150mg/100gm
Fibre	0.6%	Fe	0.8mg/100gm
Enzyme	B-amylase } phosphorylase }	Cu	1.27mg/100gm
		} considerable amount	
Oxalate	15.8mg/100gm (in dry weight)	K	650mg/100gm
Citric acid	2%	Mg	38mg/100gm
Vitamine	Thiamine	Mn	5.7mg/100gm
	Riboflavin	Na	49 mg/100
	Nicotinic acid	I	50.6 mg/100gm
	Ascorbic acid		
	Retinol		

[The wealth of India 6 : 277, 1976]

**ECONOMIC USES**

The plant with its densely villose under surface of the floating leaves, brush like submerged leaves and numerous adventitious root system play a very important role for water purification. The karnel is extensively used in different ways due to its food value and rich chemical constituents (Table-III). The various economic uses of *Trapa* are shown below.

**FOOD:**

The karnels are edible and largely consumed during the season.

The Karnel flour is the principal food for Hindu fasting day, especially as "Phalahar" when rice/ wheat could not be used.

The Karnel pounded and boiled with milk and sugar, forms an

excellent repast, 'Halwa'.

Karnel flour mixed with pepper, salt and coconut, scraping and fried in ghee or butter in lumps as big as a cherry or plum, is very delicious.

**MEDICINE:**

It provides cool effect and very useful for curing billous infection. Karnel serves as a remedial measure of diarrhoea and reported to recover tumours when applied as poultices.

**DYE:**

Powder of the nut is employed for making the red "gual" powder used in 'Holy' festival and it is also mixed with 'Abir'

**PASTRIS PUDDINGS :**

From the karnel various pastris puddings are made which are quite popular in China.

**ADULTERANT:**

Grinding of dried karnel is used as an adulterant of butter.

**WATER PURIFIER:**

In aquatic ecosystem the root and the leaves of the plant are very effective for water purification by absorbing minerals like Manganese, Iron, Copper, Magnesium, Nitrogen, Sodium, Potassium, Iodine etc. from eutropicated water.

**TEXTILE INDUSTRY**

The karnel powder has a peculiar feature to gelatinize at low temperature. This chemical character is being largely used in different industries for textile sizing.

**ICE CREAM:**

The starch present in the karnel of *Trapa* is being reported same as that of corn starch. Therefore, large no of icecream

factories use the karnel as a substitute of corn starch.

#### CULTIVATION:

*Trapa* is cultivated extensively all over India. Most commonly it is found to cultivate along the tanks of South India, Jhills of Central India, pools and perennial swamps of West Bengal, Bihar, Orissa, U.P., M.P., Jammu & Kashmir and other states. The major ecological conditions for its cultivation are related to shallow, stagnant fresh water bed and soft clay or alluvial silty substrate.

In the month of January, some fruit bearing populations are left as such in one or two selected places where the fruits are not being disturbed by farmers. The ripen fruits are automatically fallen to the water bed. During the end of January when the muds are exposed, the selected nuts are being pressed down by foot into the soft mud of the water bed. The nuts sprout automatically within a month and seedling shoot up to the surface of the water. After 7 months during June-July the

population is thinned after removing some of the plants to the another suitable water bodies at suitable intervals. Transplantation is also done by the toes for putting the stem into the mud of the water bodies.

The plant population has to face some insect diseases which lower the crop yeild. To control the diseases cultivators use some insecticides. Table - IV shows the different causal organisms, symptoms of the disease and the control measure.

### TABLE—IV

CAUSAL ORGANISM	SYMPTOMS	CONTROL MEASURE
<i>Bipolaris tetramera</i> 'shoemaker'	Minute mummy brown spots with pale yellow margin which later coalesce into larger patches	Spraying of captan [Ntrichloro-methylthio-4 Cyclohexen 1,2 dy- chlorobromide]
<i>Galerucella birmanica</i> 'Singhara beetle'	The grubs and beetle feed upon the plant as well as the fruit.	During transplantation beetles infected plants can be removed selectively and the crops in the next season can be freed from desease. B.H.C.(5%) dusting is effective though B.H.C. registant variety reported from U.P., Rajasthan and Delhi. Dusting of Tobacco Pyrodust 4000 at the rate of 44 kg/Hectare may be used. Use of Pyrethrins, Malathian (5%) dusting and carbaryl (10%) at 25 kg/Hectare can also be effective.
Larvae of <i>Chironomus</i> sp.	Small and malformed fruits usually caused by voracious feed on the petioles and pedicels.	Usually Shevin (5%) can be used.
<i>Altica cyanæa</i> 'The blue beetle'	Feeds and breeds upon the leaves.	_____ do _____
<i>Bagous trapæ</i>	Damage the submerged soft stems.	_____ do _____
<i>Rhopalosiphum nymphææe</i>	The leaves show withered appearance.	Folidol E-605 (0.03%) & Shevin (5%)
<i>Pullus nubilus</i> and <i>Pullus piescens</i>	_____ do _____	_____ do _____
Larvae of <i>Nymphula gangeticalis</i>	Swollen petiole is borrowed. The organism cuts cavities on the petiole for shelter.	Shevin (5%)
<i>Bogous vicinus</i> and <i>Nanophyes rufipes</i>	_____ do _____	_____ do _____

## HARVESTING:

The flowering starts during August September and continues along with fruit setting for 60-120 days depending upon the severity



*Trained Labourer on float busy in harvesting*

of the winter. The fruit setting is adversely affected if the water is muddy. The fruit is ready for harvesting within 21 days. The period of harvesting ranges from September to December but continues upto February depending upon the severity of cold. Harvesting is done in the beginning



*Washing & Processing of fruits for marketing*

at 15 days interval, then once in a week and from November onward almost everyday. It is started early in the morning and is an arduous task. For picking the fruits in water it needs a special mechanism and trained labour. Usually a float is being prepared with the help of two earthen pitcher connected by a bamboo stick. The entire set is then inverted into the water so that the labourer can sit

on the bamboo stick of the float for collecting safely the fruits, moving from place to place on the water surface. The trained labourers are capable to avoid the damage of the crop and also ensure to remove the developed fruits only. After picking the fruits, those are stored simultaneously in a floating aluminium vessel. When the vessel is filled up with the fruits, these are transferred to an enclosed net submerged in water. After the end of collection the fruits within the enclosed net are brought to the bank with the help of boat. These fruits are again washed from the net and transferred to a fresh aluminium vessel which is the measuring unit for marketing the fruits. During the season many



*Fruits on boat on way to market.*

truck load of fruits are carried out in different markets and sometimes they are exported.

## SOCIO-ECONOMIC ASPECT

The cultivation of *Trapa* in different parts of India is chiefly done by "Dhimor", "Singhar" and "Kahars" communities who take lease of different water bodies by paying rent to the land holders. It is reported that the Govt. as well as private land holders earn Rs. 40,000/- — 1,00,000/- yearly, for leasing the water bodies in different states of India for *Trapa*

cultivation. The fruits are picked up from the month of October and ends in the month of January. The extensive field investigation regarding the socio-economic aspect of 'water chesnut' along the districts of Howrah, Hooghly, Burdwan, Midnapore, North 24-Parganas, Bankura, Birbhum and Malda in West Bengal reveals that the *Trapa* cultivation produces average 12 Quintal of fruits per 'bigha' of water bodies in three months. At the beginning, picking of fruits are practised at 15 days interval during the month of October, the picking is done at 7 days interval during the month of November and middle of December and then picking is practised

everyday during the remaining days of December and January. It is found that for one 'bigha' land the farmer has to spend three labourers continuously for supervising the growth, water quality, fruiting pattern, spraying of insecticides, use of fertilizers and harvesting

of mature fruits. Moreover, the farmer has to spend some amount to the land owner and for purchasing chemicals, fertilizers and other necessary tools for harvesting. Accounting all the expenditure of a farmer for one 'bigha' water body, it is found that the annual profit from this cultivation is near about Rs.5000/- and along with the *Trapa* cultivation, some fishes may be cultured in the same water body. It is also reported that in a season a farmer may cultivate more than 50 'bighas' of water bodies in different areas.



TABLE—V

EXPENDITURE		INCOME		
PERTICULARS	AMOUNT	TOTAL AMT. OF FRUIT/BIGHA	RATE Rs.	TOTAL Rs.
Labour charge [9 labourers each having the rate of Rs. 60/-]	9x60.00 = 540.00	1200kg	5.00/kg	1200x5.00 =6000.00
Boat and other materials [for cultivation and harvesting]	1000.00			
Chemicals for disinfection	100.00			
Owner charges	300.00			
<b>TOTAL</b>	<b>1940.00</b>	<b>NET PROFIT</b>		<b>4060.00</b>

This table indicates that the cultivation of *Trapa* is profitable and a farmer with 50 'bigha' of water bodies may earn more than Rs. 2,00,000/- per annum

The table-V shows the detailed account for expenditure, income and net profit for a 'bigha' of *Trapa* cultivation in one season :-

However, many of the land owners are not willing to lease water bodies for *Trapa* cultivation because it usually accumulates the mud during the process of

threatened and like other aquatic plants, *Trapa* cultivation is also suffering from severe threat for rapid degradation of wetlands. During our survey work a vast *Trapa* cultivated water bodies near Hind motor area are seen to be polluted with the chemical effluents coming from the Alkali Chemical Factory at Rishra. Farmers of this field reported regarding the considerable decrease in the number of fruit production due to the above pollution effect.

In West Bengal, Bihar and Orissa, it is reported that Cultivation of *Trapa* has been reduced to 60% due to destruction of natural wetlands for various rehabilitation and other developmental activities. Now, this cultivation is mostly restricted along the ditches of Railway tracks.

Conservation of *Trapa* and management of *Trapa* cultivation is urgently needed since it is a source of regular earning for Dhimor and Kahar communities. Therefore, the best way of conservation of *Trapa* and its

cultivation would be to provide proper care and management to different wetlands in the country.

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Selling in retail market

repeated cultivation and gradually the water body becomes filled up automatically.

Due to population explosion, burning demand for rehabilitation, extensive chemical effluents from different industries and various developmental activities, the existence of wetlands in different parts of the country has become

# "Guggal"

- *COMMIPHORA WIGHTII* (ARN.) BHANDARI

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*Commiphora wightii* (Arn.) Bhandari growing in Rajasthan.

The genus *Commiphora* Jacq. belonging to the family *Burseraceae* consists of about 175 species. In India it is represented by only 6 species of which *Commiphora wightii* (Arn.) Bhandari is well known as "Guggal" from Rajasthan and Gujarat for its high commercial value as a fixative in perfumery from its gum and resin. The species is threatened due to loss of habitat, large scale commercial exploitation and very low rate of natural regeneration in the wild due to less viable seed production. Some informations regarding this species would be very much useful for its conservation measure.

*C. Wightii* is a tall, bushy, deciduous shrubs, upto 3.5 m; branches aromatic, thorny and knotty with silvery, peeling off bark. Leaflets 1-3-foliolate, 1.2 - 5.0 x 0.75 - 2.5 cm, rhomboid, ovate, serrate near the apex, entire

towards the base, lateral leaflets when present much smaller. Plants dimorphic, one having bisexual and male flowers and other having female flowers with staminodes. Bisexual and male flowers sessile, red, sometimes pinkish-white. Drupes c. 1 cm long, ovoid, shortly beaked, deep red when mature; mesocarp yellowish-orange.

**F1.** : Dec. - Jan.; **Fr.** : May - July.

**Distrib.** : Pakistan, India (Rajasthan & Gujarat).

**Status** : Threatened due to habitat loss and commercial exploitation.

**Availability** : This is a well distributed taxon, commonly called "Guggal" occurs in the arid and semi arid parts of N.W. Rajasthan and Gujarat. It is found on rocky habitats at most of the hillocks in this region. Occasionally also found on the outskirts of Aravallis. In nature, due to poor production of

fruits and viable seeds, regeneration in wild population is very scanty. The plant is an important source of Indian Bdellium— a oleo-gum-resin that exudes from the branches. Although it is commercially exploited, the plant is becoming rare also due to removal for wood purpose. This is because of continued drought extending over last five to six years, that most of the conventional wood gathering plants have been completely removed, and in absence of those, the burden has fallen on this taxon. Though the experiments show that few plants, brought and grown in the experimental plots, show production of fruits with viable seeds, and suggests that plant could be raised from them. Moreover, the plants can be easily raised from hard wood cuttings. In Barmer (Kiradu - a place about 30 km from Barmer city), unusually large plants of the taxon are found in the vicinity of ruined temples and most importantly a large number of plants are confined to sandy plains which is a very rare habitat of this taxon.

Due to its medicinal value, the plant is cultivated at a few places, raised by wood cuttings (near Mangaliaws in Ajmer district) where a few hectares has been put under plough for its commercial exploitation.

## Conservation Measures

The existence of this plant is also threatened because of low seed production in adverse natural conditions and recent climatic changes. The faulty techniques of tapping gum-resin lead to its total destruction in its natural habitats and is fighting for its survival.

The cultivation of this important indigenous medicinal plant should be given priority in afforestation programmes. Propagation can be done by cuttings and by seeds.

Hence more efforts are needed to protect and preserve the taxon, otherwise in times ahead, the plants are going to be extinct for more than one reason.

## Tissue Culture approach and Conservation

### *Ex-situ* :

(a) Vegetative propagation of *Commiphora wightii* is through stem cuttings during monsoon. Even without treatment of growth hormones, stem cuttings induce roots. For united multiplication this method could be applied.

(b) Plant tissue culture based bio-technology could play important role in the *in vitro* multiplication and conservation of gene pool of *Commiphora wightii*. Rapid propagation of this rare and medicinally important taxon could be approached through somatic embryogenesis, callus differentiation and axillary shoot proliferation. Brave & Mehta (1993) used nodal shoot/ axillary shoot buds as explant from the mature plant and

regenerated whole plant under *in vitro* conditions.

### *In-situ* :

Natural regeneration of *C. wightii* is mainly through seeds, and seeds are produced in abundance. But viable seeds are very low. Other limiting factors are insects, rodents and hostile climatic conditions in the natural regeneration of this plant.

## Uses

It produces very valuable opaque light pale yellow or dull green coloured oleo-gum-resin (Indian Bdellium) which has been used since many centuries in Indian system of medicine and by tribals in the 'Thar desert' in various diseases. The "guggal" is bitter in taste but is highly odorous. The oleo-gum-resin is a versatile indigenous drug and highly efficacious in the treatment of rheumatism, obesity, neurological disorders, syphilitic diseases, scrofulous affections, urinary disorders, skin diseases, pyorrhoea, swollen gums, chronic tonsillitis and throat ulcer. It is also used as antiseptic, anti inflammatory, uterine, stimulant, diuretic and aphrodisiac. It is said to lower cholesterol and increase leucocytes in blood and induce phagocytosis. It is largely used as an incense candle and as fixative in perfumery and as a substitute for "African Bdellium". Young branches are also used as tooth-brushes by the local people in N.W. Rajasthan.

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# "MADHUMALATI"

## - AN UNDEREXPLOITED ECONOMICALLY IMPORTANT PLANT

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Botanical Survey of India

"Madhumalati" is the sanskrit name of the plant known as *Dregea*



Flowers and the rind of unripe fruits of *Dregea volubilis* (L.f.) Benth ex. Hkf.

*volubilis* (L.f.) Benth ex. Hkf. belonging to the family *Asclepiadaceae*. It is a woody climber ca 11 m high and 95 cm in girth with densely lenticellate and pustular branches. Leaves opposite, 6.3-15 x 4.5-11.5 cm, broadly ovate or suborbicular, cordate, acuminate. Flowers numerous, green or yellowish green in lateral drooping umbellate cyme, peduncles arising from between the petioles, 2.5-5 cm long, pedicels 6-25 mm long, slender. Calyx segment 2.5 mm long, ovate

oblong, obtuse or subacute, ciliolate. Corolla 6 mm long. Follicle usually 2, broadly lanceolate, 7.5 cm long, seeds yellowish brown, broadly ovate 13 x 8 mm.

The plant is distributed throughout the hotter parts of India and Car Nicobar ascending to an altitude of 1500 m, Tropical and South Africa to China.

### Economic uses

The leaves, flowers and the rind of unripe fruits are boiled and eaten as a vegetable or used in curries; the cooking removes the bitterness and nauseating property of fruits.

The juice of the plant is used as a sternutatory. In a preliminary investigation an alcoholic extract (50%) of the plant showed activity on the central nervous

system. It also showed anti-cancer activity against sarcoma 180 in the mice. The leaves are employed in application for boils and abscesses. The tomentum of the follicles is applied to gouty and sores of cattle. The roots and tender stalks are considered emetic and expectorant. Exceedingly stout fibre is extracted from this species.



Flowers, selling in the local market

## AN OUTLINE NOTE ON REMOTE SENSING

Partha Basu  
Botanical Survey of India

Remote Sensing is a teledetection i.e. sensing of feeling the object without physical contact. It is a technique of

gathering information about objects and its features.

Considerable progress has been made in recent years for

inventorisation of the different status and strategies of natural resources, their classification and characteristics etc. by the remote

sensing technique for future utilization, conservation and protection. This aerial survey along with ground level information have been utilised rapidly in the field of status survey of agriculture, forestry, geology, hydrology, cartography and oceanography.

Various kinds of sophisticated photographic equipment and technique have been employed in aerial surveys but low level stereo-photography technique is most effective.

A further improvement in this field with the help of several bands of the electro-magnetic spectrum has been made. Recently computer processing techniques have been developed to acquire data from overhead multispectral scanners and with the help of spectral pattern, recognition of surface materials to the ground are easily classified.

Remote sensing technique is useful to classify surface vegetation pattern, soil types, effects of air pollution on vegetation, detection of diseases in trees and crops and locating the extent of thermal pollution in river, etc.

Application of remote sensing technique in the following fields may provide immediate gain.

#### **Water**

Water resources management for agricultural and industrial use.

Distribution of the humidity of the soil.

Thermal streams and salinity distribution in the ocean (marine resources).

Coastal zone, estuary and harbour activities.

#### **Land & Vegetation**

Land use (inventory and planning)

Soil classification and conservation (Agricultural production, irrigation).

Mineral inventory and exploration planning.

Control of plant diseases (crop and forest production).

Land pollution control.

Oceanography.

#### **Atmosphere**

Global weather mapping (land distribution).

Contents and distribution of minor constituents of the upper atmosphere on global basis.

Pollution control of the lower atmosphere.

Surveys of the earth's reaction (interaction with non-terrestrial phenomena).

#### **Others**

Wild life Control.

Survey of radiation hazards from nuclear plants.

Updating of the growth of the urban areas.

Traffic surveying control.  
Biomass estimation.

Special characteristics of vegetation.

Factors effecting multispectral reflectance and biomass production.

Multispectral technique to measure vegetation count.

## *New Publication*

*The Book, entitled "BHARAT KI VANASPATI VIVIDHTA" in Hindi published by the Botanical Survey of India, Calcutta, presents glimpses of plant diversity of different phytogeographical regions of India (from the Himalayas to the coastal regions). Diversity of various Flowering and Non-flowering plants, their utilization,*



*The book is released by Sri N.R. Krishnan, the Hon'ble Secretary, Govt. of India, Ministry of Environment and Forests. DR V. Mudgal, Scientist 'SF', Botanical Survey of India, is seen on the right.*

*medicinal values, ethnic conservation practices and possible measure for conservation and management are highlighted with 150 illustrations to provide a useful information to the common people in the field of plant diversity.*

## Plea for the regulation of the commercial exploitation of

## the old stems of *Bauhinia scandens* L. in India.

S. Bandyopadhyay, R. N. Kayal, P. P. Ghoshal,  
— M. K. Pathak, M. Bhaumik and S. Saha

Botanical Survey of India

*Bauhinia scandens* L., often better known by one of its synonyms *B. anguina* Roxb., occurs in Southern Asia, Malesia and South China (Wunderlin *et al.*, 1987). In India it is known to occur in the mixed deciduous forests in some parts of W. Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Karnataka and Kerala up to an elevation of 1200 m.



Snake like stems of *Bauhinia scandens* L.

The plants are woody lianas with tendrils; old stems up to 15 cm broad, flattened, alternately elevated and depressed at regular intervals, finally more or less straighten at margins but the central zone remains alternately elevated and depressed. Leaves 3-16 × 3-13 cm, ovate, (5-) 7-9 - nerved, entire (particularly the upper ones near inflorescence), acute to emarginate at apex or bifid 4/5 their length (particularly the basal ones) into prominently tapering lobes at apex, cordate to truncate at base,

glabrous above, glabrescent to glabrous below; petioles 0.7-8 cm long. Stipules ca 3.5 mm long, ovate, mucronate. Racemes simple or compound, terminal or axillary, 4.5-25 × 1.5-20 cm. Buds ca 2 mm across, globose, puberulous to glabrous. Hypanthium ca 1 mm long. Pedicels 2-6 mm long, puberulous. Bracts and bracteoles setaceous. Flowers ca 5 mm across. Calyx open, in buds at apex, cup shaped (later splitting irregularly) with 5

minute deltoid lobes in upper part. Petals 3 (-4) (including claw) × 2 (-2.5) mm, white, later turning pale yellow, obovate, obtuse at apex, veined, glabrous inside, puberulous outside on median zone; claw ca 1 mm long. Fertile stamens 3; filaments 4-5 mm long, glabrous; anthers 1.5-2

mm long, ellipsoid. Stam-inodes 2, ca 1 mm long. Gynophore ca 1 mm long, laterally oriented in relation to the deeply grooved disc; ovary ca 2 mm long, glabrous; style ca 1 mm long, glabrous; stigma little differentiated from style. Fruits 2.2-5 × 1.7-2.5 cm, oblong to elliptic, flattened, veined when dry, glabrous, 1-2-seeded, indehiscent; seeds ca 6 mm across, nearly ovate. Flowers

and fruits from October to January.

The specific epithet *anguina* means snakelike and refers to the old stems. Some of the common names like Snake climber (English), Naga-valli (Mala-yalam), Sanpe-lahari (Nepali, Dukpa), Nag-put (Sylhet) etc. also refer to the same.

In the roadside markets of India 0.5-1 m long and 2-5 cm broad fragments of the snakelike old stems are sold by some mendicants for keeping off snakes. In Calcutta they may ask for a price even up to Rs.500/- for a 1 m long and 4 cm broad old stem. The stem-bark yields cordage fibre (Watt, 1889). The curious looking old stems are now in demand as fancy walking sticks in U.S.A. and European countries and about 1 m long fragments of the stems are being exported from India in large quantity for the same. The bulk of the supply comes from the Eastern and North-eastern regions because it has become rare in the South i.e. Kerala and



Curious looking old stems, in heavy demand as fancy walking sticks in Europe and U.S.A.

Karnataka. Further more, in Kerala, the plants are conserved in some sacred groves (Nicolson *et al.*, 1988). Indiscriminate cutting of the old stems leads to the destruction of all the branches on the trees but fortunately the plants do not generally die because new adventitious vegetative shoots are proliferated from the remaining portion of the stems. Most of these young shoots run extensively on the ground and get rooted at the nodes before making their ways on the trees. Thus the plants are also easily propagated either accidentally or by intention (De Wit, 1956). But still, if the commercial exploitation is allowed in an uncontrolled way, it would pose a threat to the sustenance of the species in our country in the future.

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## SCIENTIFIC AND TECHNICAL ACTIVITIES IN BRIEF

The ENVIS Centre on Plant Diversity, of the Botanical Survey of India, Ministry of Environment & Forests, is situated at the Industrial Section, Indian Museum, 1-Sudder Street, Calcutta-700 016. The main activities of this Centre is to provide useful information on Plant Diversity with the help of publishing Newsletters and disseminating the information to all ENVIS Centres, Universities, Research Institutes, Scientists and Scholars in India and abroad. The centre has developed application Software on Database for Rare & Threatened Plants in India. The ENVIS Centre Database presently holds data on Mangroves, Coastal Plant Diversity, Flora of Arunachal Pradesh and wet-lands .

The Centre has received more than 200 National and International Queries during the last 2 (two) years in the field of Plant Diversity, Ecology, Economic & Medicinal Plants, Wetlands, Mangroves, Rare & Threatened Plants, Biosphere Reserves and National Parks. Scientists of Botanical Survey of India have critically studied and replied the Queries accordingly.

#### INTERNATIONAL QUERIES FROM DIFFERENT COUNTRIES

NEPAL	-	1
BANGLADESH	-	1
U.S.A.	-	3
U.K.	-	1
CHINA	-	2
AFRICA	-	1
MADAGASCAR	-	1



Ms. Amarjit Kaur Ahuja, Joint Secretary, Government of India, Ministry of Environment & Forests, during her visit to ENVIS Centre, Botanical Survey of India, Industrial Section, Indian Museum, Calcutta.

#### STATISTICS OF QUERIES AND REPLIES DURING 1995-1996

Total Number of National Queries	90
Total Number of International Queries-	10.

#### TRAINING AND WORKSHOP

Scientists visited Indian Institute of Science (I.I.S.C.), Bangalore for 5 days' training in computer networking. The Project Co-ordinator, ENVIS Centre attended Workshop in NCST, Mumbai for Computer Networking and Email.

Scientist attended 4 days Workshop in Indian Institute of Technology (I.I.T.), Kharagapur, for "Information access facilities to Science & Technology, Business and Industry to obtain knowledge on C.D.Rom, C.N.W., Email and On-line Database".

# AWARD



- ① Dr. L.K. Banerjee, Scientist 'SE', is receiving the VISHISHT VAIGYANIK PURASKAR 1993-94 from Sri Rajesh Pilot, Hon'ble Minister of Environment & Forests, Government of India, for his outstanding work in the field of Conservation of Natural Resources.
- ② Dr. S. Karthakeyan Scientist 'SE' and ③ Dr N. P. Singh, Scientist 'SE' BSI, Western Circle, Pune have also been awarded Vishisht Vaigyanik Puraskar for 1992-93 and 1993-94 respectively.



Memento presented to Dr. P.S.N. Rao, Scientist 'SD' of Andaman & Nicobar Circle, Port Blair by Vice Admiral & Fortress Commander, A & N Islands on 5th June, 1996 (World Environment Day) for delivering an extempore talk on 'Floristic Diversity of Andaman & Nicobar Islands

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