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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

We in IFGTB are proud that we have contributed to tree cultivation outside forests and continue to render services to the tree growers. The farmers and wood based industries are in constant touch with the Institute and based on the problems raised by them, IFGTB steers its tree improvement programmes on different tree species to suit their requirements. One such long term improvement programme is that of tamarind, a common household name of the country. From being a food item, today it is one of the largest bulk NTFP, and a potential income source to the rural folk of the country. The ENVIS RP on FGRs and tree Improvement, in this issue, highlights the multifarious uses of tamarind, and the efforts taken to generate new varieties in the species. It is our continuous endeavour to be in touch with all research organisations, state forest departments, universities/colleges, wood based industries and farmer groups and use it as a platform to share meaningful information among stakeholders.

Dr S. Murugesan
Director, IFGTB

In this issue

Know Your Trees - *Tamarindus indica* L.

Taxonomic classification

Taxonomic description of *Tamarindus indica*

Kingdom – Plantae
Division – Magnoliophyta
Class – Dicotyledons
Order – Fabales
Family – Fabaceae
Genus – *Tamarindus*
Species – *indica*

Synonym

Tamarindus occidentalis Gaertn.
Tamarindus officinalis Hook.
Tamarindus umbrosa Salisb.

Vernacular names

In India, Tamarind is known by a wide variety of vernacular names: Tetuli (Assamese); Amli, Nuli, Textili Tentul (Bengali); Amali, Ambali (Gujarati); Ambli, Amli, Imli, (Hindi); Puli (Malayalam); Amli, Chinch, Chitz (Marathi); Koya, Tentuli (Oriya); Imli (Punjabi); Chinta (Telugu); Puli (Tamil).

Introduction

Tamarindus indica L. is a member of the dicotyledonous family Fabaceae (Leguminosae) and belongs to the subfamily of Caesalpinioideae. Tamarind is found throughout the tropics. It grows unattended in backyards, roadsides or wastelands (Gunasena and Hughes, 2000). It is suited for avenue plantings as a roadside tree, in and around villages as multipurpose trees for agroforestry systems. Tamarind is valued mostly for its fruit and pulp, which is used for a wide variety of domestic and industrial purposes. The pulp is used to prepare juice, jam, syrup and candy. The acidic pulp is used as a favourite ingredient in culinary preparations such as curries, chutneys, sauces, ice cream and sherbet.

It is a valuable timber species used in making furniture, tool handles, charcoal and fuel wood. The leaves are an important source of food and herbal medicine and the edible pulp of ripe fruits is used as flavoring agent in soups jams, chutneys, sauces, and juices.Tamarind seed is a by-product of the commercial utilisation of the fruit. A seed contains 46 to 48 % of a gel-forming substance and used as a stabiliser in ice cream, mayonnaise, cheese and also used in number of Ayurveda products. Tamarind seed kernel powder is used for thickening, stabilising gelling in food and sizing in textile industries.

India is the world's largest producer of tamarind products. In India it is largely cultivated in Madhya Pradesh, Bihar, Andhra Pradesh, Karnataka, Tamil Nadu and West Bengal. The annual export to the US exceeds 10,000 tons earning about 100 million Indian rupees. In India tamarind is cultivated in an area of 58000 hectares with a total production of 185 million tones. The average productivity of tamarind is 3.2 metric tones per hectare.

Botanical Descriptions

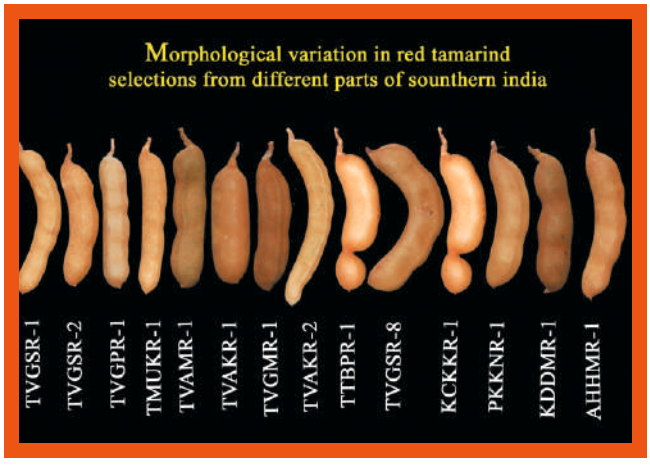
Evergreen tree grows up to 30 m tall with dense, spreading crown and short trunk. The leaves are up to 15 cm long, alternate and compound with 8-18 pairs of leaflets, each 1-3.5 cm long (Storrs, 1995). Flowers small, yellow streaked with pink, 5-10 together in 3-5 cm long inflorescences. Indehiscent pod, brittle, 5-15 cm long, more or less curved and constricted between the seeds. There are 1-10 seeds per pod, embedded in the sticky pulp. Seed is up to 18 mm long, irregular, reddish, dark brown or shiny black, with hard and smooth testa.

Although evergreen, the tree may remain leafless for short periods. Flowering normally occurs synchronous with new leaf growth. The flowers are probably pollinated by insects. The fruits develop during the rainy season and are ripe about 6 months later. The trees begin to produce fruits when they are 8-12 years old and may continue for 200 years (Purseglove, 1987).

Phenology, Reproductive biology and breeding system

Flowering normally occurs synchronous with new leaf growth,The inflorescence racemes are small, 5-10 (-13) cm long, terminal and lateral drooping, and often panicle. The flowers are bisexual and 2-2.5 cm in diameter. Pedicels are about 5 mm long, nodose and jointed at the apex. The bracts are cadaucous, fragrant and zygomorphic, nearly as long as the flower bud and are deciduous. There are 2, boat-shaped bractioles, 8 mm long and reddish in colour. Four sepals are up to 1.5 cm long, unequal, ovate and pink, cream or pale yellow. Five petals in total; the posterior and lateral ones are large and showy, slightly exceeding the calyx, they are obovate to oblong in shape, white, cream, pale yellow, or pinkish in colour, streaked with red, the anterior ones are much reduced. There are 3 fertile stamens; the filaments are connate and alternate with bristle-like staminodes to form a sheath, open above and inserted perigynously on the anterior part of the mouth of the calyx tube. Anthers are transverse, reddish brown and dehisce longitudinally. The ovary is superior and unicarpellary on a sheath coming from the posterior part of the calyx tube, it has up to 18 ovules and is oblique, curving upwards and is green with a long, hooked style (Purseglove, 1987).

Tamarind is protogynous, highly cross-pollinated and are probably pollinated by insects. The nectiferous flowers attract honeybees to collect nectar and pollen, so they presumably assist in cross-pollination. Flower bud development takes about 20 days from first



visible initiation. Peak anthesis takes place at 6.00 hrs and peak anther dehiscence at 10.30 hrs. Maximum stigma receptivity is on 10 to 11.30 hrs on the day of flower opening.

Soil

Tamarind tree can grow in a wide range of soils. It tolerates sodic and saline soils and grows in ravines and on degraded land. Tamarind thrives best in loamy, deep, well drained alluvial soil, which favours the development of a long tap root. The tree does not tolerate water-logging. The optimum pH for tamarind is 5.5-6.8, which is slightly acidic and also grows well in alkaline soils (FAO, 1988).

Climate

Tamarind grows best in maximum annual temperature ranging from 33-37°C with minimum of 9.5-20° C. It tolerates temperatures up to 47°C but is very sensitive to frost. It is mainly grown in areas with 500-1500 mm rain/year. High rainfall during flowering and fruit setting significantly reduces yield. Dry weather is very important for fruit development regardless of total annual rainfall. Tamarind can be grown in very dry areas with supplementary irrigation and can withstand up to 6 months without rainfall; this is due in part to its deep and extensive root system.

S.No	Character	Types
1	Pulp Colour	Red, Black, Brown
2	Taste	Sweet, Sour
3	Place	Cumbam (TN), Rahuri (MH), Karur urigam (TN), Kanga Devana palli (TN), Dever valimangalam (TN) Tumkur (KA)

Tamarind Varieties / Clones

S.No	Name of Tamarind Varieties / Clones	Remarks
1	PKM 1	Sour type, clonal selection Tamil Nadu Agricultural University
2	Urigam	Sour type, selection by Tamil Nadu Forest Department
3	Hasanur	Sour type selection by Tamil Nadu Forest Department
3	Tumkur	Sour type selection by Karnataka Forest Department
4	Prathisthan	Developed by Fruit research station, Aurangabad. Maharastra
5	DTS 1	Sweet type developed by University of Agricultural Sciences, Dharwad, Karnataka
6	Yogeshwari	Red type, developed by Karnataka Forest Department

Classification

Tamarind has wide variation in reproductive characters like flowering pattern, flower colour, fruiting behavior, fruit colour and acidity.

Season

The ideal planting seasons is June – July or September - October. If irrigation is available, field establishment may be undertaken at any time of the year, even in the dry season. However, it is advisable to provide partial shade to the newly established plants, if planting is carried out during the dry periods.

Pre sowing seed treatment

Soaking in cold water for 24 to 48 hours will help to hasten germination. Scraping the seed coat by rubbing on a rough surface to facilitate quick absorption of water also increases the rate of germination.

Seed propagation

Mature ripe pods should be collected from the high yielding selected trees during March-April by shaking the branches or by hand-picking. The pods should be dried in the sun and the seeds removed from the pulp by hand-kneading or washing in water. Washed seeds are then dried in the shade and stored in well-ventilated gunny bags or paper bags in a cool place. The best medium for seed germination is sand or soil mixed with cow dung. However, a normal nursery potting mixture containing three parts of red soil,

one part of sand and one part of compost, can be successfully used for germinating tamarind seed.

Seeds are sown in the nursery beds at a spacing of 20 to 25 cm in both directions. Seeds are normally sown at a depth of 1.5 cm and covered with sandy loam soil. Seedlings grow rapidly in the early stages and produce a long tap root which may reach 30 cm or more within 2 months of germination. Seedlings should attain a height of at least 80 cm before being transplanted to the field at the beginning of the rainy season.

Vegetative propagation

Vegetative propagation has the advantage of producing true-to-type progeny which can be taken from selected, superior, mother trees. Tamarind can be propagated vegetatively by stem cuttings, shield and patch budding or cleft / approach grafting on to seedling rootstocks and air layering.

Cuttings

The easiest and the cheapest vegetative propagation method of tamarind is by stem cuttings. Terminal soft wood cutting cuttings is preferred over hard wood cuttings. Cuttings collected from desirable genotypes, disinfected with 2% bavistins solution and treated with 1000

ppm of Indole Butyric Acid (IBA) in 10 seconds can be planted in polypropylene tubes containing vermiculite / perlite (1:1) and placed in a mist propagator with 70-80 % humidity.

Budding

Seedling rootstocks of 6-9 months old are deployed for budding. Patch of bud (with bark) removed from the root stock and same size of patch bark removed from selected superior tree, are wrapped firmly with a plastic tape. Budded plants are kept inside mist chambers for curing and better union formation.

Approach grafting

Seedling rootstocks 6-9 months old are used for approach grafting. A small section of bark (approx. 5-6 cm in length and 1-2 cm in width, depending on the size of the stem) should be removed from both the rootstock plant and the superior tree, at the same level, using the budding knife. The area of bark removed should be just deep enough to expose the inner tissue of the stem and allow close contact of this tissue between the two plants. The union of the two plants should then be bound firmly using grafting tape and waxed. The wax will prevent water entering the wound, as this may cause rotting. The wax will also increase the temperature and humidity around the union which will help in the healing process of the graft. The healing process in shoot grafting is usually longer than in bud grafting, and may take up to one month. Once the union is complete, the rootstock plant should be severed above the graft and the base of the 'superior' plant is removed below the graft. The grafted tree will now obtain nutrients from the soil using the root system of the rootstock plant (Swaminath and Ravindran, 1989).

Green wood cleft grafting

Tamarind seedlings can be raised in polythene bags containing pot mixture and allowed to grow to a height of 30 to 40 cm with a stem girth of 0.25-0.50 cm. Scion materials of 9 to 12 cm length collected from identified superior candidate plus trees is beheaded by retaining 15-20 cm of the semi-hard green wood. Vertical longitudinal split is made on the root stock about 4-5 cm deep in the centre of the beheaded green wood. Long gentle sloping wedge cut of about 3 to 4 cm is made at the basal end of the scion and inserted into the vertical slit made on the root stock and secured firmly with white polythene strip. The prepared grafts are placed in a mist chamber for better union formation. About 90 to 120 days old grafts is ready for planting. Best season for cleft grafting of tamarind is April to July.

Land preparation

The field should be ploughed twice or thrice to get fine tilth. The field should be levelled and pits of 90 cm^3 have to be dug out 30 days before transplanting. Pits are filled with top soil and 10 kg/pit of well decomposed FYM. Fifty grams of BHC 10% dust should be added to each pit and mixed with soil.

Planting

Square or rectangular system of planting can be adopted for establishing tamarind plantations. About 10-12 months old seedling / grafts with the height of 80 cm to 2 m grafted can be used field planting for better growth and survival. Nursery produced plants can be transplanted to the field at about 12-14 months, by which time they are about 80 cm tall. Spacing may vary depending to fertility of the soil, topography, rainfall and climatic conditions. In general three different spacing can adopted for planting of tamarind grafts *viz.,* 5 x 5 m, 6 x 6 m and 7 x 7 m and seedlings always planted in a spacing of 10 x10 m.

Staking

Immediately after planting some support is required to keep the plant straight and to bear the load of growing shoots. About 1 m long bamboo or wooden sticks should be used for staking and tie the plant at one or two places with coconut or jute strings to avoid bending and breaking of the plant.

Irrigation

Regular Irrigation promotes better growth during early establishment stages particularly during the dry seasons. Weekly irrigation is essential during 1-3 years and later years as the deep tap root system develops and water requirement becomes less. Flowering and fruiting is promoted by irrigation. In dry areas the use of water harvesting techniques during the rainy season should be considered as it encourages subsequent growth and fruiting. Mulching during the dry season will also help to reduce water losses due to evaporation.

After cultivation

The rootstock sprouts should be removed as and when they appear. The graft joint is to be examined after two months and if the wax cloth is intact without decomposition, it should be cut and removed. Shallow cultivations are essential to keep down weeds and to provide favorable conditions for plant growth.

Weed management

Regular weeding around the plant is also essential for early establishment and good growth. Intercrops cover crops are useful to control the weeds and to conserve moisture.

Agroforestry

Vegetables and legumes can be cultivated during first six years growth period to augment additional incomes and improve soil fertility.

Tamarind + Brinjal or Behndi or Tomato or Bhush beans Tamarind + Black gram or Red dram or Tamarind + Turmeric

Manures and fertilizers

Recommended dose of manure and fertilizer should be applied to tamarind plantation in two split doses coinciding with growth flushes and fruit development during April - May and September to October. The manure and fertilizer should be applied in trenches / small pits at 30-45 cm away from the main stems below the tree canopy at 10-12 cm depth and It should be covered immediately after application .

Pruning and Training

Tamarind is a compact tree and produces symmetrical branches. Pruning and training is very much essential during early growth period for formation of good canopy structure and fruiting branches. The tree should be pruned to

Age of the tree (Years)	Farm Yard manure (Kg/tree)	Urea (Kg/tree)	Super phosphate (Kg/tree)	Murite of Potash (Kg/tree)
1- 5	20	0.5	1.0	0.5
6 to 8	30	1.0	2.0	2.0
Above 9	50	2.0	3.0	2.0

allow 4-5 well spaced branches to develop in to main scaffold structure of tree. Bearing trees requires minimum pruning and other common maintenance pruning to removal of dead, weak and diseased branches. Regular pruning is being practiced in closed planted orchards to rejuvenate fruiting branches and maintain size of the trees.

Crop regulation

Cultivating 4-5 clones in orchards is recommended. Moderate pruning and soil drenching of Cultar @ 2000 ppm or Spraying of KNO_3 @2% is found effective for addressing the flowering and fruiting problems.

Maturity and harvesting

A seedling origin plantation may take more than 7-9 years to start bearing and reaches stabilised production 12 years after planting. However grafted trees will initiate into bearing in three to four years and stabilised production is achieved seven to eight years after planting. Under good growing conditions trees may continue to bear for over 150-200 years. Tamarind seed pods fill at maturity and the pulp becomes brown to reddish brown, the skin becomes brittle and cracks easily. Mature fruits have brown shells, while immature ones are green. Tapping them with the finger can help to identify the mature fruits. A hollow, loose sound will be produced as the fruit shrinks with maturity and the shell becomes brittle. Tamarind fruits are harvested by shaking the branches and the pods are collected on a mat. In sweet tamarind, the pods fetch a high price in the local market and are carefully harvested by hand picking. Sometimes bamboo ladders are used to pick the fruits. Generally, the fruits are left to ripen on the tree before harvesting.

Yield

The yield of tamarind varies considerably in different countries, depending on genetic and environmental factors. The fruit yields are influenced by environmental, genetic factors and size of the tree. Young tree yields 20-30 kg fruits per year, while full grown trees of 15 years age are yield 150 to 200 kg / tree/ year. In India, the average production of tamarind pods per tree is 175 kg and processed pulp is 70 kg /tree.

Tamarind Tree Improvement Programme

Tamarind plantations in India are mostly raised from seed origin and hence there is immense scope for selection of desirable traits. Several authors documented data on various accessions/clones/varieties of tamarind (Paules, 1975). 85 clones at Horticultural College and Research Institute Periykulam (TN) and 120 accessions at College of Agriculture, Pune (MH) were evaluated for qualitative and quantitative traits. The forest department of Karnataka identified 230 plus trees and planted forty trees in Karnataka for evaluation of agronomic characters in collaboration with University of Agricultural Sciences (UAS), Bangalore (Murthy, 1997). The department of forest, Govt. of AP, has

Detail of Tamarind Genetic Resources in IFGTB

S.No	Name of Trial	Location	Year	Clone/family
1	Progeny trial of Tamarind	Forest Campus	1996	13 family
2	VMG of Tamarind (T1)	Forest Campus	2001	24 clones
3	VMG of Tamarind (T2)	Forest Campus	2001	35 clones
4	VMG of Tamarind (T3)	Forest Campus	2002	24 clones
5	Tamarind Hybrid Trials	SFRI,Kolapakkam	2007	9 Hybrid combinations
6	Tamarind Hybrid Trials	Forest Campus,Coimbatore	2008	14 Hybrid combinations
7	Germplasm Bank of Red and Sweet Tamarind	Kurumpapatti, Salem	2010	47 red and 33 sweet clones

surveyed tamarind trees in Chittur and Ananthapur districts and they have recorded data from 52 identified trees.

Institute of Forest Genetics and Tree Breeding has initiated both short and long term mprovement programmes for *Tamarindus indica.* A comprehensive approach was attempted to study the variability and biology of the species. A survey was conducted in 1994 to identify the phenotypic variability in the Kanyakumari district of Tamil Nadu. Thirteen phenotypes were identified with distinct fruit and pulp characteristics. Open pollinated seeds were collected from selected phenotypes and a progeny trial has been laid out with 13 half sib families in a Completely Randomized Design at IFGTB Campus, Coimbatore.

Intensive survey was carried out in different parts of Tamil Nadu, Karnataka, Andra Pradesh and Puducherry to locate red and sweet tamarind genetic resources. About 36 red tamarind and 30 sweet tamarind trees were identified in different part southern India. All the identified tamarind trees were vegetatively multiplied through cleft grafting. A Germplasm bank of red and sweet tamarind at Kurumpapatti, Salem (RF) has been established. Also the best genetic resources selected by Tamil Nadu, Karnataka and Andhra Pradesh Forest Department are assembled at tamarind germplasm bank. At present IfGTB is maintaining 100 tamarind clones selected from different parts of country

Improving qualitative and quantitative value of tamarind clones is possible through hybridization. IFGTB initiated hybridization programme for qualitative improvement of high yielding tamarind clone. The main objective is to combine red colour (Anthocyanin) from red tamarind in to high yielding tamarind clones. Nine high yielding clones of tamarind were selected from clonal assemblages at Theni and Vaigai dam and control pollination was executed between high yielding clones and red tamarind. Hybrid trials were established at State Forest Research Institute, Kolapakkam and Forest

campus, Coimbatore, Tamil Nadu. Among different combination of hybrid progenies Vembrampattu 416(VEP 416) x Red Jayamangalam (RJ 403) found to be superior in qualitative and quantitative traits.

The institute is currently working on the *Evaluation of Promising Clones of Tamarindus indica L for Higher Fruit Productivity aimed at* multilocation testing of high yielding clones of tamarind for commercial release of clones. IFGTB is also executing an all India Co ordinated project on Tamarind for developing potential tamarind selections that are specific to industrial products. These "*single purpose selections*" coupled with precision silviculture techniques are to be deployed in farm, commercial and avenue forestry.

High productive sour, sweet and red tamarind clones will be released during 2026 for commercial cultivation in farm forestry. Development and testing of hybrid clones with desirable qualitative and quantitative traits will be the long term objective of tamarind improvement programs.

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A. Mayavel, J. Soosai Raj and B. Nagarajan.
Institute of Forest Genetics and Tree Breeding, Coimbatore

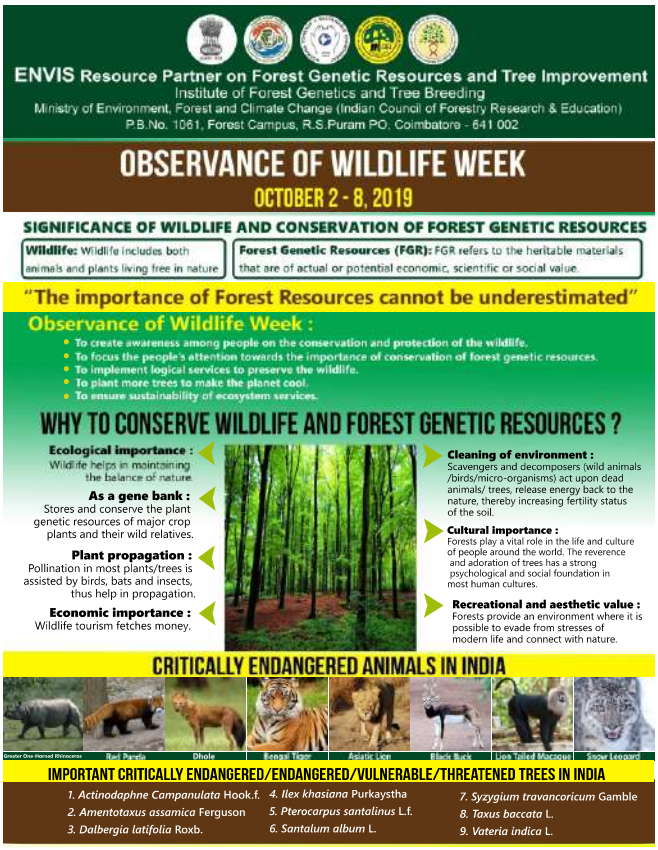
ENVIS ACTIVITIES

Observance of International Day for the Preservation of the Ozone Layer, 2019

ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at the Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore observed the International Day for the Preservation of the Ozone Layer 2019 on 16th September 2019 at IFGTB. The primary objective of the observance was to preserve the ozone layer from depletion by creating awareness among the students and general public. The programme began with an Invocation on Nature in Sanskrit by Dr Kannan CS Warrier, Scientist F and Coordinator ENVIS. Dr S. Murugesan., Director, IFGTB during his special address spoke on the importance of protection of ozone layer and the need to reduce the usage of ozone depleting substances. He also pointed out that various human interventions have resulted in changing the chemistry of the atmosphere on global level creating numerous environmental threats like ozone depletion, acid rain and climate change. He opined that healing of ozone layer could be possible only by the contribution from everyone. Dr Kannan CS Warrier explained the theme of the International Day for the Preservation of the Ozone Layer 2019 "32 years and Healing" and highlighted on the significance of Montreal Protocol. He also explained where our Country stands with reference to the phasing out of Ozone Depleting Substances. An awareness poster on the theme and the ozone timeline prescribed by the United Nations Environment Programme was released during the occasion. Short films highlighting the importance of the preservation of the Ozone Layer were also screened. Dr S. Vigneswaran, Programme officer proposed the vote of thanks. Awareness posters and handouts were distributed to students of various schools and colleges in and around Coimbatore for spreading the message on the importance of the protection of ozone layer. Awareness films on the importance of Ozone layer preservation were also screened in various schools.

Wildlife Week Celebration

The ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at IFGTB organized Wildlife Week Celebration on 04th October, 2019. The primary objective of the observance was to focus on the importance of wildlife conservation for a balanced and healthy environment. The programme began with an invocation in Sanskrit on the significance of conservation of nature and natural resources by Dr Kannan C.S. Warrier. Dr S. Murugesan, Director, IFGTB inaugurated the programme. During his inaugural address, he highlighted on the significance of wildlife week celebration which is being practiced since 1952 in India. He also pointed out the impacts of climate change in the wildlife habitats with an example of dwindling of vulture population in Tamil Nadu. He stressed on the role of every individual in protection of wildlife. Dr B. Nagarajan, Scientist G shared his experience in the management of captive elephants. Dr Kannan CS Warrier, Scientist F and Coordinator ENVIS elaborated on the ecological, cultural, investigatory, recreational, agricultural and economic importance of wildlife. He also explained India's rich and fascinating array of wildlife resources and measures taken by the Union Government to conserve wildlife. Though traditionally wildlife refers to undomesticated animal species, it includes all organisms living free in nature without introduced by human. And therefore, it consists of both animals and plants, he added. Awareness posters and handouts depicting the significance of conservation of wildlife and forest genetic resources were released and distributed to children of various schools and colleges in and around Coimbatore. Short films on the theme were also screened. Dr S. Vigneswaran, Programme Officer ENVIS proposed the vote of thanks.



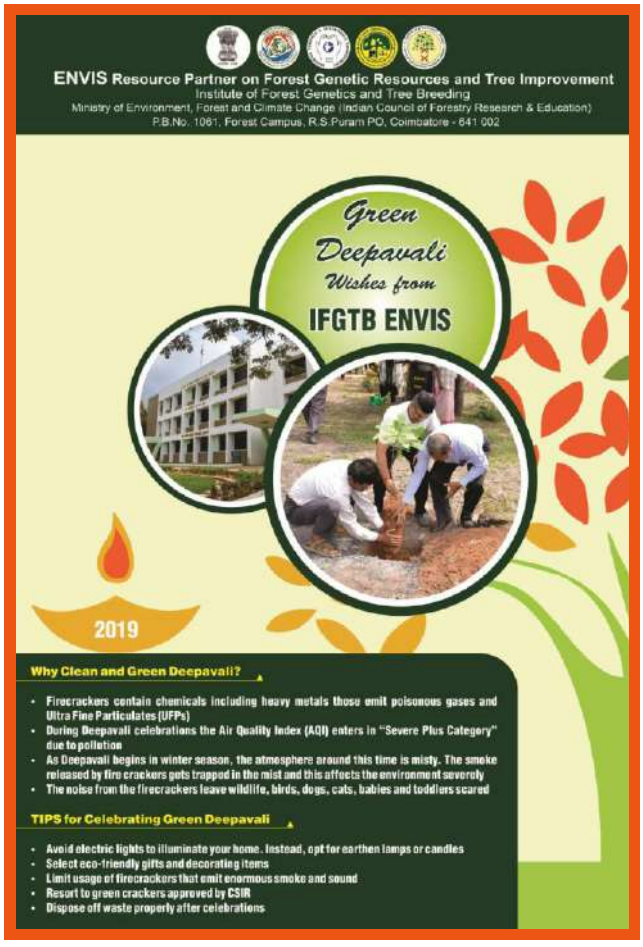
Book Published

IFGTB released a book '***Makathana Vilaichaltharaum Marasagupadi Muraigal***' (Tamil) during the Tree Growers Mela. This book deals with Tree Cultivation practices of selected and prioritized species for Tamil Nadu. Also a "***Digital App***" titled "***CYCUS-Casuarina Yield Calculation Utility Software***" was released during the program. This digital app was developed by Dr. C. Buvaneswaran, Scientist, SFM, Division, IFGTB. This application will be useful to the farmers for calculating yield in Casuarina plantations.

GREEN DEEPAVALI AT IFGTB

ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at IFGTB, Coimbatore organized an awareness programme to spread the message on celebration of **Green Deepavali**.

Dr. S. Murugesan, Director, IFGTB inaugurated the programme. He highlighted on the role of trees in combating air pollution and the need for planting multipurpose indigenous trees. Dr Kannan CS Warrier, Scientist F and Coordinator ENVIS spoke on Air Quality Index (AQI) and the ill effects of busting crackers during the festival as the AQI reaches to Severe Plus Category. He also elaborated on how Ultra Fine Particulates enter into human body on extended exposure to the polluted environment. Green Greetings on Green Deepavali Celebrations containing information on its need and the tips for celebrating the festival in a green way was released by the Director and was sent by email to all the members of IFGTB family, farmers and students in the ENVIS mailing list. Handouts of these Green Greetings were distributed to school students. Saplings of indigenous tree species including *Thespesia populnea, Neolamarckia cadamba, Ficus benghalensis, Gyrocarpus asiaticus* and *Syzygium cumini* were planted in the Institute premises by all the members of IFGTB family. Director IFGTB wished all a safe and Green Deepavali.



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,** ACTO, 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		
	Tissue Culture Teak Plants	Rs. 25.00 per plant		
2.	Windbreak Clones (WBC-1, WBC-2, WBC-3 & WBC-4)	Rs. 4 per plant		**Dr. C. Buvaneswaran,** Scientist- F, Silviculture & Forest Management Division, Phone : 0422 2484198, 94422 45047 E-mail : buvanesc@icfre.org
3.	ArborEasy® DNA Isolation Kit **Pack Size**	**Price Rs.**	**Packaging & Transportation Rs.**	**Dr. Modhumita Dasgupta,** Scientist-F, Division of Plant Biotechnology, Phone : 0422 2484123 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	
4.	Soil Testing (pH, EC, OC, Micro and Macro Nutrients)	Rs. 2850.00		**Dr. A.C. Surya Prabha,** Scientist-C, Silviculture & Forest Management Division, Phone : 0422 2484150 E-mail : acsuryaprabha@icfre.org
5.	Phytosanitary Certificate	Rs.100.00 + Tax per application		**Dr.John Prasanth Jacob,** Scientist- G, Forest Protection Division, Phone : 0422 2484159 E-mail : jacob@icfre.org
Products of IFGTB: For Sale & Booking				
6.	Hy-ACT (Natural and Seed Oil Based Biopesticide)	Rs. 80.00 per bottle		**Dr. N. Senthilkumar,** Scientist-E & Head, Division of Chemistry & Bioprospecting, Phone : 0422 2484193 Mobile : 9629160703 E-mail : senthilnk@icfre.org (or) **Smt. R. Sumathi,** ACTO Division of Chemistry & Bioprospecting, Phone : 0422 2484144 Mobile : 9942245542 E-mail : sumathir@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		
	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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