

ABOUT ICFRE - IFGTB

ICFRE - Institute of Forest Genetics and Tree Breeding (ICFRE - IFGTB), Coimbatore is a National Research Institute under the Indian Council of Forestry Research and Education. ICFRE - 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 EIACP

EIACP (erstwhile ENVIS) established by the Government of India, in 1982 has been 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 EIACP PC RP (erstwhile 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.

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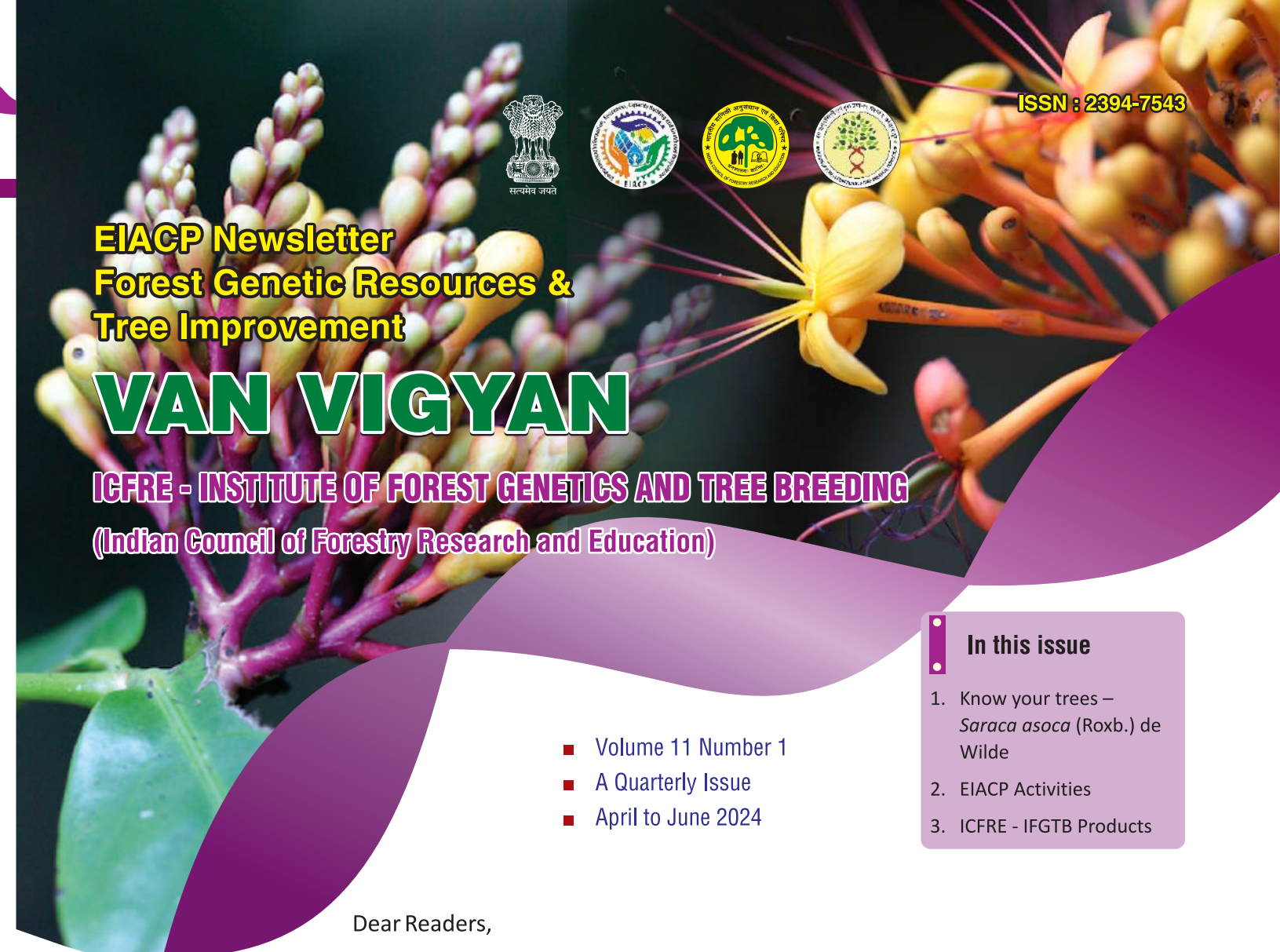
INSTRUCTIONS TO CONTRIBUTORS

Dear Author/Subscriber/Contributor,

We invite contributions to the EIACP Newsletter issues! The EIACP Resource Partner at ICFRE-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 EIACP Newsletter, Van Vigyan, a quarterly publication, publishes original research articles, reviews, reports, research highlights, news-scan etc., related to the thematic area of the EIACP 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.

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EIACP Newsletter Forest Genetic Resources & Tree Improvement

VAN VIGYAN

ICFRE - INSTITUTE OF FOREST GENETICS AND TREE BREEDING
(Indian Council of Forestry Research and Education)

- Volume 11 Number 1
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Saraca asoca (Roxb.) de Wilde
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Dear Readers,



From the Director's Desk

It is my pleasure to welcome you to this edition of our newsletter. At the EIACP Resource Partner (RP) of the Institute of Forest Genetics and Tree Breeding (IFGTB), we remain committed to disseminating valuable information on forest genetic resources, tree breeding, and conservation efforts. Our aim is to create awareness and facilitate knowledge exchange among researchers, students, forest officials, and industry stakeholders.

One of the species of prime importance in our conservation and research initiatives is *Saraca asoca*, commonly known as Ashoka tree. Renowned for its cultural, medicinal, and ecological significance, this species has been facing threats due to habitat loss and overexploitation. Our team at ICFRE-IFGTB, along with partner organizations, is working towards conservation strategies to ensure its sustainable growth and utilization.

Through this newsletter, we bring you updates on various tree improvement activities being pursued across different regions of the country. We also provide access to literature and resources on forest genetic resources (FGRs) and tree improvement. Our continuous appeal to research organizations, state forest departments, universities, and wood-based industries is to collaborate with us and utilize the ENVIS RP platform for sharing their valuable research and findings.

Dr C. Kunhikannan
Director, ICFRE - IFGTB

Know your trees – *Saraca asoca* (Roxb.) de Wilde

Introduction

Saraca asoca (Roxb.) de Wilde, also known as *Jonesia asoca* an important species of the Fabaceae family and is an evergreen tree. It is commonly known as Thawgabo (Burmese), Diyaratamal (Sinhalese), Ashok Chaal (Urdu), Ashok (Hindi), Asoke (Bengali), Ashopalava (Gujarati), Ashokapatta (Telugu), Osoka (Oriya), Akshath and Ashokadamara (Kannada), Ashokam (Malayalam), Asogam (Tamil), Kankeli and Hemapushpa (Sanskrit) (Pradhan *et al.*, 2009; Debnath *et al.*, 2010; Kauser *et al.*, 2016). The bark is used for treating gynecological problems such as leucorrhoea and menorrhagia and has a stimulating impact on the tissues of the endometrium and ovaries (Gahlaut *et al.*, 2013a). Over harvesting, bark exploitation, poor seed viability, narrow ecological niche, and deforestation have led to the classification of *Saraca asoca* as “Endangered” and “Globally Vulnerable” by CAMP (2001) and IUCN (2013) (Patwardhan *et al.*, 2014). This plant is among the 32 species of medicinal plants prioritized by



the National Medicinal Plants Board (NMPB) of the Indian government (Madhushree *et al.*, 2018a).

Distribution and habitat

Although native to the Indian sub-continent, *S. asoca* is also found in Sri Lanka and along the Indo-Malaysian region. In India, Ashoka trees are predominantly located in Peninsular India, including the Western and Eastern Ghats and the sub-Himalayan tracts. They are also widely distributed throughout the central Deccan plateau (Ketkar *et al.*, 2015a).

Ashoka trees grow in moist soil and require an annual rainfall of 2000-4000mm (Kauser *et al.*, 2016). They are found at altitudes up to 750 meters and attain a height of 10 meters (Ankur *et al.*, 2014; Patwardhan *et al.*, 2016; Kumar *et al.*, 2018). They prefer semi-evergreen and moist deciduous forests and are often found along river streams (Patwardhan *et al.*, 2014; Patwardhan *et al.*, 2016). Red lateral alluvial soil is suitable for its growth (Yadav *et al.*, 2019).

Botanical description

The bark is dark brown, grey, or almost black with reddish wood (Warrier *et al.*, 2019), and has a warty, sometimes cracked surface. It is rough, uneven, channeled, and smooth with circular lenticels (Smitha and Thondaiman 2016). The bark is distinguished by a taste that is bitter, sweet, and astringent (Rathee *et al.*, 2010).

The leaves are glabrous, long, corky at the base, and bitter (Pradhan *et al.*, 2010). Petioles are short, and the leaves are united, forming 6-12 pairs of leaflets. Leaflets are glabrous and oblong-lanceolate (Smitha and Thondaiman

2016). Young leaves display a copper-red hue during germination, transitioning to light green and ultimately maturing into a dark green color (Chauhan 2019).

The flowers form dense axillary corymbs and display hues of orange and yellow, typically visible from January to March, although they can be observed throughout the year. These aromatic flowers are hermaphrodite, staminate, and astringent in taste (Bisht *et al.*, 2017). Numerous long, thin tube flowers with four oval lobes are found in each cluster. The top ring of each tube is adorned with half-red and half-white stamens. When the flowers ripen, they start yellow and eventually turn orange and crimson. Sunlight causes them to turn vermillion. The tree bears flowers from



December to May, with peak flowering from February to March (Singh *et al.*, 2010; Mishra and Vijayakumar 2015; Smitha and Thondaiman 2016).

The seeds are flat, ovoid-ellipsoid, and covered with a brown seed coat. Two to eight seeds are found within each pod (Singh *et al.*, 2010; Smitha and Thondaiman 2016), dehiscent, and tapering at both ends (NMPB 2008). The green pods are leathery and turn black as they ripen and get ready to disperse the matured seeds. The green seeds turn black as they mature and are recalcitrant (Chauhan 2019).

The roots are long, slightly hard, and grey-brown. They have a taproot system with profuse side roots (Sanyal and Paria 2015).

Reproductive biology and breeding system

S. asoca starts flowering from three to four years after planting and the substantial number of flowers and fruit setting occur only after 6–7 years. It bears fragrant flowers from December to May, with peak flowering during February–March. The fruits attain its maturity during last week of May–July. Seeds are dispersed from the pod to the tree premises upon complete maturity. The time of anthesis in this species is noticed from 3.00 to 5.30 am, which coincides with anther dehiscence, stigma receptivity and insect activity. The length of the





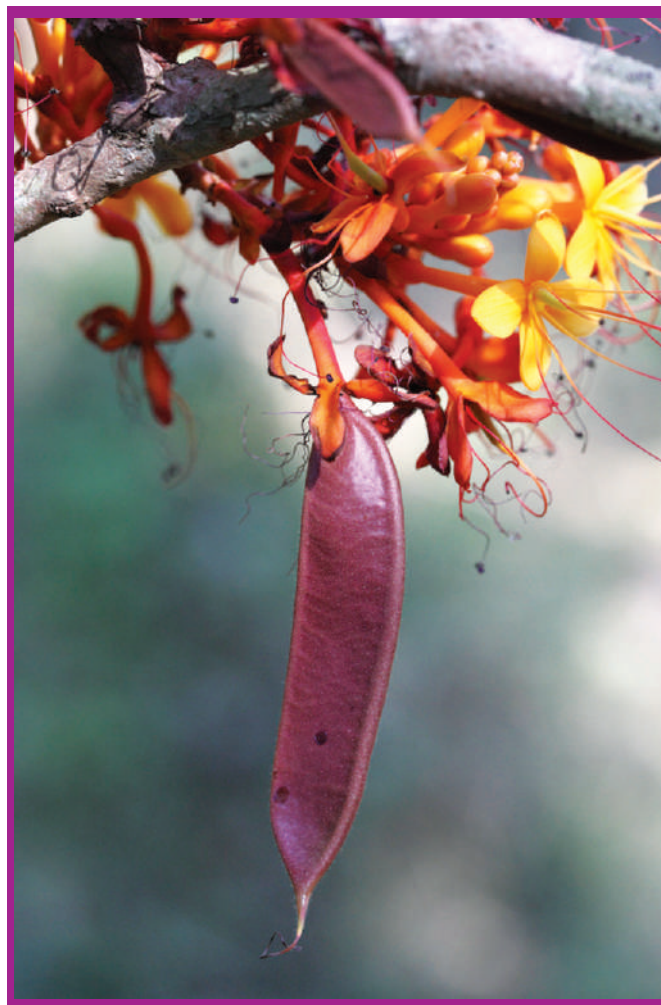
stamen and pistil points towards the pollination compatibility in both male and female parts. Pollen viability is maximum within 2 h of anthesis, which decreases thereafter and no pollens were viable after 6 h. The stigma is receptive at the time of anthesis and continues for 24 h. The tree produces bright colour attractive flowers, which changes from yellow/light orange to scarlet/red from the inception of buds to wilting. The bright color of the flowers attracts floral visitors/pollinators thereby facilitating the pollination in this species. Considerable amount of seeds produced in this species indicate that the species is capable of sustaining its progenies in the natural populations. Polyembryony to an extent of 5% is also recorded in this species.

Fruit collection and processing

Mature pods can be collected in early August, when the pod color changes from light green to dark black. The seeds are manually extracted from the mature pods. Infested and hollow seeds are discarded, and the rest of the seeds are washed to remove dirt and dried with a cloth (Arathi and Warriar 2024). As the seeds are recalcitrant, they are immediately sown for germination.

Germination

S. asoca is predominantly propagated through seeds. According to the NMPB (2008), seeds are



sown in a germination bed or polybags in a potting mixture of soil, sand, and farmyard manure (FYM) in an equal ratio. Seeds have two cotyledons and an embryonic axis covered with a thin seed coat and are non-endospermic (Prajith and Chandran 2015). The recalcitrant nature of seeds makes them unsuitable for long-term storage. The optimum temperature for seed germination is 30°C-50°C, and storing seeds at 15°C increases longevity to 4 years (Kundu *et al.*, 2020). Seeds treated with 200 ppm of Gibberellic acid (GA_3) germinate early. The conventional method of soaking the seeds overnight in water before sowing germination in process. Prachi and Pramod 2016. Healthy and disease-free seedlings found to germinate in semi-arid conditions, even when the seeds are

collected from semi-moist conditions, and no pre-treatment methods are required (Singh *et al.*, 2005). The germinated plants initially require shade and high amounts of water for survival (Nair *et al.*, 2000).

Vegetative propagation

Maximum rooting was observed on cuttings pre-treated with 500 ppm IBA, indicating the effectiveness of IBA in adventitious rooting of cuttings under *in vivo* conditions (Dash *et al.*, 2011). Similarly, applying IBA during air-layering can increase the number of primary and secondary roots, root length, root diameter, and rooting percentage (Madhushree *et al.*, 2018b).



In vitro propagation

Shoot tip, nodal, and intermodal regions are mostly used as explants for tissue culture or *in vitro* propagation. The explants are cultured in Murashige and Skoog (MS) medium supplemented with different concentrations of Benzyl amino purine (BAP) and Kinetin. Nodal explants were most suitable for the regeneration of shoots (Subbu *et al.*, 2008). Gamborg's B5 medium supplemented with BAP can also promote shoot induction and elongation of regenerated shoots (Shirin *et al.*, 2015). MS medium supplemented with BAP and 2, 4-D (2, 4-Dichlorophenoxyacetic acid) induced callus in leaf and ovary explants (Rout 2018).

Insect pests and diseases

The scale insect (*Coccus longulus*) is the main insect feeding on *Saraca asoca*. They are mostly seen on apical stems and suck sap from the stem. Severe and persistent infestation by scale insects can cause curling, yellowing, and leaf drop in Ashoka. Small ants like *Lophomyrmex squadrispinosus* are also seen in Ashoka (Kamble *et al.*, 2018).

Agroforestry practices

In India, the demand for *Saraca asoca* bark is 10724.2 tonnes. Medicinal plants like *Saraca asoca* have a high potential to fix atmospheric



nitrogen in the soil when grown for their various products in different agroforestry systems, employing suitable management practices (Patil & Depommier 2008).

Tree improvement

Indian Council of Forestry Research and Education -Institute of Forest Genetics and Tree Breeding (ICFRE-IFGTB) has established a seed production system comprising seedlings of *Saraca asoca*, *Aegle marmelos*, *Terminalia bellirica*, *Oroxylum indicum*, *Asparagus racemosus*, *Acacia concina*, and *Caesalpinia sappan* and was reintroduced at Attapady, Kerala. ICFRE-IFGTB have also established a medicinal seed orchard at Anaikatti (11°06'28"N; 76°46'03"E), Coimbatore, consisting of *Saraca asoca* accessions from different parts of Tamil Nadu and Kerala.

Utilization

The Ashoka bark is used to treat gynecological problems and stimulates the endometrial and ovarian tissues. The bark is used for stopping excessive menstrual bleeding and hemorrhagic dysentery (Shahid *et al.*, 2007). Many compounds have been identified through chemical analyses, including quercetin, epicatechol, epicatechin, procyanidin, leucocyanidin, linoleic acid, β -sitosterol, and ceryl alcohol (Baranwal 2014). Despite the emphasis on the bark, other parts of the Ashoka tree also have therapeutic applications. While the bark treats gynecological problems, seeds are used for vesicle calculi and bone fractures (Rathee *et al.*, 2010; Gahlaut *et al.*, 2013b). Fresh flowers are used for hemorrhagic dysentery and cervical adenitis, while dried flowers are used for diabetes (Rathee *et al.*, 2010). Blood-purifying properties are linked to leaves, and



pods are used as forage for cattle (Borokar and Pansare 2017). Dried roots are employed in the treatment of paralysis, hemiplegia, visceral numbness, freckles, external inflammation, ulcers, and skin diseases (Nag *et al.*, 2015).

The unavailability of Ashoka bark to satisfy the growing consumer demands has resulted in the adulteration of bark with *Polyalthia longifolia* Benth, *Trema orientalis* (L.) Bl., *Shorea robusta* Gaertn., *Bauhinia variegata* L., *Mallotus nudiflorus* (L). Kulju & Welzen, *Caesalpinia pulcherrima* and *Aphanamixis polystachya* (Khatoon *et al.*, 2009; Urumarudappa *et al.*, 2016; Borokar and Pansare 2017). Parameters including foreign matter, water-soluble extractive, alcohol-soluble extractive, water-soluble ash, acid-insoluble ash, total ash value, foaming index, moisture content, and crude fiber content evaluated on leaves can be further developed for the identification of the original drug material (Pradhan *et al.*, 2010).

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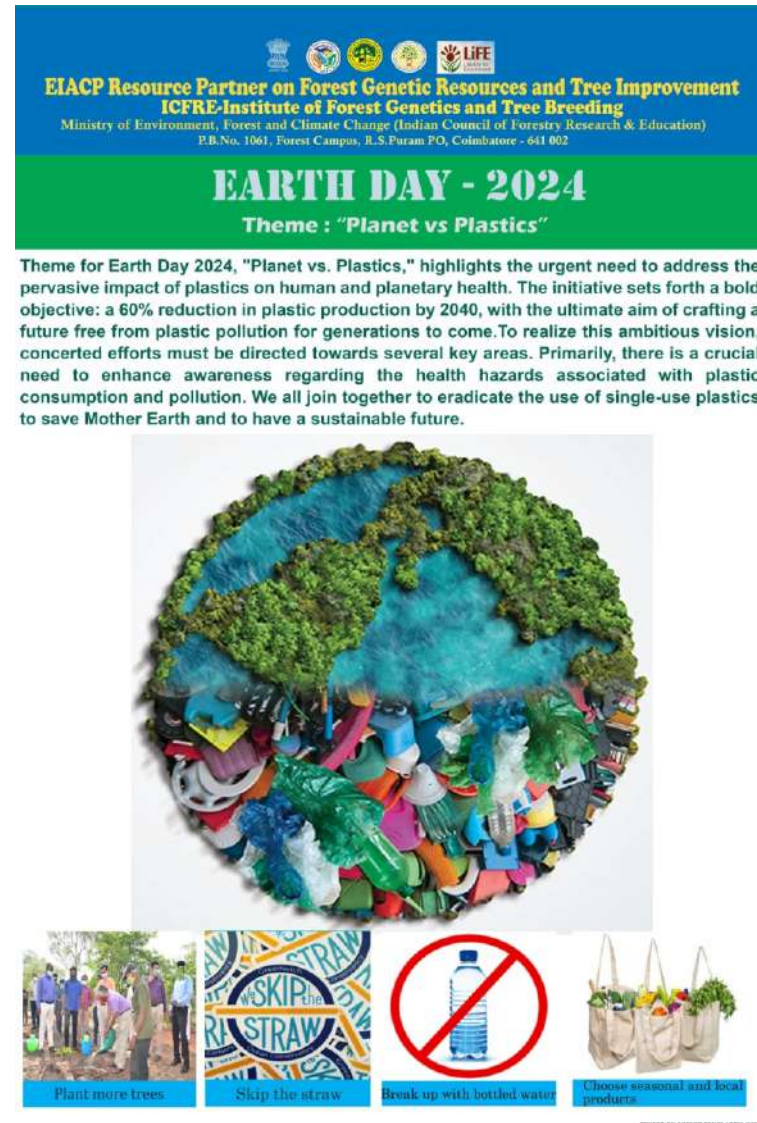
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EIACP ACTIVITIES

Earth Day 2024

As part of Mission LiFE and in observance of Earth Day 2024, awareness campaigns were organized for students and the general public to highlight the harmful effects of plastic pollution and promote environmental conservation. These initiatives were officially registered among the global events hosted by Earthday.org.

Dr. C. Kunhikannan, Director of ICFRE-IFGTB, inaugurated the campaign and unveiled the awareness poster based on this year's theme, **"Planet vs. Plastics."** As part of the outreach, awareness posters and handouts were distributed to school students and the public in and around Coimbatore. Additionally, copies of these materials were shared with the Central Library and various stakeholders to extend the campaign's impact.



International Day for Biological Diversity

As part of Mission LiFE and in observance of the International Day for Biological Diversity 2024, an awareness campaign was organized for the front line staff and sanitary workers of Coimbatore Corporation on May 22, 2024, at Corporation Kalaiaragam, Coimbatore. The primary objective of the event was to promote biodiversity conservation and emphasize the vital role frontline staff play in preserving natural ecosystems and the environment.

Additionally, a drawing competition was conducted, welcoming participants from diverse backgrounds. Both events were officially registered with the Convention on Biological Diversity (CBD) Secretariat.

Dr. C. Kunhikannan, Director ICFRE-IFGTB, inaugurated the program and delivered an interactive lecture on the significance of biodiversity. As part of the celebrations, an awareness poster highlighting the importance of biodiversity was released.

Copies of the poster and informational handouts were distributed to schoolchildren in and around Coimbatore, while soft copies were shared electronically with various stakeholders. E-certificates were awarded to all participants of the drawing competition.



World Environment Day

As part of Mission LiFE and in connection with World Environment Day 2024, organized series of awareness campaigns, lectures, awareness events and various competitions to people of different walks of life. The main goal of these activities were to promote awareness about environmental conservation and to emphasize the importance of individuals in preserving our environment and natural ecosystems. Overall, these activities served not only to raise awareness but also to foster a sense of environmental responsibility and empower individuals to become agents of positive change in safeguarding our planet. As a part of the celebration Mobile Photography competition on the theme "Land Restoration, Desertification and Drought Resilience" was conducted. Prizes were awarded to the winners and certificates were awarded to other participants. Poster highlighting the current year's theme was released by the Director and disseminated widely.


EIACP Resource Partner on Forest Genetic Resources and Tree Improvement
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 Ministry of Environment, Forest and Climate Change (Indian Council of Forestry Research & Education)
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WORLD ENVIRONMENT DAY 2024

Theme: "LAND RESTORATION, DESERTIFICATION & DROUGHT RESILIENCE"

Across the globe, ecosystems face imminent threats. From forests and drylands to farmlands and lakes, the very foundations of human existence are nearing a critical point. That's why World Environment Day 2024 is dedicated to land restoration, combating desertification, and fostering drought resilience under the banner "Our land. Our future. We are #GenerationRestoration."

Did you know?



Land degradation

- Globally, more than 2 billion hectares of land are degraded.
- Every year, an estimated 12 million hectares of land are lost to degradation.
- Land degradation affects 3.2 billion people, or 40 per cent of the world's population.
- Over 60% of India's arable land is estimated to suffer from environmental degradation.



Drought

- 55 million people are directly affected by droughts every year.
- Drought threatens people's livelihoods.
- It increases the risk of disease and death, and fuels mass migration.
- In India, approximately 25% of the land is experiencing desertification.



Desertification

- Climate change exacerbates desertification.
- It can interrupt the natural processes of the Earth, causing natural hazards.
- An estimated US\$10 trillion in global Gross Domestic Product could be lost by 2050.
- Over 70% of India reporting drought-like conditions.

#GenerationRestoration #MeriLiFE #ChooseLiFE #MissionLiFE



Ek Ped Maa Ke Naam

As part of Mission LiFE and in connection with Ek Ped Maa Ke Naam - A Tree in the Name of Mother, EIACP (Environmental Information, Awareness, Capacity Building and Livelihood Programme) Programme Centre Resource Partner at the ICFRE - Institute of Forest Genetics and Tree Breeding, Coimbatore participated in the Mass Tree Plantation Drive in Asola Bhati Wildlife Sanctuary, New Delhi. The event was organized by the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India and the Department of Forest and Wildlife, Government of NCT of Delhi. The mass plantation drive was inaugurated by Honorable Union Minister for Environment, Forest and Climate Change, Shri Bhupender Yadav.



ICFRE-IFGTB EIACP also set up a stall showcasing bamboo products and eco-friendly items crafted by trainees of the Green Skill Development Programme, along with awareness materials on Mission LiFE. Honourable Union Minister, MoEFCC Shri Bhupender Yadav, Shri Kirtivardhan Singh, MoS, Shri Vinai Kumar Saxena, Lieutenant Governor of Delhi, planted indigenous saplings and motivated the children and their mothers to take part in the mass sapling plantation drive by planting saplings. ICFRE-IFGTB EIACP staff Dr S. Vigneswaran, Programme Officer, Dr T. Vamadevan, Information Officer, Officials and staff from Ministry of Environment Forest and Climate Change, Forest officials of NCT of Delhi participated in the event. 1000 saplings of indigenous species viz *Saraca asoca* (Sita Ashok), *Ficus religiosa* (Peepal), *Azadirachta indica* (Neem), *Syzygium cumini* (Jamun), *Mimusops elengi* (Moulshree) were planted in Asola Bhati Wildlife Sanctuary, New Delhi.



LiFE Mission Activities

ICFRE-IFGTB EIACP PC RP conducted 32 LiFE Mission campaigns to students and people from different walks of life. These campaigns targeted students and individuals from diverse backgrounds, collectively engaging participants in comprehensive awareness initiatives. The campaigns were characterized by a multifaceted approach, combining informative lectures, interactive events, and engaging games tailored to resonate with students. Through these activities, participants were not only educated about the LiFE Mission's objectives but were also encouraged to actively participate in its implementation. All participants actively took the LiFE Mission pledge and committed to adhering to the LiFE action points.



ICFRE - IFGTB PRODUCTS



ICFRE - 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 ICFRE - 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, 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 and Bamboo Plants	Rs. 55.00 per plant Rs. 25.00 per plant	Dr Rekha R. Warriar, Scientist - G & Head, Division of Chemistry & Bioprospecting Phone : 0422 2484167 E-mail : rekha@icfre.org
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	Price 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	
	20 Reactions	1900.00	
	50 Reactions	4750.00	
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
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 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	