



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

Institute of Forest Genetics and Tree Breeding, Coimbatore, under the Indian Council of Forestry Research and Education, holds a national mandate in tree breeding and has been actively engaged in the genetic improvement of industrially important tree species, particularly naturalized and productive exotics such as *Casuarina* and *Eucalyptus*. The sustained, long-term breeding efforts have significantly contributed to the seamless transition from seedling-based plantations to clonal plantations. At present, IFGTB has widened its horizons to include breeding programmes of indigenous tree species, one of which is *Mitragyna parvifolia*. A brief account of this species is featured in this issue.

This edition also presents insights into the *Rhizosphere microbiota* of *Senna hirsuta* (L.), an invasive herbaceous species that has already established itself in forest ecosystems across the country. In addition, a new report documenting fruit gall incidence caused by the psyllid (*Trioza palaqui*) on *Terminalia bellirica* is included.

IFGTB has a long-standing engagement in transgenic research in forestry species and has recently initiated *CRISPR/Cas9*-mediated gene editing. This cutting-edge approach opens new avenues for functional genomics and the development of improved tree varieties. Notably, this issue highlights the first report on gene editing in woody tree species in our country.

I am confident that the information presented in this issue of IFGTB News will be of considerable value to stakeholders, including State Forest Departments, Forest Development Corporations, wood-based industries, forestry research and academic institutions, nursery growers, and farmers.

T. Rabi Kumar, IFS
Director, ICFRE - IFGTB

Sustainable Utilization of *Mitragyna parvifolia* wood: A Fibre characteristics Perspective

R. Revathy, S. Manikandan, D. Rajasugunasekar* and J. Soosairaj

Mitragyna parvifolia (Roxb.) Korth. is a fast growing, multipurpose, indigenous tree species belonging to the family Rubiaceae and is widely distributed in the moist deciduous and riverine forests of Tamil Nadu. With the growing world population, the demand for wood-based panels has increased, highlighting the importance of wood as a valuable and versatile natural resource that supports construction and everyday needs, while encouraging the sustainable management and responsible use of forest resources. The *M. parvifolia* has gained importance due to its excellent wood fibre characteristics like fibre length, fibre diameter, wall thickness and lumen diameter, which influence the pulp and paper quality.

A study was undertaken to understand the wood fibre characteristics in selected CPTs of *M. parvifolia*. Field surveys were conducted across agro-climatic zones of Tamil Nadu. A total of 50 CPTs were selected and revealed significant variations in fibre morphology, indicating strong genetic potential for tree improvement and industrial utilization. The fibre length in *M. parvifolia* was 1.394 - 2.031 μm a desirable trait in hardwood species that contributes to better tear strength and quality. The fibre diameter was 10.25 - 16.06 μm , lumen diameter ranged from 2.73 - 6.42 μm . The fibre wall thickness, 3.66 - 5.80 μm further supports good fibre flexibility and bonding strength. These fibre characteristics indicate its potential as a promising raw material for pulp and paper production, as well as for other value-added wood-based applications.

Promoting *M. parvifolia* through agroforestry and plantation programs in Tamil Nadu can help bridge the gap between wood demand and supply and sustain industrial growth and rural livelihoods. Understanding these positive relationships widens the scope for selecting better raw materials and identification of promising selections for future domestication programmes.

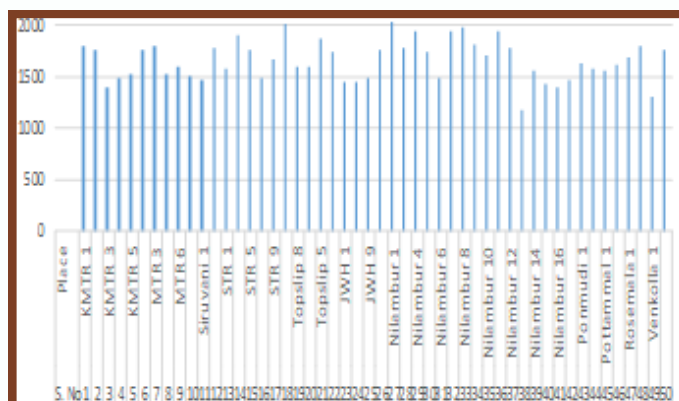
Mitragyna parvifolia



Wood core sample



Fibre length variations



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Rhizosphere microbiota of *Senna hirsuta* (L.); An Invasive Alien Plant Species in Coimbatore

Remya T Radhan, A. Rajasekaran and A. Karthikeyan

Rhizosphere refers to specialized immediate soil environment surrounding roots that are shaped by the secretion of organic compounds. This zone is not defined by rigid spatial dimensions but is instead characterized by distinct physical, chemical, and biological gradients. As one of the most complex ecosystems on Earth, the rhizosphere hosts a dense and diverse consortia of microorganisms, including bacteria, fungi, and nematodes, which collectively dictate plant fitness. Within this environment, beneficial microbes serve as a primary biological barrier, facilitating nutrient acquisition and degrading exogenous toxic compounds or allelopathic chemicals before they can accumulate and inhibit the growth of native flora.

The introduction of invasive alien plant species often disrupts established soil microbial networks that consequently alter nutrient cycling. These plants manipulate the rhizosphere by suppressing beneficial microbes and promoting native pathogens.

Their success is enhanced by mycorrhizae and bacterial endophytes that improve nutrient and hormone access. Therefore, understanding the rhizosphere microbiota is crucial for the effective ecological management of invasive species in a region. In line with these principles, a study documented the rhizosphere microbiota of *Senna hirsuta*, an invasive herb native to South America that colonizes disturbed forests, wastelands and riparian habitats.



Rhizosphere Sampling Location

10.94173° N, 76.724173° E

WPRG+W3R, Siruvani Main Rd,

Sadivayal, Tamil Nadu - 641114, India

Microbes were isolated using pure culture techniques and initially identified to the genus level based on morphological and biochemical characteristics. Further molecular characterization and identification to assess their functional roles in the establishment and competitive success of *S. hirsuta* are in progress.

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A new report on fruit gall in *Terminalia bellirica* (Gaertn.) Roxb.

Rajesh. C

Terminalia bellirica (Gaertn.) Roxb. is a deciduous tree native to India and widely distributed across Southeast Asia. Its fruits possess significant medicinal value and contain various antibacterial, antioxidant and anthelmintic phytoconstituents. The fruits are traditionally used in the preparation of the Ayurvedic formulation "Triphala" a combination with two myrobalans (Amla and Chebula).

It is widely used to treat various liver and respiratory disorders. During the fruiting season, the immature seeds usually showed fruit galls caused by the psyllid *Trioza palaqui*. This is reported for the first time in India. The psyllid *T. palaqui* infests developing fruits of *T. bellirica* and may form fruit galls. The first occurrence of fruit gall formation was discovered from the populations of *T. bellirica*

trees distributed in Anamalai Tiger Reserve, Parambikulam Tiger Reserve and Silent Valley National Park in the Western Ghats region and recorded infestation levels of 93%, 75% and 45 %, respectively. The adult psyllid lays eggs on undeveloped fruits at a very early stage. The first instar larva starts to feed on the ovary tissues and stimulates gall formation by the secretion of cecidogen substances. Abnormal growth in the fruit pericarp forms a gall cavity, with a rudimentary endocarp. The galled fruits appear as spike-like protrusions.

Fruit gall in *Terminalia bellirica*



Adult Psyllid



The adult psyllid is robust, dark brown with a faint yellow band. Gall formation reduces seed quality and threatens regeneration, necessitating urgent management research.

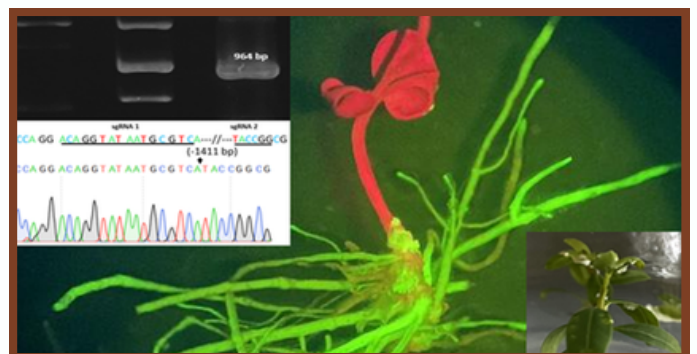
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Rapid evaluation of a promoter to express guide RNAs and generate CRISPR/Cas9-mediated *EcHKT1;1* gene edits in *Eucalyptus camaldulensis*

Shamili Krishnaraj, Sandhya M. C, Manoj Kumar Rajendran, Sreeja Sahadevan, Vignesh Chinnusamy, Aiyar Balasubramanian, Sivakumar Veerasamy, and Mathish Nambiar-Veetil

CRISPR/Cas9-mediated gene editing provides new opportunities for understanding gene function and novel varietal development in trees. It involves the use of guide RNA constructs to direct targeted mutations. In tree species that take a long time to regenerate the gene-edited plants, methods are required to rapidly evaluate the efficacy of these guide RNA constructs to direct the desired mutations. A tissue-preferential *RNA Pol II* promoter (*MsPRP2*) - driven polycistronic dual guide RNA construct was evaluated for generating a 1411 bp genomic excision in *E. camaldulensis*. GFP-tagged roots expressing the construct were rapidly generated in 36 days with a high transformation efficiency of > 20% via *Agrobacterium rhizogenes*, obviating the 12-16 month-long time required for regeneration of gene-edited plants at a much lower efficiency of < 1 to 3% in the *A. tumefaciens* method. PCR amplicon analysis of pooled GFP-tagged hairy

roots confirmed the expected 1411 bp deletion between the promoter and exon 1 of *EcHKT1;1*, along with a 69% reduction in gene expression. To validate these findings, the same construct was also evaluated in transgenic plants generated by *A. tumefaciens* - mediated transformation. These plants also carried the expected deletion in a heterozygous state, showing a 52% reduction in *EcHKT1;1* expression. The rapid method enabled us to show that an RNA Pol II-based tissue-preferential *MsPRP2* promoter can direct a polycistronic construct to generate a 1411 bp genomic excision.



The study, published in the Annals of Applied Biology, 2025, Vol. 187 (2).

It is India's first report of gene editing in woody tree species

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Awards received by Research Scholars

Best Poster Award – Sh. R. Manoj Kumar (Tropical Forestry Conclave 2025)



Sh. Manoj Kumar R. received the First Prize for Best Poster at the Tropical Forestry Conclave, held at KSCSTE–Kerala Forest Research Institute on 19 Dec 2025, for the study titled “*Engineering CRISPR/Cas9-mediated gene deletions and base edits in ECHK1;1 for modulating sodium and potassium uptake properties in Eucalyptus.*”

Co-authors: Shamili K., Sreeja S., Sandhya M.C., Rupali Rajaswini, Harshita Singh, Vignesh C., Kumaravel A., Aiyar Balasubramanian, and Mathish Nambiar-Veetil.

International Conference Presentation – Ms. Progya Dasgupta (CSIR Travel Award 2025)



Ms. Progya Dasgupta presented a poster titled “*Influence of host association and haustorium-inducing factor on morpho-physiological, biochemical and nutrient dynamics in Indian Sandalwood (Santalum album L.) seedlings during parasitization*” at the British Ecological Society Annual Meeting 2025, held in Edinburgh, UK, from 15–18 December 2025. Participation was supported by the Council for Scientific and Industrial Research (CSIR) Travel Award 2025.

Co-authors: Muthulakshmi Eswaran, Shanthi Krishnan, and Modhumita Dasgupta.

EVENTS: OCTOBER - DECEMBER 2025

- ✦ **TRAINING:** ABC of DNA (19 - 20 November); Hands - on Training on “HPLC: Instrumentation, principle and function (14th November); Hands on Training on Micro propagation of Teak and Bamboo (11th December); Winter Internship training on Genetic resource characterization and Genetic transformation methods (08 - 22 December); Tree Cultivation Techniques (16th December).
- ✦ **MEETINGS / CONFERENCE / WORKSHOP:** Safe science: Biosafety regulations and practices (27th October); Seminar – Trees Outside Forests (ToF) (31st December).
- ✦ **PRAKRITI PROGRAMME:** Importance of *Madhuca longifolia* tree (14th October); Communal benefits of tree planting (20th November); Floral diversity (25th November); Environmental Protection (26th November); Forest fires (27th November); Pesticides and their effects (28th November); Urban Ecology (02nd December); Soil Conservation (05th December).
- ✦ **OTHER EVENTS:** Vigilance Awareness Week (27 - 31 October); Commemoration of 150 Years of National Song “Vande Mataram” (07th November); Observation of Constitution Day, (27th November);

Samagra Shiksha - Rashtriya Avishkar Abhiyan (RAA) - exposure visit for government school students (18th November); Visit of Tmt. Supriya Sahu, I.A.S., Additional Chief Secretary (Environment, Climate Change and Forests) to Government of Tamil Nadu (30th December); Sexual Harassment Prevention Week (26th December).

✦ **RETIREMENTS:**



Smt. C.V. Vijayam, TO
(October 2025)



Smt. K. Sushamani, TO
(October 2025)



Smt. K.S. Rathinam, TO
(December 2025)

About ICFRE - IFGTB

The ICFRE - Institute of Forest Genetics and Tree Breeding (ICFRE - 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.

ICFRE - IFGTB has a mandate to develop improved varieties and advance management and silvicultural practices to enhance the productivity of natural and plantation forests under diverse ecological conditions and a changing environment.

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