



# 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)

◆ IFGTB Products:  
TreeGenie  
◆ Tree Health :  
Casuarina bacterial  
wilt disease

Page 2

◆ Tree Health :  
Nematodes |  
Sandal spike

Page 3 - 4

◆ Genetic Diversity and  
Conservation :  
*Canarium* | *Terminalia* |  
*Mitragyna*

Page 4 - 5

◆ Events | Meetings  
| Dignitary Visit |  
Training

Page 6



## From the Director's Desk

IFGTB has continuously strived to provide solutions to the various challenges faced by farmers and forest departments. This issue of IFGTB News brings out the research updates in the area of tree health. The use of *Frankia* and *Micromonospora* for improving growth and health of Casuarina hybrid clones has been recently published in Journal of Forest Research. The efforts to catalogue the less studied parasitic phytonematodes affecting economically important tree species provide the baseline data required for their ecological studies and control measures. A tool for early detection of sandal spike phytoplasma would be an important arsenal for controlling the spread of the disease. In the area of genetic diversity studies for conservation, observations on gender differences in *Canarium strictum* and identification of a very large tree of *Terminalia arjuna* are interesting. At IFGTB, considerable importance is given for extension of research findings to their prospective users. This issue of IFGTB News provides information on the recently released, TreeGenie, a digital platform comprising a mobile app and a web portal, which aims to bring together and provide relevant information required by various stakeholders. I hope that these articles will continue to sustain the interest of the different stakeholders of IFGTB.

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



## IFGTB Products

### TreeGenie : A mobile application and web portal

Rajesh, G., Chandrasekran, P., Anithaa, R.G., Sheheena, P.A., Venkatarathinam, M., and Saravanan, S.✉

TreeGenie digital platform aims to bring together all stakeholders of agro-forestry based systems into a community to benefit each other by sharing and communicating scientific and market information. The Integration of multiple stakeholders including tree growers, nurseries supplying quality planting materials, wood based industries, traders and research institutions on a common virtual platform is

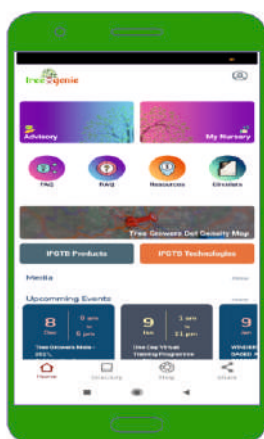
TreeGenie aims to provide relevant information for tree growers, nurseries, industries and research institutions.

expected to bring about a positive attitude towards tree farming

among all stakeholders.

#### Salient features:

- ◆ Integrates various stakeholders into a single platform.
- ◆ Gathers, organizes and facilitates seamless flow of information among stakeholders.
- ◆ Provides market information on supplier, location and availability of improved clones / seedlings.
- ◆ Communicates various government schemes related to agroforestry.
- ◆ Enables tree breeders to provide precise cultivation practices.
- ◆ Facilitates growers to interact with experts using the "Ask Expert" query system.
- ◆ Creates an intuitive sharing system for the media.
- ◆ Provides links to other relevant websites and online resources.



Scan the QR code to download



App



App Direct Link

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## Tree Health

### Frankia and Micromonospora application for improved growth and health of Casuarina hybrid clones

Karthikeyan, A.✉, Kanchanadevi, K. and Nicodemus, A.

*Frankia* and *Micromonospora* are actinomycetous bacteria living in the root nodules of Casuarinas. *Frankia* is known for

nitrogen fixation whereas *Micromonospora* is reported as a biocontrol agent. These two actinomycetes were tested in Casuarina hybrid clones against the bacterial wilt disease for control as well as growth improvement at field conditions. The disease is caused by the pathogen *Ralstonia solanacearum*. It has been reported in the Casuarina hybrid plantations in Tindivanam, Villupuram and Cuddalore. The combination of *Frankia* and *Micromonospora* was applied to the infected clones to control the disease. Six months after

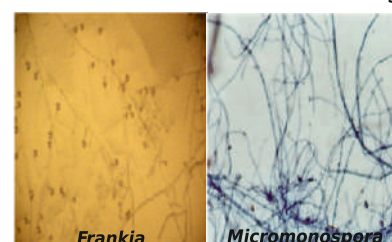


IFGTB Scientist Dr. A. Karthikeyan and team have found *Frankia* and *Micromonospora* to control the bacterial wilt disease in Casuarina hybrid clones and improve growth. [Journal of Forest Research: (IF: 1.27)].

application, the clones recovered up to 98 % from the bacterial wilt disease and exhibited improved growth and health.

The total nitrogen content also increased due to application of *Frankia*. Hence, it is concluded that the actinomycetes, *Micromonospora* and *Frankia*, are promising beneficial microbes for controlling the bacterial wilt disease and for growth improvement in Casuarina hybrid plantations.

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## Investigation of plant parasitic nematodes associated with rhizospheres of economically important trees in Tamil Nadu, India

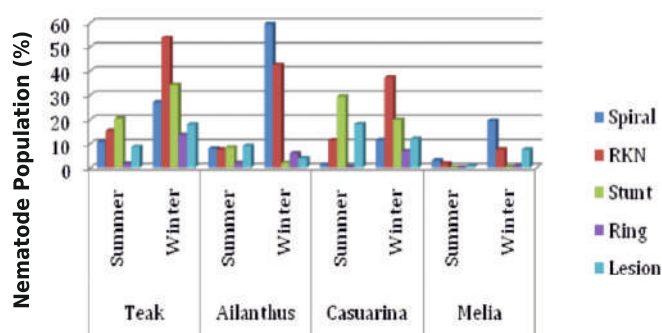
Sudha, S.✉ and Balu, A.

Nematodes, commonly known as round and eel worms constitute the phylum Nematoda. Plant parasitic or phytonematodes are important pests causing economically high yield losses in agricultural crops including tree species. Though extensive research has been carried out on the phytonematodes associated with agricultural crops, information on their association with tree species and impact on yield is scanty. With a view to investigate the phytonematodes associated with rhizospheres of economically important tree species, field phytonematode surveys were carried out in teak, casuarinas, ailanthus and melia cultivated in Salem, Erode, Vilupuram, Karur and Cuddalur districts of Tamilnadu. The study revealed the occurrence of 5 different genus [Helicotylenchus (spiral), Meloidogyne (root knot) Tylenchorhynchus (stunt), Criconemoides (ring)

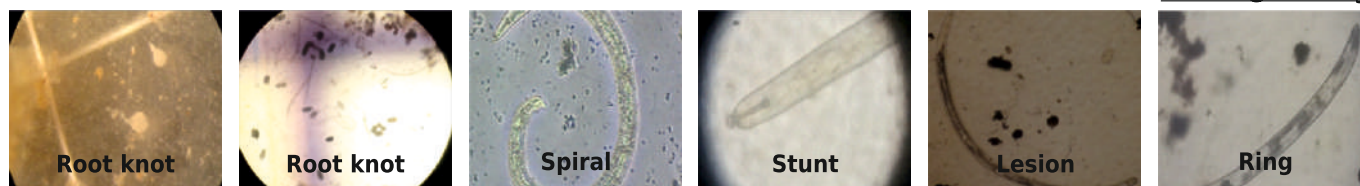
The documented genus affecting tree species would enable studies on their ecological significance and control measures.

and the Pratylenchidae (lesion) (see photos below). The population density of the nematode species in the

rhizospheres of these tree species was high during the winter as compared to summer (see figure) and the percentage of nematode population was observed to vary with the tree species.



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## Detection of sandal spike phytoplasma using rapid single step PCR based assay

Muthulakshmi, E., Karthick, T., Balasubramanian, A., Suma, A.D.\*,

Swathi, B.\* and Ghosh Dasgupta, M.✉

*Santalum album* commonly known as East Indian Sandalwood is a slow growing root hemi-parasitic tree. It is one of the most extensively exploited group of trees due to their demand in domestic and international market for essential oil. In Indian sub-continent, the major reason for depletion of the sandalwood genetic resources is also the sandal spike disease caused (see photo) by phytoplasma belonging to the class of Mollicutes. The conventional two-step nested PCR recommended by International Standard for Phytosanitary Measures is routinely used to detect the phytoplasma in sandal tissues. However, the procedure is conducted at low

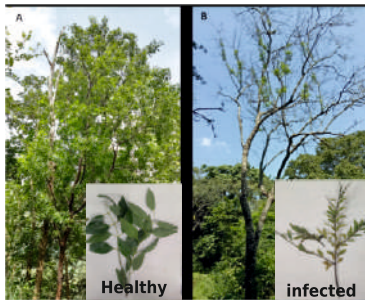
The assay enables early detection of the disease to enable implementation of control measures.

annealing temperatures of 53°C (P1/P7 primers) and 50°C (R16F2n/R16R2 primers), which includes first stage amplification of the spacer region between the 16S and 23S rRNA gene and second stage nested PCR which is specific to the 16S rDNA region. We

have developed a stringent and reliable single step PCR for detection of phytoplasma with high sensitivity of detection up to 0.8 ng DNA concentration. Genomic DNA was isolated from leaf tissues harvested

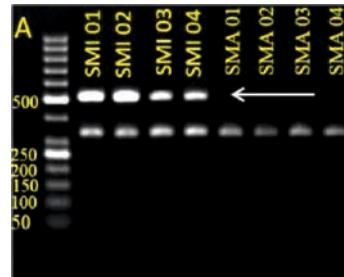
from four infected and uninfected trees at Marayoor, Kerala, India. Multiplex PCR assay was conducted with a primer pair SSD I designed in 16S rDNA region of sandal spike phytoplasma (accession number





EF050071.1) along with an internal control, SSES2, designed from *sesquisabinene B synthase 2* gene of *S. album*. The assays were conducted at high stringency of 62°C annealing temperature. In the samples derived from infected trees, internal control and the diagnostic marker amplified at 500 bp and 350 bp respectively, while in samples from uninfected trees,

amplification of the internal control at 350 bp was only documented (see photo). This multiplex assay can be used for rapid and accurate detection of the disease at an early stage to facilitate the plantation managers to take adequate measures to control the spread of the disease.



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## Genetic Diversity and Conservation

### Identification of candidate plus trees and gender discrimination studies in *Canarium strictum* Roxb.

Manikandan, S., Subramani, S.P., Surya Prabha, A.C., Sudha, S., Haritha, S., Duraisamy\* and Shanthi, A.✉

*Canarium strictum* Roxb is an indigenous, non-timber forest products (NTFP) tree species commonly called as black dhup and karunkungiliyam. It exudates a resin called as 'Sambrani' or 'Dammar' and has been used in traditional medicine. It is a dioecious species mainly distributed in the Eastern and Western Ghats of India. Female trees in the population has been overexploited due to high resin production. A collaborative study with the Tamil Nadu Forest Department has been initiated recently at IFGTB in *Canarium strictum* for genetic diversity assessment and development of gender specific DNA markers.

Morphological and genetic markers were identified for gender discrimination.

A survey was undertaken for selection of candidate plus trees (CPTs) in Kollu Hills (Namakkal) in Tamil Nadu. Tree height ranged between 35 m and 45 m and the girth between 2.5 m and 4 m. The fruits were studied for size, shape and seed filling ratio (3 locules with 2 filled seeds). Significant variation in fruit area (4.12 to 6.64 cm<sup>2</sup>) and fruit length (3.1 to 4.13 cm) was observed. Seven male trees and eight female trees were selected based on reproductive (fruit set) characters. Bark peeling was observed to be greater in male trees than in female trees. Bark morphology could be considered as a morphological

marker for discrimination of gender in adult trees. However, observations on natural regeneration revealed that gender discrimination is not possible at seedling stage. Therefore, a study has been initiated to develop gender specific DNA marker. Randomly Amplified Polymorphic DNA (RAPD) based marker study discriminated the male and female individuals using the primer OPB-18.



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## ***Terminalia arjuna* - A landmark Mahavriksha of Tamil Nadu**

Anandalakshmi, R.✉, Sathish, A., Gireesan, K., Murugan, E., Loganathan, D.,  
Vineeth Deva V. and Chokkalingam, G.

*Terminalia arjuna* (Roxb.) Wight & Arn. known as Arjuna, a sacred tree, is a member of the family Combretaceae. It is a large deciduous tree with spreading crown and drooping branches attaining a height of about 30 m. It is common in mixed dry deciduous tropical forests of India and is often found along the water courses. The Arjuna tree is considered a guardian of the heart. Its bark is a source of cardiovascular Ayurvedic drug.

During a population survey conducted in February 2022, a very large tree of *Terminalia arjuna* was identified and documented at Jawathu Hills (Melpattu forest area; N12°25'46.89", E078°51'06", Altitude: 929 msl) in Tiruvannamalai forest division of Tamil

Nadu (see cover photo). Its height is 18.5 m and girth at breast height is 1347 cm, with a clear bole height of 4 m. This tree has been found to be the largest among the *T. arjuna* trees in Tamil Nadu, documented by IFGTB. Conservation of this tree as a valuable genetic resource is therefore recommended.

A very large Arjuna tree was documented at Jawathu Hills, Tamil Nadu.

Landmark trees in India like Kalyani of Andhra Pradesh, Champa in Mizoram, Kannimara teak in Kerala and the Great Banyan Tree

in Howrah have contributed to creating cultural awareness among public on the importance of tree and forest conservation for posterity. The Arjuna tree at Jawathu Hills could similarly be used for promoting ecotourism.

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### **New Research Initiatives**

#### ***Mitragyna parvifolia* (Roxb.) Korth.: A potential indigenous species for water logged wetlands**

Rajasugunasekar, D.✉, Soosai Raj J. and Lingeshwaran, P. K.

*Mitragyna parvifolia* (Roxb.) Korth. is an indigenous potential forest genetic resource with high timber, fodder and medicinal value. It belongs to the family Rubiaceae. It is commonly distributed in Asia, and is native to India and Sri Lanka. It grows to a height of ~50 ft, with branches spread over 15 feet.

In wetlands, aeration gets stalled due to water logging and impairs crop regeneration, dispersion, and survival. Several research studies have reported that *Mitragyna parvifolia* seedlings are tolerant to water logging due to a well-developed adventitious root system and the presence of lenticels that facilitate direct exchange of gases.

A new project on genetic improvement of *Mitragyna parvifolia* has been initiated at IFGTB.



Hence, there is a need for genetic improvement of this important wetland tree species. Tapping the existing genetic variation, understanding phenology and reproductive system, and characterisation of wood properties are expected to culminate in developing quality planting stocks, thereby providing an alternative timber resource.

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## Events : Jan - Mar 2022

- ◆ **SEMINAR/ CONFERENCE** : Soil Health: Research and Development (03<sup>rd</sup> Feb), Regional Research Conference: Biofertilisers and Biocontrol agents - Success, Challenges and Future (15<sup>th</sup> Feb)
- ◆ **DIGNITARY VISIT** : Sh. Prem Kumar Jha, IFS, IGF,NAEB, MoEF&CC, New Delhi - Certificates issued to *Calophyllum* and *Eucalyptus* clonal variety release team members (see photo)
- ◆ **MEETINGS** : Launching of "TreeGenie" Mobile Application (Android) & Web Portal (20<sup>th</sup> Jan), Memorandum of Understanding between IFGTB, Coimbatore, and TNFD for collaborative research in forestry (31<sup>st</sup> Jan), NRDMS-DST8 project third PMMC meeting (25-26<sup>th</sup> Feb).
- ◆ **TRAINING** : Prakriti programme: Tree Improvement & High Yielding Clones (24<sup>th</sup> Jan), Green Skill Development Programme (GSDP): Value Addition and Marketing of NTFPs - Bamboo Crafts (31<sup>st</sup> Jan - 18<sup>th</sup> Mar); Plant Tissue Culture Techniques and its Applications (17<sup>th</sup> Feb - 18<sup>th</sup> Mar); Forest Entomology and Pest Control (14<sup>th</sup> Feb - 18<sup>th</sup> Mar), Hindi Typing (10-11<sup>th</sup> Feb), HPLC & GC-MS/MS: Instrumentation, Operation and Applications (28<sup>th</sup> Feb 2022), HRD training on "Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act 2013" (10-11<sup>th</sup> Mar).
- ◆ **OTHER EVENTS** : Observance of 73<sup>rd</sup> Republic day (26<sup>th</sup> Jan), Celebration of World Wetlands Day (02<sup>nd</sup> Feb), National Mega Science Expo 2022 at New Delhi (22<sup>nd</sup> - 28<sup>th</sup> Feb), TreeGenie - Mobile App - Presentation with DGF & Special Secretary, MoEF&CC (15<sup>th</sup> Mar), Observance of International Day of Forests (21<sup>st</sup> Mar)



## 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 body 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** : Arjuna tree at Javathu hills by  
**Dr. R. Anandalakshmi**, Scientist F.

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