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DIVERSITY AND CONSERVATION OF MEDICINAL PLANT OF SESHACHALAM HILL RANGE OF ANDHRA PRADESH, INDIA

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ABSTRACT

The Seshachalam hill range of South Eastern Ghats which is one among the **"Hot Spots"** of endemic flora of India. The environment is very much suitable for growth and development of this region important wood / timber yielding and medicinal plants. Nearly 900 plant species are medicinally important including 5 endemic medicinal plants viz., *Shorea tumbaggaiae, Terminalia pallida, Boswellia ovalifoliolata, Pterocarpus santalinus and Syzygium alternifolium* and one gymnosperm *Cycas beddomei* to this area. The tribal people Nakkala, Sugali, Lambadi and local herbal healers (Natuvidhyulu) have been using these plants to cure different ailments.

Due to interference of various biotic factors a number of plants became endangered and some are on the verge of extinction. Keeping this in view, conservation measures have been taken for some of the medicinal plants to protect the germplasm. Standardization of protocols for *In Vitro* propagation of some medicinal plants from different explants selected from elite (mother) plants : Study of morphological and anatomical changes occured during morphogenesis : Testing of clonal purity by isolation of some isozymes like peroxidase, catalase etc., and its banding pattern. Replantation of saplings developed by micropropagation in their natural habitats to sustain the ecological balance and environmental stability.

INTRODUCTION

India is one of the 12 mega biodiversity centres having over 45,000 plant species. Its diversity is unmatched due to the presence of 16 different agroclimatic zones, 10 vegetative zones and 15 biotic provinces. The country has 15,000 to 18,000 flowering plants, 23,000 fungi, 25,000 algae, 1,600 lichens, 1,800 bryophytes and 30 million microorganisms (Pullaiah, 1986). India also has equivalent to 3/4 of its land exclusive economic zone in the ocean, harbouring a large variety of flora and fauna, many of them with therapeutic properties. About 1,500 plants with medicinal uses are mentioned in ancient texts and around 800 plants have been used in traditional medicine. Around 50,000 herbal drug formulations have been developed by 4600 odd ethnic communities of India. American noble prize winner found remedy for viral hepatitis B from *Phyllanthus niruri.* Triphala *(Terminalia chebula, Terminalia bellerica* and *Emblica officinalis)* have been used in 219 formulations;

Emblica alone in 180 formulations, punarnava in 100 formulations, Guduchi-*Tinospora* in 52 formulations. Our traditional life styles is oriented towards using herbal medicine.

A team of 200 scientists from 12 countries from all parts of the world "Green plant phylogeny Research Coordinating Group" (1999) stated 5,00,000 samples of land plants and aquatic plants found on the earth excluding red algae, brown algae and fungi have a vital role in this system. Raven (1999) reported the latest data on extinction rates of plants. He predicts that between one-third and two-thirds of all plant species mostly in all tropics will be lost during the second half of the next century. Growing pressure of population, urbanization and development of roads to remote areas has resulted in deforestation and loss of natural plant resources. In many cases, as the important plant part used are roots or entire plant, resulted in to a great loss by becoming many plant extinct or being listed as threatened. The rate at which they are disappearing is alarming. Many plant species over the world are on the verge of extinction and the rate of extinction of species in India is perhaps the highest in the world. About 1500 species, which were collected a 100 years ago have been spotted in the recent past. Around 600 to 700 species listed by the Botanical Survey of India (BSI) alone are on the verge of extinction at the rate of 100 species per day and 2 to 5 species per hour are losing from tropical forest alone (Trewavas, 2001; Singh, 2002). This extinction rate will be more than 1000 times the estimated normal rate of extinction.

The exact number of plant species is not known and the full range of taxonomy is not clear. In spite of the enormous data available and documented in several archieves and herbaria spread across the country, gaps are present even in carefully compiled taxonomic information. The compilation of flora of higher plants is underway (Venu, 2002). There has been considerable work by several researchers to provide reliable biodiversity atlases and reports based on monitoring of India's biodiversity. Uma Shanker *et al.* (2001) stressed the need to have national agenda for mapping biodiversity using contours of conservation. In collaboration with Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore and networking with various sources for information collection, they have arrived at a consolidated view titled "Conservation/Contour Maps of The Biognomy of India - The plants". This will be available in the form of a CD-ROM whose contents can be accessed through web.

Plants have been one of the important source of medicines since the begining of human civilization. Charaka Samhita (1000 BC TO 100 AD) records the use of 2000 vegetable remedies. The knowledge about the use of medicinal plants has nursed through centuries and such plants are still valued even today. Inspite of tremendous developements in the field of allopathy during the 20th centruy, plants still continue as one of the major soruce of drugs in modern as well as traditional medicine throughout the world. Chemically, depending on their active principles, plants may have alkaloids, glycosides, steroids or other group of compounds which may have marked pharmaceutical actions as anticancerous, antimalarial, anthelmentic or antidysenteric, etc. Many of the essential oils, dyes, latices and even tannins and vegetable oils are also widely used as medicines. Many substances that go

to make up the medicines are frequent products of licing cells, although seemingly 'waste' or intermediate metabolic compounds and not the integral part of the protoplasm and may have no obvious utility to the plants.

Herbal medicines are the synthesis of therapeutic experiences of generations of practicing physicians of indigenous systems of medicine for over hundreds of years while nutraceuticals are nutrionally or medicinally enhanced foods with health benefits of recent origin and marketed in developed countries. The marketing of the former under the category of the latter is unethical. Herbal medicines are also in great demand in the developed world for primary health care because of their efficacy, safety and lesser side effects. They also offer therapeutics for age-related disorders like memory loss, osteoporosis, immune disorders, etc. for which no modern medicine is available. India, despite its rich traditional knowledge, heritage of herbal medicine and large biodiversity has a dismal share of the world market due to export of crude extracts and drugs. WHO too has not systematically evaluated traditional medicines despite the fact that it is used for primary health care by about 80% of the world population. The turnover of herbal medicines in India as over-the counter products, ethical and classical formulations and home remedies of Ayurveda, Unani and Siddha systems of medicine is about $ 1 billion with a meager export of about $ million.

Department of Environment of the Government of India has concluded that the tribal communities alone using 9500 samples of plants of which 7500 plants for medical purpose and 76 samples of animals, also used in tribal medicine. Largest group among folk healers are Visha Vaidhyas. They are estimated to be 60,000 in number. The 2nd largest group is traditional bone setters throughout the country about 70,000 families are practising. There are 427 plant species used in the treatment of poisonous bites in local health traditions. The All India Co-ordinated Research Project on Ethno-biology estimated that there are 4000 deaths occuring in India annually due to poisonous bites. In Kerala, 2000 plants are being used for health care at the house hold level, good apetizers, seasonal foods (festivals, Rama Navami- light food, Krishna-ashtmai - heavy food), disease resistance (*Alstonia scholaris* for preventing malaria), dhoopas (smoke), energy boosters (Kani tribe using *Trichopus zeylanicus* to carry heavy weights on their heads while climbing the hills), brain shaped (*Centella asiatica*) 'Killer of sweet' (*Gymnema sylvestre*), urine bleeding (*Mimosa pudica*) touch me not, brain tonic 'Brahmi', (*Bacopa monnieri*) etc. Recent statistics of Health Ministry, Govt. of India estimated that there are 6,00,000 licensed and registered traditional physicians in India today. India has benefitted significantly by tissue culture technology for commercial production of plants by micropropagation. Over 1/3 of the plants listed in the Indian Red Data Book are medicinally important (Holley and Williams, 1996).

METHODOLOGY

Two plant species of medicinal importance were selected for carrying out tissue culture for multiplication in the present study.

Albizia amara Boiv. commonly known as "sigaraku" in Telugu vernacular belonging to the family Leguminosae, is a valuable economic and medicinal tree commonly found in tropical forests of India. Seeds of *A. amara* were generally used as a remedy for piles, diarrhoea, gonorrhoea and astringent (Chatterjee and Chandra Prakash, 1992). The flowers are externally applied to inflammation swellings, boils and ulcers. Leaves are useful in opthalmia (Thammanna and Narayana Rao, 1990). The powder of leaf is also useful as supplements for herbal cosmetic for hair maintenance. Tree yields gum and is used for treatment of ulcers (Kashyapa and Ramesh Chand, 1992). Wood is used for preparing tool handles, mallet heads, brake blocks and also employed for carving, turney, cabinets and agricultural implements (Gamble, 1987). Molluscicidal activity was shown by the extracts of A. amara seeds (Ayoub and Yankov, 1986).

Cassia alata L. (seven golden candle sticks) is an ornamental, tall spreading and drought tolerant shrub belonging to the family Caesalpiniaceae. It is a native of West Indies introduced into India. *C. alata* is well reputed for its uses in Ayurveda and extensively used in traditional indigenous systems of medicines as a remedy for number of disease like itching, cough, asthma, bronchites, leprosy, various skin diseases, and snake bite.

The information on folk medicine uses of local plants was obtained through interviews with traditional healers in the study area. The plants were identified by authors with the help of related literature (2-4). Data on the local name of plant, their uses, part used, other ingredients added (if any), method of preparation and modes of administration were recorded for each claim. Voucher specimens are deposited in the Botany Departments, S.V.University, Tirupati.

The nutrient media used in the present study were Murashige and Skoog (MS) medium (1962), Llyod and Mc Cown's (1980) Woody Plant Medium (WPM). Gamborg's (B5) medium (1968) and White's medium (1954). Histological studies were made as per the method outlined by Johansen (1940) and Raghuramulu *et al.*, (1983) to examine the nature of shoot organogenesis from explants.

Determination of clonal purity : Studies on Isozymes of peroxidase were carried in the *in vitro* regenerated plants and mature parent plants and comparison was made. The method of Reddy and Garber (1971) was followed for the preparation of enzyme extraction. The protein was estimated by Lowry's method (Lowry *et al.*, 1951). The vertical slab gels were prepared as described by Van Eldic *et al.*, (1980). The stacking gel was made with 4% polyacrylamide and the separating gel was made with 12% polyacrylamide.

RESULTS AND DISCUSSION

The plants are listed in alphabetical order of the botanical name, followed by family, vernacular (local) name and brief notes on methods of preparation and administration. Most of the remedies consists of single plant species. However, in many cases recipes are made up of two to five different plant species and ingredients of no-plant origin. Moreover, the same plant can be used for more than one disease and a single disease may be treated by several plant species. In such cases it would be difficult to know which

plant is actually more effective to particular ailment. Plants and plant parts are used in different dosage, forms the most common being fresh juice, decoction, infusion and dry powder. External applications of drugs are indicated for ailments like cuts and wounds, dermatitis, sprain and swelling. Sometimes the drug is taken by chewing and smoking of particular plant part. Traditional knowledge of herbal medicine is transmitted orally from one generation to another. Because of rapid urbanisation, the land area available for wild species is reducing every year. Hence, it is high time to document the knowledge of this traditional medicine. The therapeutic values of plant species reported by Natuvidhyulu required modern scientific studies to establish their safety and effectiveness.

The explant source has been one of the important factors that greatly affects the frequency of plant regeneration. In general, however, the effect of BAP was slightly more pronounced than the effect of kinetin both in terms of days of bud break as well as mean number of shoots produced per explant. The dependence of explants on various cytokinins for bud break response and shoot multiplication has already been established (George and Sherrington 1984). In the present experiment, a lower concentration of IBA was employed to achieve the high morphogenetic potential of axillary bud on MS medium. These findings are consistent with published results which show that successful *in vitro* propogation of various species accompanies the use of low concentration of auxin or a high concentration of cytokinin (Sudhersan, 1998).

After 4-6 weeks, when the regenerated shoots attained a length of more than 3 cm, they are transferred to half strength MS medium containing different concentrations of IBA and NAA (Table 2 and 3). Root primordia emerged from the shoot base 15-20 days after inoculation. The maximum frequency of rooting (85.2%) and number of roots (4.6 ± 0.2) per shoot was obtained on IBA $0.5 mgl^{-1}$. The root length was attained upto 4.2 cm after one month of inoculation (Fig.1C). All concentrtion of NAA showed comparatively less effect on frequency of rooting, number of roots per shoot and the root length. The regenerated plantlets showed good adaptation after transfer to liquid media containing half strength of MS medium. The plantlets retained in the medium for about seven days and subsequently transferred to plastic pot containing vermiculate covered with perforated polythene bags to maintain humidity. They were kept under culture room conditions for about one week (Fig. 1D). Later the plastic pots without polythene bags were transferred to the garden and placed under shade till the new leaf appeared. Then they were planted under normal garden conditions.

Similar observation were also reported in *Dalberzia latifolia* in which the shoot organisation got initiated from the peripheral cortical region of the callus (Sudhadevi and Nataraja 1987).

Isozyme (peroxidase) profile showed no variation between parent plants and *in vitro* raised plants (Fig. 1F). Direct shoot multiplication is preferable for generating true-to type plants to avoid chromosomal variations. This report helps to multiply elite genotypes of this useful medicinal plants which can be conserved in nature.

Table 1 : Stock solutions (g/l) used in preparing various media for micropropagation of *C.alata* and *A. amara*

Group	Compound	Murashige and Skoog (MS) Medium	Woody Plant Medium (WPM)	Gamborg (B5)	White's Medium
A	$NH_4 NO_3$	165.00	40	-	-
	KNO_3	190.00	-	250.00	8.0
	$Ca(No_3)_2.4H_20$	-	55.6	-	30.0
B	$K2SO_4$	-	99.00	-	-
	$Mg SO_4.7H_2O$	37.00	37.00	25.00	72.0
	$MnSO_4.4H_2O$	1.69	2.23	1.00	0.7
	$ZnSO_4.7H_2O$	0.86	0.86	0.2	0.3
	NH_4SO_4	-	-	13.4	-
	Na_2SO_4	-	-	-	20.0
C	KI	0.083	-	0.075	0.075
	$Cacl_2.2H_2O$	44.0	9.6	15.00	-
	$Cocl_2.6H_2O$	0.0025	-	0.0025	-
	Kcl	-	-	-	6.5
D	KH_2PO_4	17.00	17.00	-	-
	H3BO3	0.62	0.62	0.30	0.15
	$Na_2MoO_4.2H_2O$	0.025	0.025	0.025	-
	$NaH_2PO_4.H_2O$	-	-	15.00	1.65
E	Fe SO_4.7H–O	2.784	2.78	2.78	0.25
	Na2EDTA	3.724	3.73	3.725	-
F	Thiamin Hcl	0.10	0.10	1.00	0.01
	Pyridoxine Hcl	0.05	0.05	0.10	0.01
	Nicotinic acid	0.05	0.05	0.10	0.05
	Glycine	0.20	0.20	-	0.3
	Cystein	-	-	-	0.1
G	Myo-inositol	10.00	10.00	10.00	-

The final stock stolutions are 100 × in a volume of 100 ml. For preparing 1 litre of the culture medium 10 ml of each stock solution was used.

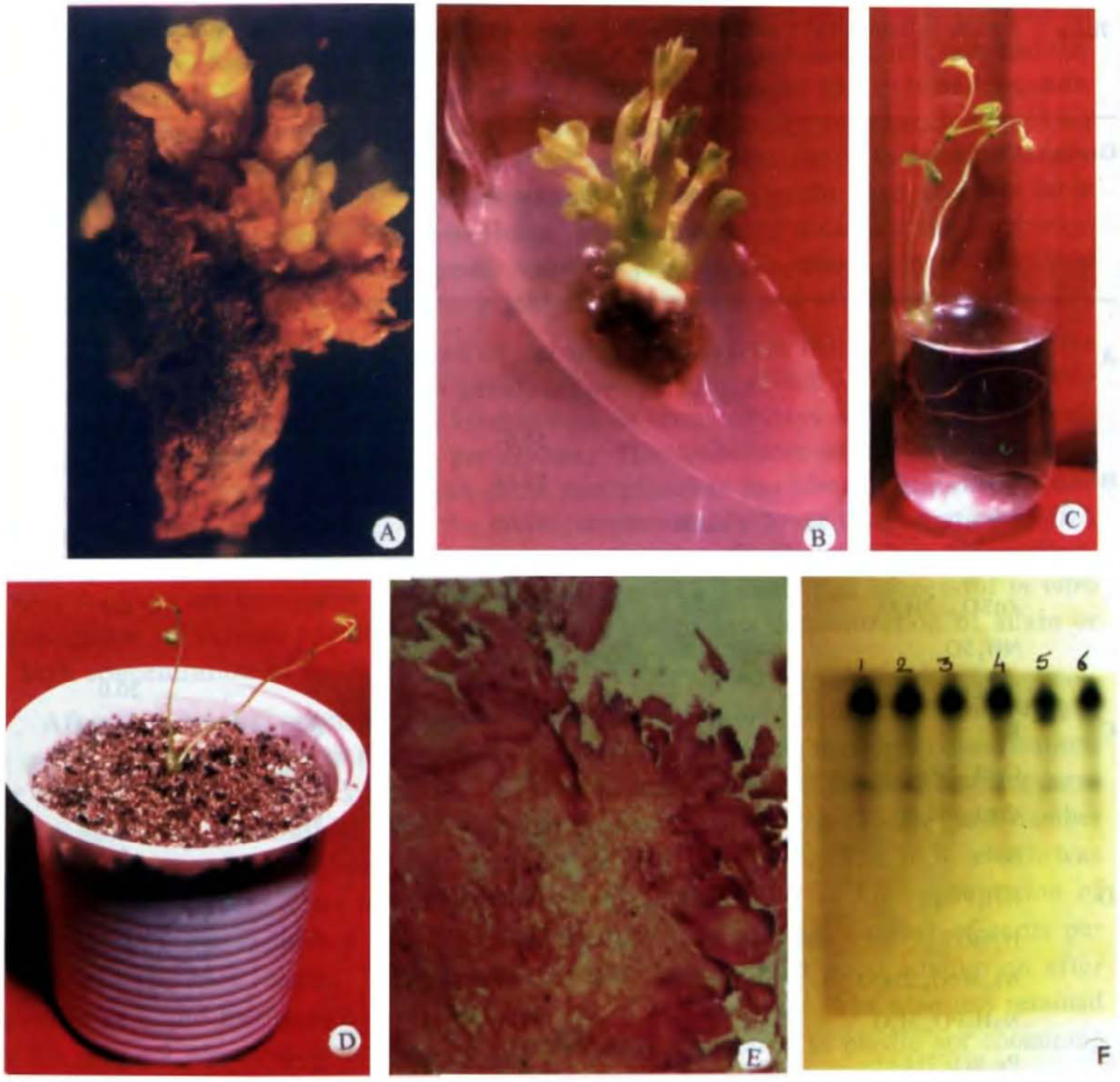


Fig. 1. *C. alata* :

A. Induction of multiple shoots from axillary bud on MS medium with 1.0 mgl^{-1}BAP + 0.2 $mg\ l^{-1}$ IBA.

B. Elongation of multiple shoots of MS medium with 1.5 mgl^{-1} kinetin + 0.2mgl^{-1} IBA.

C. Rhizogenesis of shoots on 1/2 strength MS medium with 0.5MGl^{-1} IBA.

D. Potted *In vitro* shoot regeneration from axillary bud

E. Histology of shoot regeneration from axillary bud.

F. Banding pattern of peroxidase isozyme in leaf tissues. 1-3 parent plant, 4-9 regenerated plant.

Table 2 : Effect of various combinations of PGR in MS medium on indirect shoot regeneration from hypocotyl callus of C.alata. Observations : After 6 weeks.

BAP	Kinetin	2-ip	IBA	NAA	Frequency of shoot regeneration (%)	Mean no. of shoots/ explant	Mean length of the Shoot (cm)
1.0	—	—	0.3	—	61.1±0.5	6.4±0.2	2.8±0.7
1.0	—	—	—	0.3	60.4±0.3	6.7±0.5	2.6±0.3
2.0	—	—	0.3	—	78.1±0.7	8.5±0.4	3.5±0.2
2.0	—	—	—	0.3	69.2±0.9	7.2±0.2	3.3±0.2
—	1.0	—	0.3	—	41.8±0.4	3.4±0.4	2.9±0.6
	1.0	—	—	0.3	46.3±0.5	4.2±0.2	3.0±0.1
	2.0	—	0.3	—	67.7±0.1	7.8±0.7	3.7±0.9
	2.0	—	—	0.3	60.9±0.3	6.9±0.2	2.5±0.5
	—	1.0	0.3	—	0.0	0.0	0.0
	—	1.0	—	0.3	10.6±0.7	1.4±0.4	0.9±0.7
	—	2.0	0.3	—	54.1±0.3	5.6±0.1	2.8±0.1
		2.0	—	0.3	48.9±0.1	5.1±0.9	1.9±0.8
2.0	1.0	—	0.3	—	60.4±0.5	5.7±0.3	2.4±0.3
2.0	1.0			0.3	56.7±0.6	6.3±0.6	3.1±0.2
2.0	—	1.0	0.3	—	51.6±0.4	5.1±0.4	1.7±0.6
2.0	—	1.0	—	0.3	49.8±0.2	5.9±0.1	1.2±0.9

Values are mean of 20 replicates.

± Standard error

The anatomical studies revealed that the formation of calli from the cut surfaces of axillary bud and the commencement of differentiation was marked by the appearance of the distinct cells with dense cytoplasm and prominent nuclei (Fig. 1E). Generally, these cells are located at subepidermal level as well as in the centre of the callus as in *Viola tricolor* (Babber and Sharma, 1991). In the present study the gathering of meristematic cells, i.e., meristemoids were marked at both the depths. The upper meristemoids, *i.e.*, cells about 3-4 layers possessing relatively larger size were differentiated to form shoots. This type of organisation represents the exogenous nature.

Table 3 : Effect of different concentrations of PGR in MS medium on induction of multiple shoots from axillary bud explants of A. amara. Observations : After 6 weeks

PGR (mgl^{-1})					Frequency of Shoot regeneration (%)	Mean no. of shoots/ Explant	Mean length of the shoot (cm)	Callusing
BAP	Kinetin	2-ip	NAA	IBA				
1.5	—	—	0.2	—	70.3^{b}	4.2^{b}	6.1^{a}	+
1.5	—	—	—	0.2	72.6^{a}	4.9^{a}	5.5^{b}	++
3.0	—	—	0.2	—	58.4^{b}	3.4^{d}	4.3^{ef}	+++
3.0	—	—	—	0.2	62.5^{c}	3.9^{c}	5.2^{bc}	++
	1.5	—	0.2	—	48.4^{g}	3.0^{f}	5.9^{a}	+
	1.5	—	—	0.2	50.3^{f}	3.2^{de}	5.3^{bc}	++
	3.0	—	0.2	—	56.8^{c}	3.4^{d}	5.8^{d}	+++
	3.0	—	—	0.2	47.1^{h}	3.8^{c}	5.2^{bc}	++
		1.5	0.2	—	58.4^{d}	2.9^{fg}	4.2^{e}	+
		1.5	—	0.2	62.3^{e}	3.1^{de}	4.5^{e}	+
		3.0	0.2	—	44.2^{i}	3.2^{de}	3.8^{g}	++
		3.0	—	0.2	34.9^{j}	2.8^{fg}	3.6^{g}	++

Values represented above are the mean of 20 replicates.
No. of + indicates the degree of basal callus formation.
Mean values followed by the same letter are not significantly different at P 0.05
(Student Newman- Keuls Multiple Comparison Test).

ENDEMIC MEDICINAL PLANTS (Savithramma and Sulochana, 1998)

Sl. No.	Scientific Name & Family	Habit	Part used	Preparation / Administration	Used for curing diseases
1.	*Boswellia ovalifoliolata* Henry (Burseraceae)	Medium tree	gum : Oleoresin	Dissolved in water : drunk	Amoebic dysentery
2.	*Cycas beddomei* Dyer (Cycadaceae)	Low shrub	Pith	Crude stem floor : given with milk	Stomach ulcer
3.	*Pimpinella tirupatiensis* Bal (Apiaceae)	Herb	Tuberous root	Infusion : drunk	Aphrodisiac
4.	*Pterocarpus santalinus* L (Fabaceae)	Tree	1. Stem bark 2. Wood pices	1. Powder with soft porridge: eaten 2. Drinking water in wooden cup: drunk twice a day, dicoction: drunk	1. Diarrhoea 2. Diabetes
5.	*Shorea tumbuggaia* Roxb. (Dipterocarpaceae)	Large tree	Resin from trunk	Dissolved in water: drunk	Local incense & indegenous medicine
6.	*Syzygium alternifolium* Walp. (Myrtaceae)	Tree	Seed	Powder in water : Orally, 3 times a day after food	Diabetes
7.	*Terminalia pallida* Brandis (Combretaceae)	Tree	Fruit	Decoction : Drunk	Diarrhoea
8.	*Adhatoda vasica* L. (Acanthaceae)	Shrub	Leaves	Decoction, mixed with honey: oral	Whooping cough

Sl. No.	Scientific Name & Family	Habit	Part use	Preparation / Administration	Used for curing diseases
9.	*Aloe vera* L.	Herb	Leaves	Inner part mixed with sugar : Orally	Syphilis, gonorrhoea
10.	*Capparis zeylanica* L. (Capparaceae)	Climbing thorny shrub	Leaves Root bark Root paste	1. External application 2. Decoction 3. Rub with water	1. Boils, skin erruptions & piles 2. Cholers 3. Anthelmintic
11.	*Cardiospermum canescens* Wall. (Sapindaceae)	Climbing Tendril bearing herbs	Entire plant	Juice squeezed into ear	Ear aches & foul smell in the ear
12.	*Cassia fistula* L. (Caesalpiniaceae)	Small tree	Stem bark Root Pod Young leaves	1. Maceration : drunk 2. Maceration : drunk three times per day 3. Pulp mixed with almond oil 4. Juice-drunk	1. Back aches 2. Asthama 3. Thoratic obstructions 4. Ring worms
13.	*Celastrus paniculata* Willd. (Caelastraceae)	Climbing shrub	Seed	Oil extraction: external application	Leprosy & Chronic wounds
14.	*Clerodendrum serratum* L. Moon. (Verbenaceae)	Tree	Root	Decoction with ginger & coriander	1. Nausea, fever & dyspepsia

Sl. No.	Scientific Name & Family	Habit	Part use	Preparation / Administration	Used for curing diseases
15.	*Crotalaria medicaginea* Lamk. (Fabaceae)	Herb	Entire plant	Decoction	Tribals used general problems
16.	*Entada pursaetha* DC. (Mimosaceae)	Gigantic climber	1. Seed 2. Bark	Ground into paste with water juice	1. Hair wash, Fish poison and glandular swellings 2. Ulcer
17.	*Givotia rottleriformis* Griff. (Euphorbiaceae)	Tree	Seed	Paste : externally as ointment	Psoriasis
18.	*Glycosmis pentaphylla* Correa (Rutaceae)	Shrub	Leaf	Paste in oil or water : external Application	Rheumatic & Joint pains
19.	*Gmelina arborea* Roxb. (Verbenaceae)	Tree	1. Fruit pulp & Bark	Powder : oral	Diarrhoea
20.	*Gymnema sylvestre* R.Br. (Asclepiadaceae)	Large climber	1. Leaves 2. Root	1. Powder or chewing or Infusion 2. Paste or Macerate : drunk	1. Diabetes, increases secretion of urine, activate uterus 2. Scorpion sting & poisonous bites

Sl. No.	Scientific Name & Family	Habit	Part use	Preparation / Administration	Used for curing diseases
21.	*Helicteres isora* L. (Sterculiaceae)	Shrub	1. Root 2. Seed	1. Decoction: mixed with turmeric powder and applied externally 2. Aqueous extract drunk	1. Cuts and wound
22.	*Momordica cymbalaria* Fen (Cucurbitaceae)	Trailing plant	Fruit	Raw-orally	Diabetis
23.	*Mimusops elengi* L. (Sapotaceae)	Small evergeen tree	Leaves	Powder in milk: drunk twice a day for 40 days	Diabetis
24.	*Ochna gamblei* Brandis (Ochnaceae)	Small tree	1. Leaves 2. Root	1. Decoction 2. Decoction	1. Poultice in lumbago ulcer 2. Menstrual complaints poisonous bites and asthma
25.	*Pouzolzia indica* (L.) Benn. (Urticaceae)	Herb	1. Leaves 2. Plant	1. Juice decoction	1. Gangrenous ulcers 2. Stomach-ache, syphilis, gonorrhoea snake poision.
26.	*Randia dumetorum* Lamk. (Rubiaceae)	Large shrub	Bark	1. Infusion 2. External application : paste	1. Abortifacient, diarrhoea and dysentery 2. Rheumatism, boneache

Sl. No.	Scientific Name & Family	Habit	Part use	Preparation / Administration	Used for curing diseases
27.	*Semecarpus anacardium* L. (Anacardiaceae)	Tree	1. Nut 2. Barkgum	1. Burnished and applied to osuteri and nut oil 2. External application	1. Abortion, piles skin diseases nerves debility 2. Leprous nodules
28.	*Shorea talura* Roxb. (Dipterocarpaceae)	Tree	Resin	Direct application	Astringent
29.	*Solanum pubescens* Willd. (Solanaceae)	Large shrub	Fruit	Mixed with vegetables	Blood Pressure & Anti diarrhoeal
30.	*Thevetia peruviana* Schum. (Apocynaceae)	Large shrub	Seed	Powder	Cardiovascular diseases, high dosage : Suicidal

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