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From the Director's Desk

Greetings from IFGTB! Although the year 2021 is coming to the end, the COVID-19 pandemic has still not shown sign of better recovery. The year 2021 is rather challenging for all of us. Most of the planned activities were either cancelled or postponed. Despite the challenges in 2021, ENVIS-IFGTB is very grateful for the continuous support from MoEFCC to organize the Green Skill Development Programme. We conducted three trainings successfully during this period, training 65 unemployed youth. I would like to extend my appreciation to all those who have supported the ENVIS during this challenging time. Allow me to take this opportunity to wish all members and friends of IFGTB a prosperous new year in 2022.

Dr C. Kunhikannan
Director, IFGTB

Know Your Trees - *Terminalia chebula* Retz.

Taxonomy and Nomenclature

In the world, around 200 species of trees and shrubs of the genus *Terminalia* are distributed in the tropical and subtropical regions. In India, 20 species have been reported, which includes *T. alata*, *T. arjuna*, *T. bellerica*, *T. berryi*, *T. bialata*, *T. catappa*, *T. chebula*, *T. citrina*, *T. coriacea*, *T. crenulata*, *T. gella*, *T. manii*, *T. moluccana*, *T. myriocarpa*, *T. pallida*, *T. paniculata*, *T. parviflora*, *T. procera*, *T. tomentosa* and *T. travancorensis* (Srivastava, 1993; Parkinson, 1936 and Srivastav, 1996). Amongst these *Terminalia chebula* Retz. is one of the very important indigenous multi-purpose tree species. The synonyms are Zhang-Qin-Ge, Hezi (China); Myrobalan in dien (France); Myrobalane (Germany); Aralu terminalia (Srilanka); in India Haritaki (Bengali); Gallnut, Chebulic myrobalan, black myrobalan (English); har, hararh, harh, harra, harrar (Hindi); Aabhaya, amrita, hemavati, haritaki, jeevanti, sudha, vijaya (Sanskrit); Illagucam, kadakai, kadukhai, kolaippakku, Kadukkai (Tamil); karaka, karakkai (Telugu); Kadukka (Malayalam); alalai, allale, aralaikai, arili, halle, herrda (Kannada).

Distribution and Environmental Conditions

Terminalia chebula is moderate-sized deciduous tree, found in mixed deciduous forests of the sub-Himalayan tracts- West Bengal and Assam, ascending up to an altitude of 1,500 m in the outer Himalayas, Uttar Pradesh, Madhya Pradesh, and up to 900 m on dry slopes in the Western Ghats of Maharashtra, Tamil Nadu, Karnataka and Kerala. The tree is also reported in Sri Lanka, Nepal, Bangladesh, Iran, Egypt, Turkey, China and Myanmar (Khan *et al.*, 2015). Major associates are *Shorea robusta*, *Lagerstroemia*



parviflora, *Terminalia alata*, *Anogeissus latifolia* etc. It can grow in different environmental conditions. In natural habitat, the mean maximum temperature varies from 37°C to 48°C, absolute minimum temperature from 1°C to 15°C and annual rainfall from 750 to 3250 mm (Joshie and Narain, 1992; Troup, 1921). It is found on variety of geological formations and on laterite, clayey as well as sandy soil. The tree is a strong light-demander. The young plants, however, appreciate a certain amount of shade, and benefit by side protection from the hot sun. It requires less moisture, and is frost-hardy and drought resistant to a considerable extent. It also withstands fire and exhibits a remarkable power of recovery from scars and burns after a forest fire.

Botanical Descriptions

It is a medium sized tree with cylindrical bole and round crown with spreading branches. Bark dark brown, often with shallow longitudinal cracks, exfoliating in irregular woody scales. Leaves simple, opposite or sub-opposite, petioled, ovate-elliptic, obovate, acute or obtuse, entire, glabrous, lateral nerves 6 to 12 pairs; base usually rounded; petiole with a pair of large glands on the upper side near the top. Flowers small, cream-coloured, all bisexual, in axillary and terminal, often paniculate, spikes, with an

offensive smell; calyx-tube glabrous without and hairy within; lobes short sometimes obscure. Petals absent; stamens 10; ovary 1-celled. Fruit glabrous, obovoid-ellipsoidal or ovoid drupe, yellow to orange brown in colour, 5 angled when dry, glabrous, shining, hard when ripe; stone very thick and bony. The trees start shedding their leaves during November and by February-March the trees are usually leafless; but in moist places leaf-fall commences in February. The new leaves appear from March to May along with the flowers. The fruits ripen from October to March, depending upon the locality, and fall soon after ripening.

Reproductive Biology and Breeding System

Floral bud initiation take place in May. Flower opening starts in the morning hours between 7 to 8 and maximum flower opening ranges from 77.7 to 81.8 per cent. Anthesis occurs between 8 to 9 am. Stigma is most receptive between 9 to 14 hrs approximately one hour after anthesis. Pollen size ranges from 15.40 to 17.5 μm . *T. chebula* pollination is entomophilous and cross-pollination is effected mainly by 42 species of

insects (*Apis indica*, *Chilomenes sexmaculata*, *Drosophila melanogaster*, *Solenopsis geminata* and *Carpophilus hemipterus*). Honey bee (*Apis indica*) is the chief pollinator (Gargi and Sinha, 2017) The open pollinated condition of the fruit setting is around 5.8 to 7.4 % as against the 65.67% realized in manual xenogamous pollinations (Singh, *et al.*, 2018). It takes more than 240 days for fruit maturity and 25-30 per cent fruit may drop. Fruits fall to the ground when mature and dry, but wind is also instrumental in shedding fruits. The fallen fruits are mainly dispersed by animals and to some extent it may be dispersed by rain and seeds germinate depending on the soil condition (Singh, *et al.*, 2018).

Seed Collection, Processing and Nursery Techniques

The seeds collected after complete maturation are dried under shade. It is reported that the first half of January is the best time for collection. It germinates better if it becomes covered up with soil or debris. Germination takes place during rainy season, in some cases, not until the following year. The seeds can be stored in gunny bags for one year. But fresh seeds germinate quicker than seeds, which are 1-3 year old. Seed weight is 2.5 to 6g. Seeds are separated from fruits by breaking the stony endocarp with a hammer.





The germination capacity of the seeds is said to be low because of the hard endocarp thus, pre-treatment is recommended. Soaking the seed in cold water for 36 hours after clipping it at its broad end and then sowing in nursery beds under shade gives better germination (Bhardwaj and Chakraborty, 1994). Germination commences in 15 days and completes in three to four weeks. Sowing the de-pulped seed in pure sand beds after soaking in water for 24 hours was also found to be better. Germination and growth of seedlings of *T. chebula* were maximum when the seeds were soaked in cold water for 24 hours before 5-week stratification in cow dung. Seeds were treated with Bavistin and sown in sterilized soil/sand (1:1), and (2) surface sterilized with 0.1% HgCl_2 before culturing on MS medium containing 0.7% agar and sucrose at 24/20°C with a 16 hrs photoperiod. Refinement of the germination medium used is therefore required as the *in vitro* culture method is not suitable for routine use. Breaking the endocarp is a practical method of seed treatment when kernel was extracted from the hard seed coat resulting in the highest germination of about

73.6% which was significantly higher than all other pre-sowing treatments (Negi and Todaria, 1997; Sharma *et al.*, 1995; Singh, *et al.*, 2018; Singh *et al.*, 2020).

Sharma *et al.* (1995) tried 4 years old stock plants of *T. chebula* and using scion material from *T. chebula* superior tree in Himachal Pradesh for three grafting methods (cleft, tongue grafting and patch budding). Patch budding was successful, with growth starting 45 days after grafting, and producing 18 cm sprouts within 3 weeks, in contrast to seedlings which grew to 15-20 cm in 7 months.

Natural regeneration of *T. chebula* is poor due to its hard seed coat, thick shell and poor formation of kernel and vegetative propagation is quite successful. To enable early fruiting cleft grafting was very successful and it can be used for forming a clonal bank for this species (Singh *et al.*, 2020). Vegetative multiplication through seedling cuttings was tried and it was found that it rooted within 30 days, with no special treatments. Cuttings from the middle portion of the stem with 4000 ppm IBA treatment in the month of March gave rooting. Air layering was successful with 10000 ppm. IBA treatment in *T. chebula* showed 73.3% rooting (Bhardwaj *et al.*, 1993; Jose and Thomas, 1998; Misra and Jaiswal, 1994; Srivastava, 2000).

Silviculture, Plantations and Management

One-year-old seedlings can be planted out for better results. Direct sowing and stump planting also gave good results. However planting out of nursery-raised seedlings should be preferred to sowing. Wider spacing with not less than 8 m is better for good crown development and fruit production. The species has fairly well coppicing ability.

Agroforestry Practices

Terminalia chebula is a slow growing species and

takes nearly 10 years to flower and fruit. Therefore it has great potential to be an agroforestry tree, mainly in field boundaries. Trees are grown/ retained along the field bunds especially for collecting leaves for goats in Central India (Kumar, 1988).

Growth, Yield and Economics

Growth of the seedlings is very slow; attaining a height of 10-20 cm by the end of first season. The year's growth stops during November and new growth starts during March. The production of fruits varies from year to year. The quantity of seed produced by the trees varies considerably in different years. Trees seem to yield a larger crop of fruits when it is grown in the open fields or waste lands. A full grown tree yields an average 100 kg of fruits /tree/year and fruits are sold at the rate of Rs. 15-20 per kg. in the open market. The fruit also constitutes one of the most important vegetable tanning materials. The dried pulp surrounding the seed contains 35% tannin.

Important Insect-Pests and Diseases

A few pests have been reported on the species, but none of them cause any appreciable damage. *Uredo terminaliae* caused leaf rust disease on clonal plants of *Terminalia chebula* in a research nursery of State Forest Department, (Mohan and Manokaran, 2005). The larvae of *Trabala vishnou* (Castor Hairy Caterpillar) feed on the leaves. *Selepa celtis* also sometimes causes widespread defoliation, the midrib and stouter side veins being left untouched while feeding on large leaves. *Acanthopsyche moorie* also causes considerable damage to the leaves. Other minor defoliators are *Asura dharmia*, *Brassa alopha*, *Ascotis infixaria*, *Hyblaea puera*, *Teleclita strigata* and *Polyptychus trilineatus*. The beetle and larvae of *Attagenus alfieri* and A.

gloriosae attack dry stored fruits. Pathogenic fungi recovered on the species are *Uredo terminaliae*-attacking leaves, *Phyllactinia terminaliae*-causing powdery mildew and *Cercospora catappae*-causing leaf spots, *Phoma arcuata* producing brown spots on the leaves of *Terminalia chebula*. Fruit rot is caused by *P. citrinum*, *P. variable* and *P. frequentans*.

Genetics and Tree Improvement

Studies were conducted on three provenances (viz., Brahamapura-Philorhi, Salyo-Hathia, and Mandhna) of Haryana, to investigate the regeneration status. Field evidence indicated that fruit character is heritable as expressed in half-sib progeny trees that bear similar if not identical fruits (Singh *et al.*, 2003).

Shyamkumar *et al.* (2007) carried out genetic transformation in *T. chebula* using *Agrobacterium tumefaciens* strain C-58. Various experimental methods were followed for infecting the explants. In MS basal medium genetic transformation subsequent swelling response were observed in cotyledon and hypocotyl.

Verma *et al.* (2013) carried out *in vitro* regeneration of *T. chebula* to obtain complete plantlets from juvenile explants (hypocotyls and cotyledon). Dried seed were inoculated on MS medium after surface sterilization with Bavistin (0.2%) alone followed by HgCl₂ (0.1%), resulting in maximum (75%) germination. Hypocotyl showed 90% and cotyledon 75% callus induction on MS medium containing 1.0 mg 2, 4-D after 30 days house inoculation. Shoot regeneration was recorded only from cotyledonary callus on shoot induction medium comprising 1.5 mg BAP with 10 mg NAA with maximum (36.67%) shoot regeneration. Maximum (43.75%) rooting was reported in ½ strength MS medium with 0.5%

activated charcoal.

Wood Properties/Utilization

The sapwood is light greenish, yellowish or brownish grey, while heart wood is dark purple, grains are small and irregular. The wood is rather dull to lustrous with smooth feel, durable both in the open and in contact with water. The timber is classed as highly refractory. It is difficult to season, saw and work and finishes to a hard, smooth surface. It polishes well.

The timber is chiefly used, in South India, for construction, and as posts and beams; it is also used for carts, chiefly for the frames, axles and shafts. The wood has been found suitable for the manufacture of good quality tool handles.

The most important product from the tree is the fruit, known as the chebulic myrobalan, which constitute one of the most important vegetable tanning materials. The dried flesh surrounding the seed contains 35% tannin. The mature fruits, after collection, are dried in shade and graded for marketing. Myrobalans obtained from Salem district, Tamil Nadu are considered the best because of their high content of tannin and the paleness of the extract from them. It is exported in the form of whole nuts, crushed nuts and solid and spray dried extracts, which are used in tanning. Apart from its use as a tanning, myrobalans are employed in making ink and in dyeing as a mordant for the basic aniline dyes. It is used in tanning of leather and purification of petroleum. Leaves are used as fodder.

Medicinal Uses

Terminalia chebula is called as the “King of Medicine” in Tibet due to its extraordinary power of healing & treatment of asthma, bleeding piles, sore throat, vomiting and gout. *T. chebula* is listed at the top of the list of Ayurvedic

Materia Medica also (Bag *et al.*, 2009). Fruits are credited with laxative, stomachic, tonic and other alternative properties. It is useful in asthma, piles, fevers, diarrhoea, dysentery, indigestion, anaemia and cough. It is also useful in healing of wounds and scalds. It is used as gargle against inflammation of mucous membrane of mouth. It is one of the constituents of 'triphala' (three fruits-including *T. bellirica* (Bahera or Thanikka) and *Phyllanthus emblica* (Amla or Nellikka). It is a rasayana drug capable of imparting youthful vitality and receptivity of mind and sense organs. It is astringent, light, digestive, antiseptic, laxative, diuretic, and carminative. It promotes digestive power, heals wounds and ulcers, cures local swellings, skin and eye diseases, diabetes, chronic and recurrent fever, anaemia, cardiac disorders, diarrhea, dysentery and cough. It dispels diseases caused by the vitiation of *vata*, *pitta*, and *kapha* and is useful in spleen enlargement, vomiting and blood pressure. *T. chebula* has been found to be effective in treatment of simple constipation. The fruit powder used in dental caries of teeth, bleeding and ulceration of gums. Extracts of fruits inhibited HIV-1 protease activity by >70% at a concentration of 25 ml. It is also known to heal wounds and chronic ulcers (Dwivedi, 1999).

The edible tissue of *T. chebula* fruits contains 10.3 times more vitamin C and 14.5 times more protein and presence of 5% lysine increased the biological value of its protein. The fruits are rich in macro- and micro nutrients. The minimum Recommended Dietary Allowance for selenium, potassium, manganese, iron and copper minerals can be met if 100 g of the raw fruit is eaten. As a good *Rasayan* (rejuvenating) in Ayurveda, the fruits being used for all immuno-deficiencies since time immemorial. The

terminology used by Ayurvedic masters may differ but the results showed that it is being used for enhancing immunity. A US Patent No. 5 529 778 was awarded for Ayurvedic composition for the prophylaxis and treatment of AIDS, flu, TB and other immuno-deficiencies and the process for preparing the decoction (Grover *et al.*, 1997; Kim *et al.*, 1999).

***T. chebula* an important NTFP**

India is the main producing country of *T. chebula*. In India it is estimated that 100,000 tones of dry fruits of *T. chebula* are produced, in which 20% is exported to neighboring countries, Europe and U.S. Large sized fruits fetch higher price in the national and international markets and thus fruit size is an important characteristic. *T. chebula* freshly collected and dried immediately have yellowish color and fetch a better price. The demand for its fruit has increases tremendously, because of its medicinal value; its fruits are sold at a price of 10 to 20 per kg. *T. chebula* produced in Morni Hills and the adjoining part of Haryana is in great demand in Pakistan, Afghanistan, Iran, Iraq and other Gulf countries. Guleria *et al.* (2017) analyzed the economics of production of NTFPs: A case study of *T. chebula* in Himachal Pradesh, and found that the average establishment cost per year was Rs. 13550 100⁻¹ plants. The maintenance cost of grafted *T. chebula* increased from Rs.12241.78 to 123675.30 during 2nd year to 15th year and net returns varied from (-) Rs.12241 to 116262. The payback period worked out to be 9 years, NPV as Rs. 226106, the benefit-cost ratio as 1.57 and internal rate of return (IRR) as 33% under the present value summation method.

References

Barthakur, N.N. and Arnold, N.P. 1991. Nutritive value of the chebulic myrobalan

(*Terminalia chebula* Retz.) and its potential as a food source. *Food Chemistry* 40(2): 213-220.

Bhardwaj, S.D. and Chakraborty, A.K. 1994. Studies on time of seed collection, sowing and pre-sowing seed treatments of *Terminalia bellirica* Roxb. and *Terminalia chebula* Retz. *Indian Forester* 120(5): 430-439.

Bhardwaj, S.D., Chakraborty, A.K. and Joshi N.K. 1993. Vegetative propagation of *Terminalia bellirica* Roxb. and *Terminalia chebula* Retz. by stem cuttings. *Indian Forester* 119(5): 360-366.

Chetty, K.M. and Rao, K.N. 1989. Phytochemical comparison of endemic *Terminalia pallida* Brandis with *Terminalia chebula* Retz. *Indian Journal of Forestry* 12(2): 117-120.

Dwivedi, S.N. 1999. Traditional health care among tribals of Rewa district of Madhya Pradesh with special reference to conservation of endangered and vulnerable species. *Journal of Economic and Taxonomic Botany*. 23(2): 315-320.

Grover, I.S. and Bala, S. 1992. Antimutagenic activity of *Terminalia chebula* (myroblan) in *Salmonella typhimurium*. *Indian Journal of Experimental Biology* 30(4): 339-341.

Jose, P.A. and Thomas, J. 1998. An account of the vegetative propagation in *Terminalia chebula* Retz. *Indian Forester* 124(5): 357-359.

Kim, T. G., Park, M.S., Han, H.M., Kang, S.Y., Jung, K.J., Rheu, H.M. and Kim, S.H. 1999. Inhibitory effects of *Terminalia chebula*, *Sanguisorba officinalis*, *Rubus coreanus*

- and *Rheum palmatum* on hepatitis B virus replication in HepG2 2.2.15 cells. *Yakhak Hoeji*. 43(4): 458-463.
- Kumar, A. 1988. The genus *Terminalia* L. (Combretaceae) in Madhya Pradesh (India). *Journal of Economic and Taxonomic Botany* 12(2): 415-420.
- Lu, P., Liu, X., Li, X. and Weng, J. 1991. Studies on the chemical constituents of fruits of *Terminalia chebula* Retz. *Acta Academiae Mediciniae Shanghai* 18(3): 233-235.
- Misra, K.K. and Jaiswal, H.R. 1994. Effects of indole butyric acid on rooting of air layers of Arjun and Chebulic myrobalan. *Indian Forester* 120(2): 183-186.
- Negi, A.K. and 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.
- Sharma, K., Thakur, S. and Badiyala, S.D. 1995. First report on the propagation of *Terminalia chebula* Retz. through patch budding. *Indian Forester* 121(8): 760-761.
- Singh, V. 2000. Utilization of medicinal plants for wasteland. *Journal of Economic and Taxonomic Botany* 24(1): 99-103.
- Srivastava, R. K. 2000. Approach grafting: A new approach for the formation of clonal bank of *Terminalia chebula*. *Indian Forester* 126(3): 300-304.
- Pitamber, J. and Pratap, N. 1992. Bhimal: a multipurpose tree for agroforestry. *Indian Farming* 41(12): 14-15.
- Srivastava, P. K. 1996. Conservation of *Terminalia* genetic resources: the principal source of non-wood forest products in India. *Forest Genetic Resources*, 25:55.
- Srivastava, P. K. 1993. Pollination mechanisms in the genus *Terminalia* Linn. *Indian Forester*, 119:147-150.
- Parkinson, C. E. 1936. Indian *Terminalias* of section *Pentaptera*. *Indian Forester*, 1:1-26.
- Shyamkumar, B., Anjaneyulu. and Giri, C.C. 2007. Genetic transformation of *Terminalia chebula* Retz. and detection of tannin in transformed tissue. *Current Science* 92, 361-367.
- Verma, Y.S, Kanwar, K. and Bhardwaj, S.V. 2013. Regeneration and transformation studies in *Terminalia chebula* Retz. *Journal of Scientific and Industrial Research* 72, 563-571.
- Singh, N.B., Thakur, S., Sharma, K. and Sankanur, M. 2020. Genetic Improvement of Harar (*Terminalia chebula* Retz.). National Seminar on Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security (19-2 Sept, 2017), ICAR Research Complex for NEH Region, Umiam, Meghalay.
- Guleria, A., Tiwari, P. and Sharma, R., 2017. Cost of cultivation and economic feasibility of grafted Harar (*Terminalia chebula*) In Himachal Pradesh. *International Journal of Pure and Applied Biosciences* 5, 1005-1011.
- Singh, A., Srivastav, R. and Pandey, A.K. 2018. Effect of the seeds of *Terminalia chebula* on blood serum, lipid profile and urine parameters in STZ induced Diabetic rats. *Journal of Pharmacognosy and Phytochemistry*, 7(2): 01-05.

Wildlife Week 2021 Celebrations

As a part of Azadi Ka Amrit Mahotsav 2021, ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at the Institute of Forest Genetics and Tree Breeding, Coimbatore organized Wildlife Week 2021 Celebrations digitally through Facebook live on 07th October 2021. An online elocution competition was also conducted for students and public on the topic “Importance of Wildlife”. The celebrations attracted the attention of the Union Minister of Environment, Forest and Climate Change Shri Bhupendar Yadav. Results of the Online Elocution Competition held on the theme “Importance of Wildlife” were declared. Peoples from all walks of life have participated in the competition. Master R Shreyas, 1st grade,

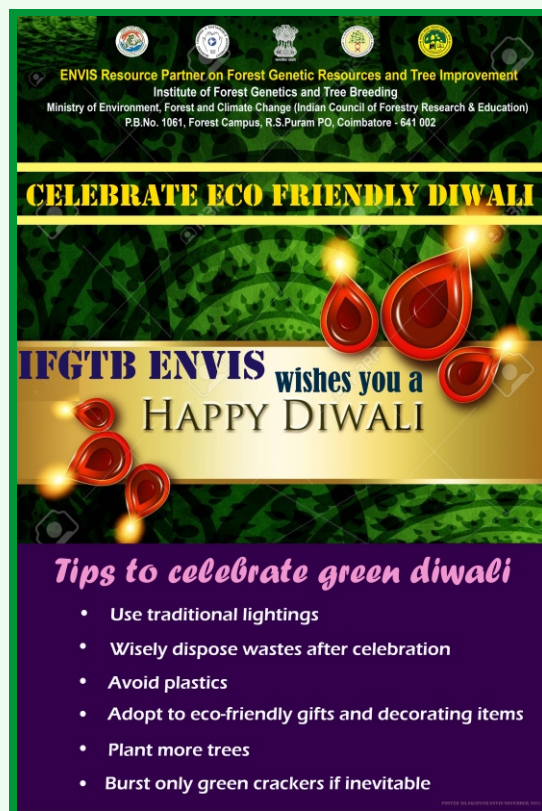
GRD Public School, Coimbatore, Ms. Kajal Sah, 10th grade Khanna High School for Girls, Kolkata and Ms Srishti R, 7th grade, GRD Public School, Coimbatore won the first, second and third prizes respectively. Elocutions of Baby. Anira V.S, 1st grade, Adrian Loyal School, Karur and Ms. Sonal Patel, University of Lucknow were awarded consolation prizes. Prizes were awarded to the winners and E Certificates to all the participants. An awareness poster highlighting the importance of wildlife conservation was released during the occasion and its digital copies were shared with students and all the stakeholders. The online event can be accessed at <https://bit.ly/33A4u8s>.



Awareness programme on Green Deepavali

The ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at the Institute of Forest Genetics and Tree Breeding, Coimbatore organized an awareness campaign on 03rd November 2021 to spread the message on celebration of Green Deepavali following mandatory protocol to contain the spread of COVID-19. Dr C. Kunhikannan, Director, IFGTB

inaugurated the event. Green Greetings on Green Deepavali Celebrations containing information on its need and the tips for celebrating the festival in a green way was released during the occasion and was electronically disseminated to students, public and all stakeholders.



Green Deepavali

Green Skill Development Programme (GSDP)

Plant Tissue Culture Techniques and its Applications

Green Skill Development Programme (GSDP) on “Plant Tissue Culture Techniques and its Applications” was organized by the ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement, IFGTB from 10th November 2021 to 31st December 2021. Dr C. Kunhikannan, Director IFGTB Director inaugurated the training programme. The training programme (NSQF level 6) was for a period of 40 working days (320 hours) and the training module included theory (30%) and practical (70%). 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. Lectures on entrepreneurship development and banking linkages were arranged to motivate them for seeking self employment. 15 trainees from various part of the country successfully completed the course and certificate from the Union Ministry of Environment, Forest and Climate Change (MoEFCC) was awarded.



Quality Planting Material Producer (QPMP)

Green Skill Development Programme (GSDP) on “Quality Planting Material Producer” was organized by the ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement, IFGTB from 22nd November 2021

to 31st December 2021. Dr C. Kunhikannan, Director IFGTB Director inaugurated the training programme. The training programme (NSQF level 4) was for a period of 30 working days (240 hours). The GSDP have been outlined to give a unique learning experience through focused interactions in the class room (30%) as well as hands-on exercises (70%). Green skills are

regarded as skills for sustainability which are related to the technical skills, knowledge, values and attitudes needed in the work to develop and support sustainable social, economic and environmental outcomes. The participants were trained on various aspects of seed technology, nursery management, production of nursery, management of clonal nurseries, methods of vegetative propagation, preparation of rooting media, plant growth promoting substances and their applications, bio-control agents, pest & disease management, bio-fertilizer production and production of quality planting stock on a large scale. Field trips to a commercial clonal

nursery, bio-fertilizer production unit, Forest College and Research Institute, Mettupalayam and Tamil Nadu Newsprint & Papers Ltd., Karur were arranged for the participants to provide a real time exposure on quality planting material production. Lectures on entrepreneurship development and banking linkages were arranged to motivate them for seeking self employment. 40 candidates from various part of the country completed the training and certificate from the Union Ministry of Environment, Forest and Climate Change (MoEFCC) was awarded.



Digital Observance of World Soil Day 2021

As a part of Azadi Ka Amrit Mahotsav (AKAM) and Ek Bharat Shreshtha Bharat (EBSB), ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at the Institute of Forest Genetics and Tree Breeding, Coimbatore commemorated the World Soil Day 2021 digitally on 03rd December 2021. An awareness event on the theme "Halt soil salinization, boost soil productivity" prescribed by the FAO of the United Nations was organized through Facebook live in order to contain the spread of COVID 19. The digital observance also found a place in the worldwide events organized by the FAO of

United Nations and also got the attention of the Ministry of Environment Forest and Climate change (MoEF&CC), Government of India. An Awareness Quiz on soil was also organized for students and general public. People from all walks of life have participated and E Certificate was also awarded to all. An awareness poster highlighting the current year's theme "Halt soil salinization, boost soil productivity" was released by Dr C. Kunhikannan, Director IFGTB during the occasion and its digital copies were shared with students and all the stakeholders. The online event can be accessed at <https://bit.ly/31opMI2>.



Observance of International Mountain Day 2021

As a part of Azadi Ka Amrit Mahotsav (AKAM) and Ek Bharat Shreshtha Bharat (EBSB), ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at the Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore organized an awareness campaign on the occasion of International Mountain Day 2021 on 11th December 2021. Dr C. Kunhikannan, Director, IFGTB inaugurated the event. An eco-tour to Nilgiri Biosphere Natural Park (NBNP), Anaikatti was organized for the students to provide real time exposure to the significance and conservation of forest genetic resources and their role in preserving the mountain ecosystems. In addition, an online painting competition on the theme “Sustainable Mountain Tourism” was also conducted for students and the general public as part of the

awareness campaign. Among the participants who took part in the competition from different parts of the country, Shri Kumar Arijit Mishra, DAV Public School, Odisha, Shri V. Arun, Coimbatore, Shri K. Shiti Shashikant, Karnataka, won the first, second and third prizes respectively. Consolation prize was awarded to Ms S. Shruthika, Kikani Vidhya Mandir, Coimbatore and Ms B. Divyadharshini, Chinmaya Vidyalaya, Chennai. Special prize was awarded to Aisha Panda, DAV Public School Odisha. Prizes were awarded to the winners and e-Certificates to all the participants. An awareness poster on 'Sustainable Mountain Tourism', the current year's theme identified by the United Nations was released and its digital copies were electronically disseminated to students, public and all stakeholders.



IFGTB PRODUCTS



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(Indian Council of Forestry Research and Education)

(An autonomous body of Ministry of Environment Forest & Climate Change, Govt. of India)

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	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 Bambooo 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. Buvaneswaran, 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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