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ENVIS Newsletter
Forest Genetic Resources &
Tree Improvement

VAN VIGYAN



INSTITUTE OF FOREST GENETICS AND TREE BREEDING
(Indian Council of Forestry Research and Education)



From the
Director's Desk

The ENVIS Resource Partner at IFGTB brings out precise information on tree genetic resources, their importance and utilization aspects, various tree improvement activities being carried out and species-specific methodology to cultivate in large or small land holdings. We also provide hands-on training through the Green Skill Development Programmes supported by the Ministry of Environment, Forest and Climate Change (MoEF&CC) to enable India's youth to secure gainful employment and/or self-employment. The present issues contain article on *Terminalia bellirica*, a multi-purpose Non-Timber Forest Produce, information on the celebration of days of international and national importance, and educational and extension activities related to forest genetics and tree improvement. We look forward to your feedback and suggestions.

Dr C. Kunhikannan
 Director, IFGTB

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Know Your Trees - *Terminalia bellirica* (Gaertn.) Roxb.

Taxonomy and Nomenclature

Terminalia bellirica belongs to the family Combretaceae. The synonym of the species is *Myrobalanus bellirica* Gaertn. The vernacular names are Baheraa, Bhayraa (Bengali); Bastard myrobalan, Behere, Belleric myrobalan (English); Baheda, Bahedaa (Hindi); Santi, Thani, Thare (Kanada); Taanni, Taannikka (Malayalam); Beda, Beheda, Berda (Marati); Taanni, Taanrikkaay, Thandri, Thaanri, Thani (Tamil); Tadi, Tani, Thandra (Telugu).

Distribution and Environmental Condition

It is widely distributed in Nepal, India, Sri Lanka, Burma, Thailand, Indo-China, and throughout Malesia, but is apparently absent in the Philippines and New Guinea. *T. bellirica* occurs scattered in deciduous forest, in dry regions associated with teak, sometimes in considerable numbers. It is seldom found in evergreen forest (Hocking, 1993). *T. bellirica* a deciduous tree distributed in Maharashtra, West Bengal, Madhya Pradesh, Uttar Pradesh, Assam, Tamil Nadu, Rajasthan, Karnataka, Kerala, Gujarat, Punjab, and Andaman and Nicobar Islands. *T. bellirica* is fairly common in monsoon forest, mixed deciduous forest or dry deciduous Dipterocarp forest, on periodically dry soils. It has a wide ecological range, but does not grow above 600 m altitude. The species is light-demanding, but is somewhat shade-tolerant in youth. It is fairly sensitive to frost, though



seedlings can survive, particularly when covered with grass; it is moderately drought-tolerant. In its natural area of distribution, mean annual precipitation varies from 1000 to over 3000 mm. It is capable of growing on different type of soils, but is attains best development on loose well drained soils, such as sandy loam as well as clayey loam. The species prefers periodically dry soils.

Botanical Descriptions

T. bellirica is a handsome tree, with characteristic bark and obscurely 5-angled fruits. Leaves are alternate, broadly elliptic or elliptic-obovate, puberulous when young but glabrous on maturity and the nerves are prominent on both surfaces. Flowers are in axillary, the flowers are solitary, simple, axillary spikes longer than the petioles but shorter than the leaves. Calyx lobes are pubescent outside. The fruits are green and inflated when young and yellowish and shrink (nearly seen as ribbed) when mature. The ovoid, yellow to orange brown fruits are 2.5 to 4.0 cm long, usually 5-angled when dry. Stone very thick, bony,

obscurely angled, rough, grooved, having gum vessels on the wall. The nut is stony.

Reproductive Biology and Breeding System.

The species flowers in October-November and fruits in November-December. The tree sheds leaves in November with young leaves appearing together with flowers. Animals eat fruits, thus dispersing the seeds. In Java, flowering takes place in October-November, fruits are set in February and ripen in August-December. Trees are leafless for a short period (some weeks) in the dry season. Pollination is done by insects, as the flowers have unpleasant odour, which attracts flies. Dispersal of seeds is by many animals, both arboreal and terrestrial ones like deer and goats. The stones in the fruits are often completely disorganised by ruminants, aiding in such dispersal, but the seeds are often destroyed by rodents and insect pests.



Genetics and Tree Improvement

Seed Collection, Processing and Nursery Techniques

Time of collection: January to March is the best period for fruit collection, with January harvests yielding optimum tannin content. The tannin content varies from 12 to 49 percent, although average tannin content is around 32 percent.

Grading: Grading generally consists of separating inferior fruit which constitute a second grade, the remainder being the first grade. The following grades are recognized, based on their origin. Bimlies (Bs) exported from Bimlipatam (Andhra Pradesh); Jabalpur (Js) exported from Jabalpur (Madhya Pradesh); Rajpores (Rs) exported from Kolhapur (Maharashtra); Vingloras (Vs) exported from Maharashtra and Coast Madras, or Madras, exported from Tamil Nadu forests. The myrobalans from Salem district (Tamil Nadu) are regarded as the best in the country for color and tannin content.

Processing: Collected fruit is sun dried. It is important to store the fruit properly as it easily rots. Crushed myrobalans and solid extract of myrobalans regularly enter the commercial trade. The extract is prepared in factories and is exported in solid blocks containing 50 to 60 percent tannin. Most tanners prefer to make their own liquors with 30-35 percent tannin content.

It flowers in April-June and fruit ripens from January-March and fall soon after ripening.



Seed Collection and Storage: Fruits are collected when they turn yellow. The seeds can be collected as soon as they fall on the ground, and are dried under shade. The seeds can be stored in gunny bags for one year but fresh seeds germinate quicker.

Seed Biology: The germination percentage of *T. bellirica* is around 60% and the plant percentage is 50%. Approximately a kilogram contains 250 to 350 seeds and able to produce 290 to 320 seedlings/kg. The germination will take place within 15-30 days after sowing (Negi and Todaria, 1997).

Pretreatment: The depulped seeds should be either treated by fermentation process for a period of 15 to 20 days, or the seeds may be clipped at its broad end and then soaked in water for a period of 2 days and then sown in nursery beds.

Nursery Technique : Germination is hypogeal (while other *Terminalia* species have epigeal germination), seedling with a long, thick, tapering taproot, an indistinct hypocotyl and thick fleshy cotyledons; first leaves opposite or alternate, small, subsequent leaves alternate and larger. Seedling growth is moderate during the first growing season, but this improves afterwards under good conditions. A long stout taproot is formed, and the young stem is erect. Young trees grow rapidly, and have a straight and erect stem; buttresses are formed in older trees (Naidu and Samy, 1995). Volume increment is moderate. In a closed stand the crowns are small and the foliage is thin; fruiting is sparse. When

growing in the open, crowns are dense, large and spherical, and fruiting is more abundant. Pre-germinated seeds are put in polythene bags of bigger size (at least 15" X 9".) since the root growth is comparatively faster. The nursery should be shaded against the sun. There appears to be some correlation between maximum tannin content of the fruit and the optimum germinative capacity (Naidu and Samy, 1995).

T. bellirica is usually propagated by direct seeding or nursery-raised container seedlings. Regeneration is plentiful within the natural and artificial stands but is affected by destruction of seeds by insects, birds and animals. Artificial regeneration in India has been achieved by direct sowing and transplanting of nursery-raised stock. Seed is sometimes broadcast to supplement natural regeneration. The root-shoot cuttings or stump planting give good results. Germination occurs within 10-45 days after sowing and the nursery phase is about 3-4 months. Through grafting also this species performing well especially in patch budding method.

Silviculture and Plantation Management

The species is a light demander and fairly drought resistant. It coppices well after pollarding especially if planted on a wide spacing. Spacing of 3-4 m apart in pure plantation is common. Good protection from grazing is required. Trees of *T. bellirica* planted in Java have a mean annual increment in height of 1.6 m and diameter of 2.1 cm at the age of 15 years. For good results, plantations have to be

established on fertile soils, and spacing has to be fairly wide. Mixed planting was tried, but *T. bellirica* out-competed other species fairly rapidly. Pruning wounds close well. As the timber value is marginal and *T. bellirica* production is poor in closed plantations, such planting is not advised. In India it has been found to react well to coppicing, but pollarding gave no good results; increment was found to be moderate. In experimental plantations in Java on good soil, trees had reached a height of 20-25 m in 15 years, after a few thinnings. *T. bellirica* has been introduced and become naturalized in Yunnan (China). It has been successfully grown at low altitudes in Mauritius, where it is no longer planted due to the susceptibility of the timber to wood borer attack. Except in India where taungya plantations are practiced, the species is rarely cultivated in its native range. The products are usually collected from the natural stands.

Agroforestry Practices

Normally this tree is not suitable nor preferred for agroforestry practices because of its large crown and creating shade effects to annual crops. In high altitude regions, farmers maintaining this species under the uncultivable areas and mainly in farm bunds.

Growth, Yield and Economics

The mean annual volume increment of a trial plantation of *T. bellirica* in Java planted at was 6 m/ha at the age of 15 years. However, in more open, mixed forest, attempts might be made to improve regeneration of this species, by sowing

seeds in favourable places, as was done fairly successfully in places in India for *T. chebula*. More research on regeneration, growth and development, and potential uses of *T. bellirica* is needed, as much less is known about this species as about chebolic myrobalan.

Important Pest and Diseases

The seeds and the timber are attacked frequently by borers. *Oxymagis horni* (Coleoptera) – Stem borer. *Zeuzera coffeae* (Lepidoptera) – Twig and stem borer.

Wood Properties/ Utilization

The timber seasons fairly rapidly to moderately slowly, with almost no degradation. Durability may be increased by steeping in water for some time. The timber is difficult to plane smoothly, but is fair in mortising, shaping and boring. Turning is reported to be poor. Pre-boring for nails is advised, to avoid splitting. Sanding works well. The timber absorbs much polish, and soon loses its lustre. Peeling is very easy, and veneer is good. Preservatives do not always penetrate well (Ginoga, 1996).

Food: The kernels of the fruit can be eaten but are somewhat dangerous as they have a narcotic effect.

Fuel: The tree yields a good-quality firewood and charcoal with calorific value of sapwood being 5000 kcal/kg.

Timber: The wood is whitish, rather soft, with a density of 675-900 kg/m³ at 12% moisture content; sapwood and heartwood are not

distinct with straight grains. The wood is steeped in water to make it more durable then used for making boxes, furniture and construction (Lemmens and Wulijarni-Spetjijtoed, 1995).

Medicinal Uses

Root bark, leaves, flowers, fruits, seed: metrorrhagia; laryngitis; ophthalmia; cough; heart disease; promotes hair growth; good for eyes; giddiness after excess eating. Root bark for tooth-ache and gum inflammation. bark: anemia; jaundice; leucoderma; dysentery. dried leaf: Indigestion. flower: splenomegaly; dysentery; chest pain; purifies blood; bronchitis. fruit rind: asthma; cough; laryngitis; bronchitis; cough; astringent. fruit flesh: lithiasis; dysuria; ophthalmia; asthma; cough; palpitation of heart; analgesic for pains and aches. flesh of ripe fruit: arthritis, ophthalmia. fruit powder: impotency; biliary infection; cholecystitis; indigestion; unproductive cough bronchitis. seed: bronchitis; emesis; giddiness; cough.

From the plant, sitosterol, gallic acid, ellagic acid, chebulagic acid, galloyl glucose and a number of free sugars have been isolated. The fruit pulp contains a non – nitrogenous crystalline substance. Kernels yield yellow fatty oil containing fatty acids. The seeds contain protein and oxalic acid, while bark contains tannin. Oxalic acid and tannins are isolated from the bark and kernel and its oil contains palmitic, oleic and linoleic acids as major fatty acids, A new cardiac glycoside-bellericin isolated which yielded glucose and galactose (2:1) sitosterol, gallic acid, ellagic acid, ethyl gallate, galloyl

glucose and chebulagic acid isolated from fruits (Lemmens and Wulijarni-Spetjijtoed, 1991; Valsaraj *et al*, 1997).

The seed oil or the paste of its fruit is applied externally on the swollen and painful parts. In skin diseases and premature graying of hair, the seed oil is applied with excellent results. The respiratory ailments, especially due to kapha, like cough, cold, hoarseness of voice and asthma, respond well with chewing the baked pieces of fruit. It works well as a mucolytic in such conditions. The fruit powder is beneficial in wound dressing to arrest the bleeding, if any (Anand, 1994; Misra, 1986; Shaila *et al.*, 1995).

Other Relevant Information

Fodder: The leaves are highly valued and extensively used as fodder. The farmers' lopp side branches, often sparing the main limbs to ensure good growth and future supplies of fodder. The chemical composition improves with the stage of maturity in leaves, which are on the whole considered to be nutritious, palatable and digestible. Leaves contain 9- 14% crude proteins and can be used to rear tussar silkworms (*Antherea mylitta*).

Dyestuff or tannins: The fruit produces tannins and dyes used for leather tanning, dyeing of clothes, matting and inks. The fruits are commercially used for tanning hides into leather, often in combination with other tanning materials. Beleric myrobalan is principally used in the production of sole leather. The fruits yield a dye that is occasionally used together with iron sulphate for dyeing black cloth and matting, as a

cheap substitute for indigo, and for preparation of ink. Food: The kernels can be eaten, but they possess narcotic properties. Lipids: The oil extracted from the kernels is used for hair-oil and in the manufacture of soap.

References

- Anand K. K. 1994. Hepatoprotective studies of a fraction from the fruits of *Terminalia belerica* Roxb. On experimental liver injury in rodents. *Phototherapy Research*. 8: 287-292.
- Ginoga B. 1996. Machining properties of nine wood species originated from West Nusa Tenggara. *Buletin Penelitian Hasil Hutan*. 14(2): 47-51.
- Hocking D. 1993. *Trees for Dry lands*. Oxford & IBH Publishing Co. New Delhi.
- Lemmens RHMJ and Wulijarni-Spetjptoed. 1991. Dye and tannin producing plants: Plant Resources of South-East Asia. No. 3. Pudoc Wageningen. Netherlands.
- Lemmens RHMJ, Soerianegara I, Wong WC (eds.). 1995. Plant Resources of South-east Asia. No 5(2). Timber trees: minor commercial timbers. Backhuys Publishers, Leiden.
- Misra, N. 1986. Mycoflora associated with stored fruits of *Terminalia bellirica* (Gaertn.) Roxb. *Proceedings Of The National Academy Of Sciences India*. Section B. 56(2): 157-159.
- Naidu, C.V, Swamy P.M. 1995. Seasonal variation of growth characteristics in some selected tree saplings. *Indian Forester*. 121(9): 797-801.
- Negi, A.K, Todaria, N.P. 1997. Effect of seed size and weight on germination pattern and seedling development of some multipurpose tree species of Garhwal Himalaya. *Indian Forester*. 123(1): 32-36.
- Shaila HP, Udupa AL, Udupa SL. 1995. Preventive actions of *Terminalia bellirica* in experimentally induced atherosclerosis. *Int J Cardiol*. 49(2): 101-6.
- Valsaraj R, Pushpangadan P, Smitt UW, Adersen A, Christensen SB, Sittie A, Nyman U, Nielsen C, Olsen CE. 1997. New anti-HIV -1, antimalarial, and antifungal compounds from *Terminalia bellirica*. *J. Nat. Prod*. 60(7): 739-42.

ENVIS ACTIVITIES

Green Skill Development Programmes Plant Tissue Culture Techniques & its Applications

The training programme (NSQF level 6) was for a period of 40 working days (320 hours) and the training module included theory (35%) and practical (65%). Field trips to various commercial tissue culture labs, bio-fertilizer production units, nurseries etc were arranged for the participants to provide a real time exposure on tissue culture. The participants were trained on various aspects of tissue culture which includes selection of explants, media preparation, sterilisation, culture initiation and maintenance, rooting, hardening; acclimatisation etc. 15 trainees from various part of the country successfully completed the course.



Forest Entomology and Pest Control

The training programme (NSQF level 6) was for a period of 27 working days (216 hours). Field trips to various insectariums, entomology labs, sericulture units, bee parks, farmers' fields etc were arranged for the participants to provide a real time exposure on entomology. The participants were trained on various aspects of forest pathology, forest entomology and management of pests and pathogens species infesting tree species, insect field biology, principles of management of social insect's etc. 15 trainees from various part of the country successfully completed the course.



Value Addition and Marketing of NTFPs – Bamboo Crafts

The training programme (NSQF level 5) was for a period of 50 working days (400 hours). Field trips to various bamboo processing units, bamboo tile factories, Uravu Indigenous Science & Technology Study Centre and various bamboo parks etc were arranged for the participants to provide a real time exposure on bamboo crafts. The participants were trained on various aspects of crafts making and gained experience in processing of bamboo with the help of various recent tools. 15 trainees from various part of the country successfully completed the course.



International Day of Forests 2022

As part of Azadi Ka Amrit Mahotsav (AKAM) and Ek Bharat Shreshtha Bharat (EBSB), IFGTB ENVIS commemorated the International Day of Forests 2022 on 21 March 2022 by organizing a digital awareness campaign through Facebook live. The main objective of the campaign is to create awareness among students and general public about the significance of sustainable forestry. As a part of this commemoration, a mobile photography competition on the current year's theme "Forests and Sustainable Production and Consumption" was also conducted to peoples of all walks of life from 01.03.2022 to 18.03.2022. An awareness poster highlighting the current year's theme was also released during the occasion and was digitally transmitted to students and all other stakeholders. The digital event can be accessed at <https://bit.ly/3N6F3QC>.





**ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement
Institute of Forest Genetics and Tree Breeding**
Ministry of Environment, Forest and Climate Change (Indian Council of Forestry Research & Education)
P.B.No. 1061, Forest Campus, R.S.Puram PO, Coimbatore - 641 002

INTERNATIONAL DAY OF FORESTS 2022

Theme: Forests and Sustainable Production & Consumption

Forest ecosystems constitute an integral part of life support system of more than 70 % of the population. Forests possess a stark uniqueness as regards their composition and resilience to natural changes. They receive maximum solar radiation and exhibit complex and intricately interdependent survival systems. Due to a wide range of species diversity, they are the storehouses of endemic genepools. India ranks sixth among the 12 megadiversity countries of the world. Sustainable forestry is about protecting the future of our biosphere, making sure we ' have fresh air to breathe, and clean water to drink. It is also about making a global economy sustain its needs for wood in the present as well as the future by adopting strategies that promote replenishment, jobs and a healthier greener environment, offering more forest space for biodiversity. It is also about ensuring the future of our forests, enhancing our wildlife habitat, and protecting water.

Benefits of sustainable forests



Enhances wildlife habitats



Provides Clean air



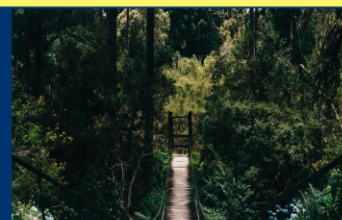
Combats climate change



Conserves soil



Provide economic benefits



Assures recreational values



Improves wood utilization



Protects water quality



Enriches medicinal values

Sustainable forestry balances the needs of the environment, wildlife, and forest

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World Wetlands Day 2022

As a part of Azadi Ka Amrit Mahotsav (AKAM) and Ek Bharat Shreshtha Bharat (EBSB), IFGTB ENVIS commemorated World Wetlands Day 2022 on 02.02.2022 by organizing an awareness campaign. The main objective of the campaign is to create awareness among students and general public about the significance of wetlands. As a part of this commemoration, an online awareness quiz on the current year's theme "Wetlands Action for People and Nature" was also conducted to peoples of all walks of life from 10.01.2022 to 31.01.2022. Both the events were registered in the worldwide events organized by World Wetlands Authority (www.Ramsar.org). 411 participants from different walks of life participated in the online awareness quiz and E Certificate awarded to all the participants. An awareness poster highlighting the significance of wetlands was released during the occasion and its digital copies were shared with all the stakeholders. Awareness handouts were disseminated to school children and general public. The awareness campaign can be accessed at <https://youtu.be/SXUSW6DrN1U>.





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In collaboration with



ENVIS RP on Wetland Ecosystems including Inland Wetlands
 Salim Ali Centre for Ornithology & Natural History (SACON)
 Coimbatore, Tamil Nadu



Jammu & Kashmir ENVIS Hub
 Department of Ecology, Environment & Remote Sensing
 Jammu & Kashmir

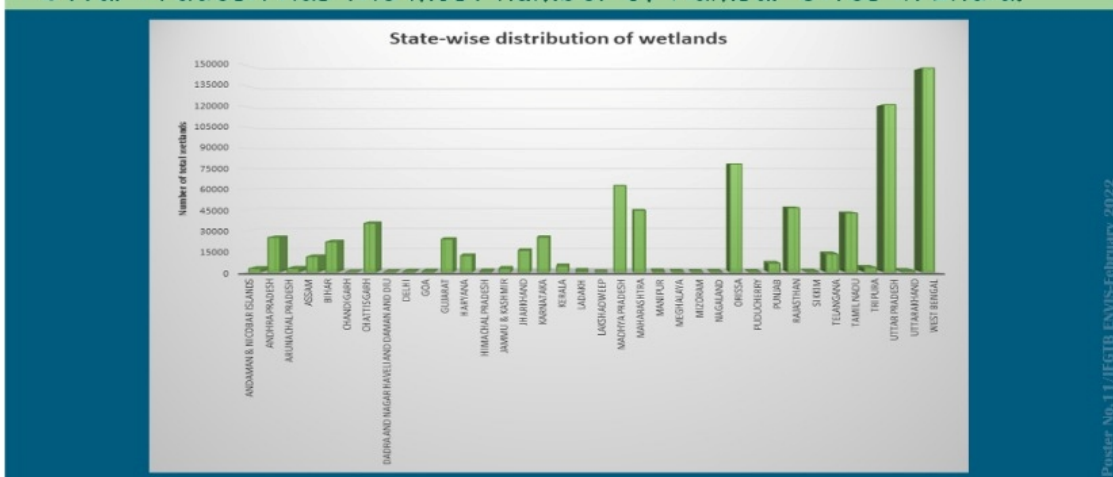
WORLD WETLANDS DAY 2022

Theme: Wetlands Action for People and Nature

Wetlands as Biodiversity Hotspots provide habitats for a large number of endemic, threatened as well as migratory species. Wetlands have intrinsic cultural value and are part of the cultural and religious fabric. Coastal wetlands like mangroves, coral reefs, mudflats and estuaries act as physical barriers limiting damaging effects of storm and tidal surges. They act as 'kidneys of landscapes', purifying water by locking up pollutants in their sediments and vegetation

India and Wetlands

- India nearly has 4.6% of its land as wetlands that cover an area of 15.26 million hectares.
- India became a party to the 'Convention on Wetlands', also known as the Ramsar Convention on 1st February 1982.
- There are 47 Ramsar sites in India. These are wetlands deemed to be of "international importance" under the Ramsar Convention.
- India has an area of 10,90,230 hectares under the list of Wetlands of International Importance.
- India stands first in South Asia and third in Asia in terms of number of designated Ramsar sites.
- Sundarbans is the largest Ramsar Site of India.
- Chilika Lake (Orissa) and Keoladeo National Park (Rajasthan) were recognized as the first Ramsar Sites of India.
- Uttar Pradesh has the most number of Ramsar Sites in India.



IFGTB PRODUCTS



INSTITUTE OF FOREST GENETICS AND TREE BREEDING

(Indian Council of Forestry Research and Education)

(An autonomous body of Ministry of Environment Forest & Climate Change, Govt. of India)
P.B. No. 1061, R.S. Puram, Coimbatore - 641 002. Tamil Nadu, India



The following Services are provided at IFGTB for various stakeholders. Please contact us for details as below.

Services		Cost per unit		Contact Number with Email ID
Clonal Seedling: For Sale & Booking				
1.	Clones of Casuarina Hybrids (CH-1, CH-2 & CH-5)	Rs. 4.50 per plant		Smt. K. Shanthi, CTO, Division of Plant Biotechnology, Phone : 0422 2484122 E-mail : shanthik@icfre.org
	Eucalyptus clones (EC-4, EC-6, EC-9 & EC-11)	Rs. 4.00 per plant		
2.	Tissue Culture Teak Plants Bamboos Plants	Rs. 55.00 per plant Rs. 25.00 per plant	Dr Rekha R. Warriar, Scientist - F, Division of Plant Biotechnology Phone : 0422 2484167	
3.	Windbreak Clones (WBC-1, WBC-2, WBC-3 & WBC-4)	Rs. 4 per plant		Dr. C. Buvanewaran, Scientist - G, Sliviculture & Forest Management Division, Phone : 0422 2484198, 94422 45047 E-mail : buvanesc@icfre.org
4.	ArborEasy® DNA Isolation Kit Pack Size	Price Rs.	Packaging & Transportation Rs.	Dr. Modhumita Dasgupta, Scientist - G, Division of Plant Biotechnology Phone : 0422 2484115 E-mail : ghoshm@icfre.org gmodhumita@gmail.com
	10 Reactions	950.00	150.00	
	20 Reactions	1900.00	200.00	
	50 Reactions	4750.00	300.00	
5.	Soil Testing (pH, EC, OC, Micro and Macro Nutrients)	Rs. 4750.00		Dr. A.C. Surya Prabha, Scientist - D, Sliviculture & Forest Management Division, Phone : 0422 2484150 E-mail : acsuryaprabha@icfre.org
6.	Phytosanitary Certificate	Rs. 100.00 + Tax per application		Dr. John Prasanth Jacob, Scientist - G, Forest Protection Division, Phone : 0422 2484157 E-mail : jacob@icfre.org
Products of IFGTB: For Sale & Booking				
7.	Hy-Act (Natural and Seed Oil Based Biopesticide)	Rs. 80.00 per bottle		Dr. N. Senthilkumar, Scientist - F & Head, Division of Chemistry & Bioprospecting Phone : 0422 2484193 Mobile : 9629160703 E-mail : senthilnk@icfre.org
	Tree PALH (Natural and Seed Oil Based Biopesticide)	Rs. 80.00 per bottle		
	Crawl clean (Plant Based Green Insecticide)	Rs. 25.00 per packet		
	Tree Rich Biobooster (Instant Organic potting mixture for home garden, terrace and kitchen garden)	Rs. 50.00 per packet		(or) Smt. R. Sumathi, CTO Division of Chemistry & Bioprospecting, Phone : 0422 2484144 Mobile : 9942245542 E-mail : sumathir@icfre.org
	Tara Red Jam (with natural fruit colorant)	Rs. 60.00 per bottle		

ABOUT IFGTB

Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore is a National Research Institute under the Indian Council of Forestry Research and Education. IFGTB envisions a wood secure society. The Institute primarily aims to carry out research to improve productivity of forest tree species through conventional breeding programmes and biotechnological interventions. The major areas of research include tree improvement, breeding, planting stock improvement, marker assisted selection, genomics, clonal propagation, agroforestry systems, climate change research, integrated disease and pest management, seed handling and testing, eco restoration and conservation.

ABOUT ENVIS

ENVIS established by the Government of India, in 1982 has been on providing environmental information to decision makers, policy planners, scientists and engineers, research workers, etc. all over the country. It is a comprehensive decentralized information system on environment involving effective participation of institutions / organisations in the country actively engaged in work relating to different subject areas of environment. A large number of nodes, known as ENVIS Centres, have been established in the network to cover the broad subject areas of environment with a Focal Point in the Ministry of Environment, Forest and Climate Change.

INSTRUCTIONS TO CONTRIBUTORS

Dear Author/Subscriber/Contributor,

We invite contributions to the ENVIS Newsletter issues! The ENVIS Resource Partner at IFGTB focuses on Forest Genetic Resources and Tree Improvement. It aims to act as a window for quality scientific publications and a forum for presenting your thinking on the challenges in the fields of FGRs and tree improvement. The ENVIS Newsletter, Van Vigyan, a quarterly publication, publishes original research articles, reviews, reports, research highlights, news-scan etc., related to the thematic area of the ENVIS Resource Partner. Original research and review articles, notes, research and meeting reports are invited for the newsletter. Details of forthcoming conferences / seminars / symposia / trainings / workshops also will be considered for publication in the newsletter. Articles may be sent in Times New Roman (with font size 12) in double spacing with a maximum of 5-6 typed pages. Photographs/line drawings and graphs need to be of good quality with clarity for reproduction in the newsletter. Only electronic submission will be accepted.

Details may be sent to: ifgtb@envis.nic.in.

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