



# IFGTB NEWS



Quarterly Newsletter on societal applications of **research Interventions in Forestry, Genetics and Tree Breeding** from the Institute of Forest Genetics and Tree Breeding, Coimbatore.

(A national institute of the Indian Council of Forestry Research and Education,  
Ministry of Environment, Forest & Climate Change, GOI)

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## From the Director's Desk



The International Day for the Conservation of the Mangrove Ecosystem is celebrated annually on 26 July. In this context, this issue of "IFGTB News" has mangroves as the theme, and highlights the habit changes in mangroves arising out of habitat changes in mangrove ecosystem. Two nursery technologies for establishing mangrove propagules by simulating the natural ecosystem conditions are also featured. Furthermore, the issue also highlights a farmer friendly mobile App developed for estimating yields in *Melia dubia* plantations, and a cotton facemask dyed using botanical extracts for use during COVID-19 pandemic. It is hoped that this issue enables wider dissemination of these technologies in addition to raising awareness of the importance of mangroves and promoting their sustainable management, conservation and use.

**Dr. C. Kunhikannan**  
Director, IFGTB



### Habitat changes?! Habit changes!! : Mangroves in critical state?

Utchimahali, M., Nagarajan, B., Chitra, P., Aswin, Y. and Haribabu, K.

Mangroves are the most valuable green capital to address climate change vagaries and mitigation. They serve as a bulkhead in guarding the coasts

during natural calamities such as storms and cyclones (see figure). Mangroves stand as the richest biological warehouse chain with incalculable net blue carbon credits. A hectare of undisturbed mangrove is worth 90,000 US \$/ hectare<sup>1</sup>. Ironically, this most important fragile tropical ecosystem, happens to be the most threatened biome as well. Biotic, abiotic and anthropocentric forces have cumulatively altered and continue to degenerate its structure, function and services<sup>2</sup>. Loss of global mangrove cover seems unstoppable, and is estimated to hardly last little over a century<sup>3</sup>. A major universal vortex to mangrove cover loss is upstream water diversion for agricultural purposes. In an agrarian perspective, many nations are of view that riparian water flow into sea as a wasteful draining process. However, fresh water influx plays a critical role in the intrinsic balance of the biological needs of critical ecosystems such as mangroves, sea grasses and coral reefs. Some of the current challenges that mangroves encounter are sub optimal fresh water flow, very high surface evaporation and hypersalinity. This situation slowly and steadily transforms the ecosystem to become antagonistic to its occupants.

Pichavaram mangroves (11°17'46"- 11°30'17"N; 79°45'34"-79°50'32"E) encounters one of the most

Mangroves are indispensable critical ecosystems. Biotic and abiotic pressures affect their structure, function and services. Dwarf phenotypes 0.5-1.5 feet in height with highly reduced crowns and scanty reproduction seems the resultant of hypersalinity at Pichavaram, Tamil Nadu.

dramatic salinity changes (0.6 – 32 %) in the country. Until the 1970s, the Cauvery delta region annually received 70 TMCs of water that eventually

got reduced to 3-5 TMCs in the late nineties. This certainly has overall implications on the structure, function and services of the ecosystem. In the last decade or so, local salinity changes is largely determined by the rates of monsoon precipitation rates.

Hypersalinity tremendously affects the physiology of plants both in the vegetative and reproductive phases. Slowdown in photosynthesis and terminal bud loss eventually leads to overall biomass reduction and ecosystem net productivity. In Pichavaram, the harsh hypersaline conditions has perhaps led to the development of dwarf phenotypes in *Bruguiera cylindrica* and *Ceriops decandra* (see figure). These phenotypes are with very few leaves and they hardly grow 0.5 to 1.5 feet in height, while their normal counterparts attain 2 m in mesosaline patches. The reproductive fitness and success of mangroves are severely constrained, in dwarf mangroves. While flowering lasts 8-10 weeks in the adjacent normal habits, the dwarfs flower only for a period of 2-3 weeks. These dwarfs also exhibit very high levels of pollen sterility, deformities and very high rates of flower and fruit abortions. The one or two propagules produced by these dwarfs are much smaller in size compared to the normal ones. It is important to notice that, unlike terrestrial plants, true mangroves reproduce through vivipary, a highly specialised breeding system, wherein the juveniles stay on the mother plants and obtain nourishment by a daily dose of fresh endosperm. This process of growing seedlings on mother plant takes over three months to one year, depending on the species.

Propagules from these dwarf mangroves are unlikely to regenerate profusely and meet the canopy filling requirements of the ecosystem.







*B. cylindrica*



*C. decandra*

However, dwarf mangroves are of potential value as adverse bio-indicators to monitor ecosystem degeneration and breakdown.

Mangroves are legitimate stakeholders of nature. It is certainly pragmatic to orient our water management systems towards sustaining agri-crops. However, deprivation of mangroves of their share of fresh water influx can lead to endangering the ecosystem. It is to be noted that the Cauvery Tribunal has asserted its concern by provisioning

water to environmental needs. However, it would be highly desirable to find out what would be the true requirement of mangroves on spatial and temporal needs based on scientific studies. A strong national policy on mangroves conservation is perhaps the need of the hour in an era of climate change. It is hard to comprehend what would be the fate of true mangroves in future as its ability to procreation is challenged. But we record that with habitat changes, certainly habit changes at least in mangroves.

#### Reference

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## IFGTB Technologies

### Automated Mangrove Incubator Nursery Technology (AMINT)

*Nagarajan, B., Ashwin, Y. and Utchimahali, M.*

The automated nursery technology will be transferred to the Tamil Nadu Forest Department and is expected to facilitate mangrove plantation programmes.

The survival and establishment of true mangrove juveniles is most times very challenging and difficult, particularly, in RET species recovery. Complete loss of nursery stock during the first 90-120 days is very common, due to malnutrition and salinity levels. To overcome this constraint an Automated Mangrove Incubator Nursery Technology (AMINT) is being deployed by the Institute. Seedlings are raised in PVC bubbles within troughs and nutrition is supplemented to the water system and pH is balanced in accordance with the species and the growth conditions. Brackish water influx and fresh water efflux from the PVC bubbles based on



tidal timings is the basis to the technique. Currently, the system is being built and experimented by the Institute on *Rhizophora* improvement at Pichavaram, Tamil Nadu. The automated incubator nursery could be used for raising quality planting stock in large scale within shorter durations. On the International Mangrove Conservation Day (IMCD), July 26, 2021, the Director General, ICFRE will be transferring the technology to the Tamil Nadu Forest Department.



## Ex situ nursery establishment of *Bruguiera cylindrica* using native beneficial microbes

Karthikeyan, A.

The mangrove species of *Bruguiera cylindrica* is commonly found in the coastal regions of Kerala and Andaman

Islands. Mangrove species are normally propagated in nurseries established in their natural habitat. To simulate the rhizosphere conditions available in these habitats, beneficial microbes isolated from mangrove forests were used for successful propagation of *B. cylindrica* under *ex situ* conditions. Propagules of uniform lengths (15 cm) were initially sterilized using 80 % ethanol for 2 min, followed by 0.1 % HgCl<sub>2</sub> for 10 min and finally washed 10 times in sterile distilled water. These treated and uniform length propagules of *B. cylindrica* were placed in poly bags (13-25 cm) containing sterilized soil and sand

Native beneficial microbes isolated from mangrove forests were used for establishment of *ex situ* nurseries.

in equal volumes. The propagules were maintained in the IFGTB nursery for 30 days under shade house and

watered twice per day for development of roots. Beneficial microbes isolated from the mangrove forests such as *Azospirillum brasilense* (N fixer), *Bacillus megaterium* (Phosphate solubilizer) and *Frateuria aurantia* (Potassium mobilizer) were inoculated into these propagules. The inoculated propagules were maintained for 6 months under normal nursery conditions at 32°C (± 1.2); 74 % (±2.6) RH and watered twice a day. The inoculated beneficial microbes mobilize nutrients to the seedlings thereby enabling generation of well grown seedlings even under *ex situ* nursery conditions.



## Wood Yield Calculator: A farmer friendly Mobile App for yield estimation in *Melia dubia* plantations

Buvaseswaran, C., Senthilkumar, M., Senthilkumar, S., Velumani, R., and Arulmani, K.

Wood yield calculator enables rapid and reliable estimates of yield in standing plantations thereby enabling farmers to negotiate a fair price for his produce.

A Mobile App "Wood Yield Calculator" was released in the Webinar on "The path ahead for silviculture research in important tree species" organized at IFGTB, Coimbatore on 28<sup>th</sup> January 2021.

To develop the wood yield calculator, biomass sampling was done by felling a total of 122 sample





trees from 41 plantations of *Melia dubia* across Tamil Nadu. Using the stem wood biomass data from the sample trees, a best-fit model was developed for wood yield estimation in plantations of *Melia dubia*. This best-fit model was used to develop the Mobile App for yield estimation in plantations of *Melia dubia*.

This mobile app is farmer friendly as only 5 % of sampling needs to be done. For estimation of yield of standing crop using this Mobile App, the girth of every 20<sup>th</sup> tree in the field needs to be measured along the tree rows so that entire plantation is covered. Yield estimation in standing plantations facilitates the farmers for better negotiation for selling his plantations to the buyers / middleman.

"Wood Yield Calculator" is available for download in Google Play Store.



## DYECOP: Double Layered Cotton Natural Dyed Aromatic Face Mask for COVID-19

Thangamani, D., Mohamed Nawas, O.M. and Lalitha, S.

The Institute of Forest Genetics and Tree Breeding has released double layered cotton, natural dyed, aromatic face mask named "DYECOP" using extracts from IFGTB Eucalyptus clones. It is made using plain weaved cotton, dyed with the extracts of Eucalyptus leaves along with natural mordants like Myrobalan, Aloe vera, turmeric and pomegranate peel. The dyed fabric can also be used in garment making.

Eucalyptus is traditionally used for the treatment of respiratory tract infections, colds, flu, sore throats, bronchitis and pneumonia. It has anti-microbial activity, antioxidant, anti-inflammatory

"DYECOP" facemask can be used as potential source control against COVID-19 pandemic.

and cytotoxic properties. It is rich in tannins (gallic acid & ellagic acid) and flavonoids (quercetin & rutin). Natural ingredients in Eucalyptus dye and the mordants interact and cause microbial protein denaturation, resulting in arrest of microbial growth.

The DYECOP facemask was tested for Bacterial Filtration Efficiency (BFE), as per the Bureau of Indian Standards and showed 90 % filtration efficiency. It is washable and reusable. This mask is recommended for infection prevention and as source control for COVID-19.



## EVENTS : Jan - Mar 2021

- ◆ **Meetings** : Interactive meeting with pulp wood production team of Tamil Nadu News Print Limited (8<sup>th</sup> Mar)
- ◆ **Trainings** : ICFRE HRD Training on “Plant Taxonomy and Economic Botany” (8-10<sup>th</sup> Feb), “HRD training on Statistical Methods in Forestry Research” under CAMPA funding (15-18<sup>th</sup> Feb), 3 trainings on Green Skill Development Programme (22<sup>nd</sup> Feb–26<sup>th</sup> Mar), Bharat ka Amrut Mahotsava “Wealth out of waste for tribal development” (19<sup>th</sup> Mar), “Capacity building on “Development of Tree Rich Biobooster” (26<sup>th</sup> Mar)
- ◆ **Seminar and workshops** : “The Path Ahead for Silviculture Research in important tree species” (28<sup>th</sup> Jan), ICFRE-ICAR consultative workshop on the theme, “Developing molecular breeding technologies for enhancing plant productivity in degraded lands” (24<sup>th</sup> Mar), Stakeholders Workshop - “Developing and Popularizing Digital Interactive Platform for Tree Growers & Other Stakeholders of Tamil Nadu”, Release of IFGTB Documentary film “Walking Tall with Trees” and Creation of IFGTB's YouTube channel (26<sup>th</sup> Mar).
- ◆ **Other Events** : Demonstration of the touch screen interactive board (25<sup>th</sup> Jan), Collaboration with Suryan FM- A promotional video on Gass Forest Museum (29<sup>th</sup> Jan),
- ◆ **Days Celebrated** : 72<sup>nd</sup> Republic Day (26<sup>th</sup> Jan), World Wetlands Day (2<sup>nd</sup> Feb), International Day of Forests (21<sup>st</sup> Mar).
- ◆ **Awards** : Dr. D. Thangamani, Scientist D, was honoured with Dr. A.P.J. Abdul Kalam award for scientific excellence by the Marina Labs, Chennai.
- ◆ **Memberships** : Dr. Modhumitha Dasgupta, Scientist G & Head, Plant Biotechnology and Cytogenetics Division, has been nominated as a member of the ICFRE Society for two years.
- ◆ **Superannuation** : Sh. R. Kanagaraj, UDC, and Smt. D. Jamuna, UDC, superannuated in Feb and Mar 2021 respectively.



Sh. R. Kanagaraj



Smt. D. Jamuna

## About IFGTB

The Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore, is a national institution of the Indian Council of Forestry Research and Education (ICFRE), an autonomous council under the Ministry of Environment, Forest and Climate Change, Government of India. IFGTB has a mandate to develop new varieties, management and silvicultural techniques to maximize productivity of natural and planted forests under different ecological considerations and changing environment.

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**Cover Photo** : Controlled pollination of  
*Rhizophora* by **Dr. B. Nagarajan**, Scientist G.

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