KFRI

# Evergreen

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## Kerala Forest Seed Centre

The Kerala Forest Seed Centre (KFSC), established in 2003, is a collaborative venture of Kerala Forest Department (KFD) and KFRI. The objective of the Centre is to collect seeds of superior trees/stands, process, grade, store and supply to KFD and other government departments and non-governmental agencies including farmers interested in propagation of forest tree species. KFSC also has an important mandate of supplying graded quality teak seeds to KFD for raising high quality planting stock for their extensive teak planting programme. Processed good quality teak seeds, are also sold to entrepreneurs, farmers, research institutions and students at nominal rates, fixed by the Government of Kerala. In addition to supply of quality seeds of forestry species, facilities are also used for undertaking research in seed science and technology of tropical forestry species and to provide training to forestry professionals, researchers, students and others interested in seeds. Training programmes cover aspects such as seed collection, processing, storage and management of teak seed production areas.

# Pre-sowing treatments for enhancing seed germination of common forestry species

**Chandrasekhara Pillai PK and Deepa K**
Kerala Forest Seed Centre, KFRI

Viable seeds of many forestry species fail to germinate even under favourable conditions due to their dormancy. Pre-sowing treatment terminates dormancy and speeds up germination (Table 1). It also reduces toxic compounds present in the seed coat, which inhibit seed germination. Mainly, seed dormancy is of three types, i.e., physical (hard and impermeable seed coat/pericarp), mechanical (hard seed coat) and morphological (under-developed embryo). Morphological dormancy can be broken by storing seeds for a while after ripening process (eg. *Tectona grandis*). Following are the common pre-sowing treatments to break seed dormancies.

**Water soaking:** Soaking of seeds in tap-water for 12 to 48 hours, helps in softening seed coat and leach out chemical inhibitors. This treatment is applied to the most medium-sized dry seeds to overcome physical, mechanical or chemical dormancy eg. *Swietenia macrophylla, Oroxylum indicum.*

**Hot water treatment:** Soaking seeds in hot water (boiled, and then cooled for about 5–10 minutes at 80 °C) for 1 to 45 minutes (depending on hardness of the seed coat) and then soaking in tap-water for 12 to 24 hours. Seeds imbibe water and swell. It can overcome the physiological dormancy due to the hard, thick and waxy seed coat, by creating tension which consequently cracks the macro scleried layer or affects the strophiolar plug eg. *Caesalpinia sappan.*

**Acid scarification:** Seeds with thick impermeable seed coat is scarified in concentrated $H_2SO_4$ for 1 to 30 minutes depending on the nature of seed coat. Thereafter thoroughly rinsed under running water for 10 minutes to remove any traces of acid and soak in water for 12 hours to enhance imbibition. Acid causes wet combustion of seed coat, which results in disruption on the seed coat and increases permeability or lower mechanical resistance eg. *Cassia fistula, Adenanthera pavonina.*

**De-winging:** It is the removal of dry seed appendages like wings, spines, hairs and arils. De-winging creates crack on seed coat that help to imbibe water. Wings usually increase surface area of the seed, tend to accumulate moisture and promote fungal attack. De-winging also helps reducing bulk and ease in handling eg. *Swietenia macrophylla.*

**De-coating:** It is the removal of fleshy or hard seed coat to promote germination. Seed coat may setback seed germination due to the presence of chemical inhibitors. De-coating also helps to prevent fungal infection in fleshy seeds eg. *Garcinia gummi-gutta, Dysoxylum malabaricum.*

**Weathering:** Weathering means wetting and drying of seeds to soften hard seed coat. Wetting of seeds during night and drying them under sun is repeated for 7 days. Weathering causes softening of pericarp (due to expansion and contraction) and to crack the hard seed coat which helps imbibe water resulting in increased germination eg. *Tectona grandis.*

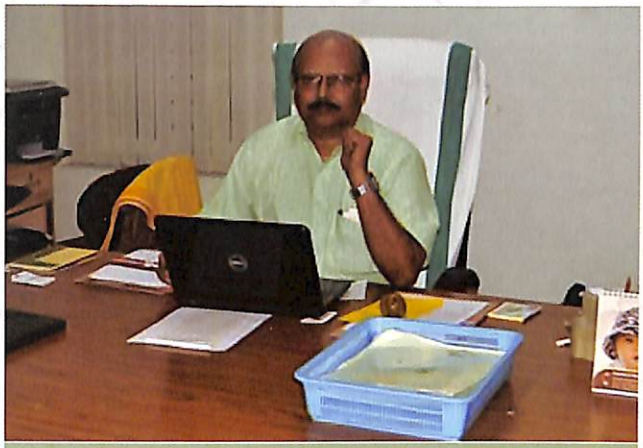
**Clipping:** Chop at both the distal ends or micropylar end will create a crack on seed coat, through which moisture and gaseous exchange

take place and make the conditions suitable for germination eg. *Spondia spinnata.*

**Splitting endocarp:** It improves the imbibition and promotes germination eg. *Melia dubia.*

**Abrasion treatment**: Mixing of seeds with sand (about 1-2 times of seeds) and then grinding them gently in a mortar. Scarification of seeds by rotating in drums lined with sand paper can also be adopted. After treatment, seeds are soaked in water for overnight before sowing.

**Mechanical scarification:** Tumbling in cement mixer with sand/ gravel (*Melia dubia*). However, it is time consuming/ labour intensive



Dr. P.S. Easa joined duty as Director-in-Charge, KFRI on 25 April, 2014 and superannuated on 30 November, 2014.

Table 1. Pre-treatments to enhance seed germination

| Species | | Treatment | Treatment duration |
|---|---|---|---|
| **Scientific name** | **Common name** | | |
| *Adenanthera pavonina* | Manchadi | Acid scarification | 15 minutes |
| *Aegle marmelos* | Koovalam | Water soaking | 6 hours |
| *Butea monosperma* | Plash | De-winging | |
| *Caesalpinia sappan* | Chappangam | Hot water treatment | 5minutes |
| *Calophyllum inophyllum* | Punna | De-coating | |
| *Cassia fistula* | Kanikkonna | Acid scarification | 6 minutes |
| *Dysoxylum malabaricum* | White cedar | De-coating | |
| *Garcinia gummi-gutta* | Kodappuli | De-coating & Water soaking | 12 hours |
| *Gmelina arborea* | Kumizhu | De-pulping & Water soaking | 24 hours |
| *Oroxylum indicum* | Palakapayyani | De-winging & Water soaking | 12 hours |
| *Phyllanthus emblica* | Nelli | Water soaking | 12 hours |
| *Pongamia pinnata* | Ungu | Water soaking | 24 hours |
| *Pterocarpus marsupium* | Venga | De-winging &Water soaking | 24 hours |
| *Pterocarpus santalinus* | Red sandal | Soaking in cow dung slurry | 48 hours |
| *Santalum album* | Chandanam | $GA_3$ treatment | 24 hours |
| *Saraca asoca* | Ashokam | Water soaking | 12 hours |
| *Spondia spinnata* | Ambazham | Clipping | |
| *Stereospermum colais* | Pathiri | Water soaking | 12 hours |
| *Strychnosnux-vomica* | Kanjiram | Soaking in cow-dung slurry | 24 hours |
| *Terminalia arjuna* | Neermaruthu | Water soaking | 24 hours |
| *Terminalia chebula* | Kadukka | De-coating & Water soaking | 24 hours |
| *Terminalia travancorensis* | Peikkadukka | weathering | 7 days |
| *Ziziphus mauritiana* | Elentha | Acid scarification | 15minutes |

mixing cow-dung with equal quantity of water and then soaking the seeds for 24 hours. Cow-dung contains growth hormones like indole acetic acid (IAA), gibberillic acid ($GA_3$), kinetin, abscissic acid (ABA), etc. This treatment will overcome physiological dormancy.

**Biological scarification:** Seeds germinate quickly if they are passed through digestive systems of birds/animals. Seeds of *Acacia senegal, Gmelina arborea. Acacia nilotica, Melia dubia,* etc., showed improved germination by the action of strong digestive chemicals in the guts of animals. Termites are an important agent for breaking down the seed coat dormancy in *Tectona grandis.*

**Hormonal treatment ($GA_3$):** Soaking seeds in gibberellic acid ($GA_3$) solution (500 ppm- 0.5 g in 1000 ml) for 24 hours. It promotes cell elongation, cell division and thus helps in the growth and development eg. *Santalum album.*

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# A database for the Rare and Threatened plants of Southern Western Ghats: A boon to species recovery research


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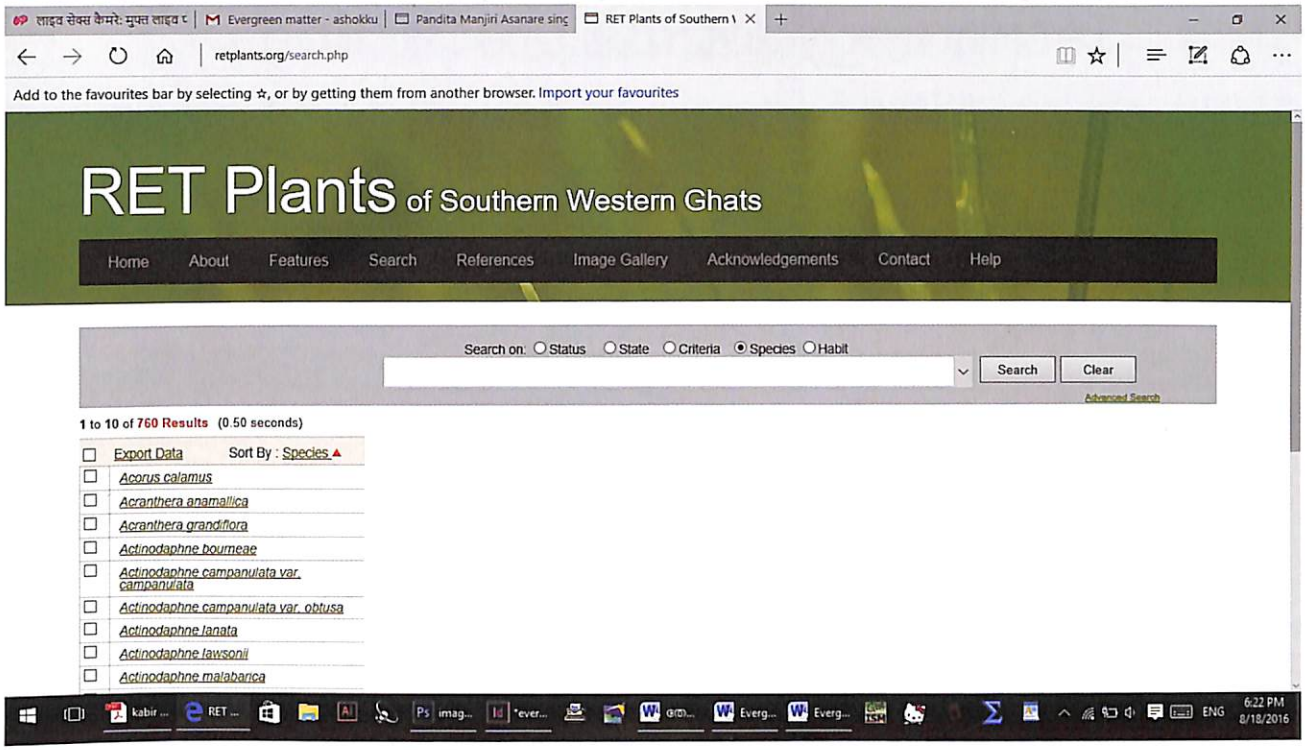
The plant diversity of the Southern Western Ghats is estimated to be over 4,500 flowering plants with 1,500 endemic species reported from the region. However, a comprehensive account about the Rare and Threatened flowering plants of the region and their research updates are lacking. As a result, many studies on such species are overlapping and many other species are yet to receive deserving attention with respect to their future conservation. In this backdrop, a database categorising Rare, Endangered and Threatened (RET) plants of Southern Western Ghats has been developed to strengthen the plant biodiversity conservation programmes in the country.

Literature from 26 sources (IUCN, 2012; Sasidharan, 2011; Nayar *et al.*, 2006; Ravikumar and Ved, 2000; Molur and Walker, 1996, 1997; Nayar and Sastry, 1987, 1989 and 1990) were used for categorisation of plants in the region into RET. The literature survey resulted in enlisting 760 plants in the Southern Western Ghats, spread over in 332 genera in 109 families. The information on the species such as threat status, references in support of threat status, family, citations,




synonym, habit, distribution in the southern Western Ghats and images available on the species were incorporated.

Among the species enlisted, 558 species are covered under the present threat status and 202 species in the 'needs status updation' category. The species included under 'present status' is as per of IUCN, 2012 and Sasidharan, 2011. The species under 'needs updation' is prepared where at least two status references have been provided in different periods by different authors. However, current threat status was lacking in them. The threat status is followed as per the 6 categories of IUCN along with other published works. The IUCN threat categories listed are *viz.*, extinct, extinct in the wild, critically endangered, endangered, vulnerable and near threatened. Among 760 RETs enlisted, 260 species have been available with publications covering 2,159 abstracts and 51 citations and the same has been provided under six research components such as Population Structure (PS), Population Dynamics (PD), Climatic and Edaphic analysis (CEF), Conservation Strategies (CS), Restoration (RE) and Evaluation (EV). The remaining 500 species are yet to receive any attention in the research front. The abstracts of publications are compiled from the online sources *viz.* Commonwealth Agriculture Bureau International (CABI), Google Scholar, Indian Forestry Abstracts, the R & D library information systems and from scientists who had worked in the field. A search provision is provided in the web based information system which has been developed with Open Source software, php and Java Script as front end and MySQL as back end. The entire information generated has been uploaded in the website, www.retplants.org for quick access. A Compact Disc version of the uploaded database is also available with the Institute Library for reference. A link to the database is provided in the KFRI website www.kfri.res.in.

The database would benefit researchers, foresters, policy makers and those who are involved in the plant biodiversity conservation programmes to strengthen the species recovery research of the country.

# Technology for the production of good quality organic manure from weeds using *jeevamrutham*

**Sujatha MP and Lathika C**
Soil Science Department
Sustainable Forest Management Division

Considering the recent organic farming drive in the State and lack of good quality organic manure in the market, KFRI has standardized a technology for the production of good quality organic manure from weeds using jeevamrutham as inoculum. This technology is being popularized through training programmes to various stake holders including farmers, women self help groups, students, prisoners, among others. The technology involves steps shown in the flow chart shown below.

The organic manure thus produced is alkaline (pH 8.2) in reaction and on an average contains N (2.8%), P (1.2%), K (1.3%), Ca (1.8 %), Mg (0.78%) and all the essential micronutrients. Application of jeevamrutham imparts diversified groups of microorganisms also. Thus it is a complete organic manure with all the essential nutrients in optimum quantity, diversified microorganisms like bacteria (*Lactobacillus* spp, *Bacillus cereus, Bacillus insolitus*), fungus (*Penicillium* spp (green), *Penicillium* spp (yellow to green), *Penicillium* spp (yellow), *Penicillium* spp (dark green), *Penicillium* spp (Cream to green), *Aspergillus* spp, *Botryotrichum*), actinomycetes (Pure white coloured, Green to ash coloured ) and with improved resistance to diseases owing to the presence of different types of phytochemicals, hormones, fulvic acid etc.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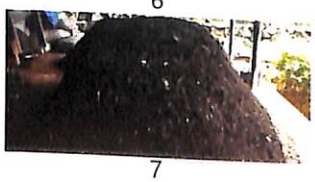
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Collection of fresh weeds before flowering and chopping in to small pieces

↓

Stacking of weeds and application of jeevamrutham

↓

Preparation of jeevamrutham

(Take 2kg cow dung, 1litre cow urine, 100g pulse flour, 100g. jaggerry, 5 hand full of virgin soil and mix thoroughly and make up to 20 litre with water and allow to ferment for 3 days)

↓

Stack the weedsup to 1.5 m height in a trapezium model

↓

Turning

Alternate turning up to 10 days (5 turning). Once in three days turning up to 25 days (5 turning). Once in five days turning up to 50 days (5 turning)

↓

Watering if necessary

↓

Maintain the heap up to 75 days

# KFRI Research Reports

## KFRI Research Report No. 465

### Kerala Forestry Statistical Database, data mining and information dissemination

Sivaram M.

An integrated statistical database on various resources of forests at State level is very frequently sought for making management decisions, resource accounting, developing criteria and indicators for the sustainability assessment of forest resources, economic computations, making policy decisions and to evaluate forestry programmes. In this regard, an attempt has been made to update the existing desktop version of the database (developed through previous projects) to web based database for easy data retrieval and wider use. The website address is http://www.kfstat.com.

## KFRI Research Report No. 466

### Ecosystem structure, dynamism, biodiversity, human dimensions and their linkages of Iringole Sacred Grove in the Western Ghats of India

Nair KKN, Ramachandran KK, Anitha V, Mohanan C, Mathew G, Menon ARR, Jayson EA, Thomas TP, Nair PV, Sivaram M and Yesodharan K.

Iringole Sacred Grove (10°6'31"N; 76°30'28"E) located in the Perumbavur Municipal Town is perhaps the largest and the best preserved among all the sacred groves in the State with an extent of about 10.53 hectares. This is a comprehensive report on the Phyto-sociological, biodiversity and socio-cultural linkages of this sacred grove.

## KFRI Research Report No. 467

### Floristic studies in Aralam Wildlife Sanctuary

Sasidharan N.

Aralam Wildlife Sanctuary is situated along the northwest slopes of Western Ghats. The major vegetation types of the sanctuary are evergreen and semi-evergreen forests. Dicotyledons have 818 species belonging to 476 genera under 108 families and 2 sub families. Monocotyledons are represented by 186 species in 120 genera under 19 families. Fabaceae with 83 species is the largest family followed by Rubiaceae with 59 species. Twenty four dicot families, 4 monocot families and 1 gymnosperm family are represented with only single species. During the present study, 59 species placed under various threat categories were collected from the sanctuary. Among the 300 species collected, 190 are exclusive to this area in the sanctuary. The number of species collected from different sections of the sanctuary are 712 (Chavachi), 621 (Narikadvu) and 390 species (Aralam).

## KFRI Research Report No. 469

### Digital archival of Rattan information

George KF, Sarojam N and Renuka C.

Annotated bibliography on rattans of the world prepared with 1406 references are brought out in a CD which can be searched by author, title, keywords and year. 68 books, 14 KFRI research reports, 90 KFRI scientific papers and 170 reprints on rattan are digitized and made available in KFRI library portal.

## KFRI Research Report No. 470

### Maintenance of provenance trial plots of eucalypts and acacia and development of new clones for establishment of Clonal Muliplication Area (CMA)

Florence EJM and Balasundaran M.

KFRI had established two clonal multiplication units, one at Kottappara, in Kodanad range for low altitude species of eucalypts and acacias and another one at Devikulam in Munnar division for high altitude species. More than 1,50,000 ramets of eucalypts and acacia clones were developed from Kottappara and 64,061 ramets were supplied to KFD, JK paper mills and HNL during the

reporting period. The rest of ramets were planted in CMA at Kottappara. Around 20,000 ramets of different clones were developed from Devikulam during the previous years and a total of 14,235 ramets were supplied to KFD, HNL and other private agencies.

## KFRI Research Report No. 471

### Ecology and conservation of selected tree endemics of Kerala

Swarupanandan K and Balasubramanyan K.

Geospatial analysis and density data were utilized for estimating population size. Flowering of the species extends during January-April with the peak season of mature fruit availability during February-March. Three different fruit types are observed for the species (a) Narrow elongate with medium sized beak (b) obpyriform-ampulliform fruits with long beak and (c) obpyriform with medium sized beak. The total population density of the species is less than 500 with around 200 trees in Kerala. Presumably, the species also suffered from selective logging and the low population size which makes the species 'Critically Endangered'. Mature fruits are available by May. Apparently seed sterility is inherent in the species, which requires further investigation.

## KFRI Research Report No. 472

### Evaluation of classical biological control of *Mikania micrantha* with *Puccinia spegazzinii*

Sankaran KV and Suresh TA.

*Mikania micrantha* (mikania), a neotropical invasive plant, is a major threat to natural and plantation forests and agricultural systems in Asia and the Pacific. It was subjected to additional host specificity tests against 74 plant species in the NBPGR facility. Since the rust was proved to be highly host specific, the Government of India issued permission to release it as a biocontrol agent in selected *Mikania* infested localities in Assam and Kerala. It was released in selected *Mikania* infested agricultural systems and forest sites in the State during August-October 2006. The releases were successful in the sense that the rust had spread to the native population of *Mikania* in all the sites. However, the rust persisted on the field population of the weed only till December 2006 - until the environmental conditions were suitable for the disease spread. Since the releases of the rust in Papua New Guinea and Taiwan were successful in controlling the population of the weed, it is believed that the future releases in Kerala may be successful provided a high load of inoculum is applied in the field during the south-west monsoon (June-July).

## KFRI Research Report No. 473

### Conservation through restoration of two endemic endangered trees of Western Ghats of Kerala

Jose PA and Chandrasekhara Pillai PK.

Owing to the importance and significance of conservation and management of Rare, Endangered and Threatened (RET) plants of the Western Ghats, in 2010, a three year study on the conservation through restoration of two endemic and endangered trees of southern Western Ghats were conducted. The species studied are *Drypetes malabarica* (Euphorbiaceae) and *Hydnocarpus macrocarpa* (Flacourtiaceae). *D. malabarica* is a medium sized evergreen tree having patchy and isolated populations in Kerala and Tamil Nadu. Natural regeneration of the species was meager in its habitats. By considering the small size in populations and fewness in distribution nature, IUCN categorized the species under 'endangered' for priority conservation efforts. The present study was initiated with the objectives (i) To study the population structure, diversity, dynamics including environmental factors and phenology of the two species. Population ecological, reproductive phenological, climatic and edaphical, propagation and restoration aspects were attempted in these species.

Distribution of the species was studied through intense field explorations. Reproductive phenology was studied by periodic field visits and observations on different phenophases. Propagation of the species through seeds, rooting of stem cuttings, air layering was attempted.

## KFRI Research Report No. 474

### Capacity building of a tribal community in managing non-wood forest produce resources: Monitoring of empowerment and sustainability in Nilambur

Mammen Chundamannil and Anitha V.

The forest policy of independent India which focused on producing wood as raw material for the wood using industries since 1950s was radically shifted towards conservation in 1980 by the Forest Conservation Act and the National Forest Policy in 1988. Kerala Forest Department, although a late starter, developed its own style of Participatory Forest Management drawing from the Joint Forest Management Guidelines issued by the Government of India in 1990. At the Range level, several Forest Protection Committees locally called Vana Samrakshana Samithy (VSS) were formed to carry out forest conservation activities involving people living within and adjoining the forests in Territorial Divisions. Within Protected Areas such as National Parks, Tiger Reserves and Wild life sanctuaries, these VSS are called Eco-development Committees. When the VSS consists exclusively of tribal families, they are designated as Tribal Vana Samrakshana Samithies (TVSS). This is a case study of a tribal community living within the forest with a tradition of forest dependence. This case study looks at one such TVSS at Vaniampuzha in Nilambur Range of the Nilambur North Forest Division in Malappuram District of Kerala. It follows a previous study on rehabilitation of degraded forests by Kerala Forest Research institute (Kallarackal et al., 2005).

## KFRI Research Report No. 475

### Tolerance of indigenous forest species seedlings to degraded lateritic soils of Kerala

Sujatha MP, Sureshkumar P and Thomas TP.

The present study envisages generating information on the adaptability of selected indigenous forest trees to degraded laterite soils of Kerala so that they can be selected for various afforestation and plantation programmes. The main aim is to categorise the selected indigenous species based on nutrient efficiency, tolerance to toxicities of Al and Mn; soil moisture stress, soil compaction and cation exchange capacity of roots. The study revealed significant variation between the indigenous species in their tolerance to various factors of degraded lateritic soil conditions. Hence priority must be given to species-site matching while selecting species for successful afforestation or reforestation programmes, especially in degraded lateritic soils. With respect to nutrient efficiency, *Ailanthus* was the most efficient followed by *Terminalia* and *Xylia*. *Haldina* ranked first in extracting higher quantity of nutrient from soil. Terminalia and bamboo were superior in producing relatively higher root biomass. Selective absorption of phosphorous was more in *Terminalia* followed by *Pterocarpus*, bamboo and *Ailanthus*. *Ailanthus* and *Terminalia* were found equally good in tolerating stresses due to soil moisture and soil compaction.

## KFRI Research Report No. 476

### Field trial of tree infusion technique to manage mistletoe infestation in teak plantations

Sajeev TV.

The present study envisaged reviving the tree infusion technique attempted by KFRI in 1980's. An attempt was made to control mistletoes in teak plantation using two herbicides namely, krizin, and gramaxone. The active ingredient of krizin is metribuzin. Metribuzin was effective in

controlling mistletoes observed on treated trees. Use of gramaxone, (active ingredient is paraquat dichloride) defoliated mistletoes but it caused the death of teak also in the process. Results obtained indicated that both the chemicals were not effective to give long term protection to teak from mistletoes.

## KFRI Research Report No. 477

### Identification of phytochemical insect attractants in teak.

Sajeev TV.

The teak defoliator pest, *Hyblaea puera* Cramer is extremely destructive to teak plantations. Studies revealed that teak defoliator outbreak happens only in teak plantations with tender teak foliage. Chemical cues mainly volatiles play a major role in locating and adapting to specific host plants by adult insects. Current study attempted to identify the volatile profile of the tender teak leaf opposed to that of the mature leaf in different seasons. GCMS and Head Space GCMS studies were carried out to elucidate the volatile combinations of teak leaves. The amount and type of volatiles were found to be different in tender and mature teak leaves. Seasonal variations in volatile combinations were also observed in the present study. In pre-out break period, the tender leaf holds Ethanol, 2-methoxy, IR-alpha pinene, beta- phyllandrene, sabinene, 1-4 methanol-1-x-cyclox and alpha thujene. Among them IR-alpha pinene, beta-phyllandrene, sabinene and alpha thujene are insect attractants. During the out break season 1-4-methanol-1-x-cyclox and alpha thujene were absent, but instead caryophyllene and alpha caryophyllene were newly presented. The mature teak leaf holds only two volatiles. From the present study, it is identified that the host recognition by *H. puera* is mediated by the combination of eight volatiles present in the tender teak leaf.

## KFRI Research Report No. 478

### Growth model for *Acacia auriculiformis* in relation to soil conditions in Kerala

Rugmini P, Pandalai RC and Sujatha MP.

A growth model in relation to soil conditions was developed based on data generated from 50 semi-permanent sample plots laid out in *Acacia auriculiformis* plantations in Kerala. The study has also shed light on the optimum levels of soil attributes, which maximize the tree growth. The sample plots belonged to various age groups and site conditions were included. The plots were laid out during 2011 and growth measurements involving girth at breast - height (1.37 m above ground) and height were recorded for two successive years. In addition to this, measurements for miscellaneous tree species growing in these plots were also recorded.

## KFRI Research Report No. 480

### Role of Bamboo in sustainable rural livelihood in South India

Anitha V, Muraleedharan PK, Sankar S and Seethalakshmi KK.

The report highlights the role of bamboo in sustainable rural livelihood carried out South India. The study highlights that the bamboo-based traditional industry in south India functions through the formal and informal sectors. Profile studies highlight that the artisans are traditional, largely marginalized and involved with the unorganized bamboo based productive activities. The development indicators indicate socio-political and economic backwardness and a stagnant economy. Policy, institutional indicator analysis matrix highlights diverse ownership, management, institutional and organizational arrangements from State to State in south India. There is a shift in the focus in utilization of bamboo from subsistence to commercial, the corresponding policy changes, change from centralized to decentralized management and the current dilemmas encountered in the context of bamboo management in the wake of

Forest Rights Act (FRA), 2006 and its socio-cultural and political dimensions. Based on the south Indian experience, the study puts forth recommendations for the improvement of the traditional marginalized communities in south India and further emphasizes the need to implement social policies to reach the beneficiaries.

## KFRI Research Report No. 481

### Structure and functioning of Bamboo handicraft industry in South India. 2013

Anitha V, Muraleedharan PK and Seethalakshmi KK.

The report synthesizes the findings of the state level studies on the structure and functioning of bamboo handicraft industry in South India carried out in the states (Kerala, Tamil Nadu, Karnataka, Andhra Pradesh and Goa). Bamboo craft, one of the oldest of traditional cottage industries in south India is currently a highly vulnerable industry in when compared to other North-Eastern regions of India as far as technical progress and product diversity is concerned. The overall structure of bamboo based household enterprises depicts a formal, informal and private sector. The growing informal sector is a limiting factor to the optimal and sustainable development of the industry due to its unhindered growth. The movement of bamboo from cottage to commercial industries, lacking strong marketing channels, is highly disturbing. The study puts forth strategies and action plan for sustainable and optimal utilization and management of this sector.

## KFRI Research Report No. 482

### Early selection and mass multiplication of *Eucalyptus* interspecific hybrid crosses

Balasundaran M and Florence EJM

This project report describes standardization of methods for the development of eucalypt interspecific hybrid clones using mini-cutting technique and evaluation using microsatellite markers. Fast growing, disease and pest resistant putative hybrids were identified through field planting in clonal testing area. The best trees were felled when they were about 18 month-old and coppice shoots arising from stumps were utilized for standardizing a mass propagation technique using mini-cutting. Mini-cutting technique is adopted for production of plantlets through rooting of second generation cutting produced from axillary sprouts of first generation rooted cuttings of coppice shoots origin. Intensive selection with combinations of as many desirable characters as possible was carried out for development of heterotic interspecific hybrid clones.

## KFRI Research Report No. 484

### Studies on clonal propagation of plus trees of teak for identifying superior trees for future plantation programmes

Surendran T.

Studies on clonal propagation of plus trees of teak were carried out in Kerala Forest Research Institute (KFRI). The mass production technique was standardized at KFRI which involves macro-propagation of genetically superior trees. Following this technique, 30 Plus Trees of teak were cloned successfully, properly rooted and hardened ramets were field planted. Clonal gardens were established at Kalkulam (Nilambur), Decent Mukku (Quilon), and at Chettikulam (Thrissur).

## KFRI Research Report No. 485

### Growth of field planted teak clones at Karulai

Surendran T.

Clonal technology for mature teak trees developed at Kerala Forest Research Institute was successfully used to clone 30 plus trees of teak and clonal propagules were produced in sufficient numbers. In order to study the growth and field performance of these clonal propagules, an experimental plot was established at Kalkulam, Karulai Range, Nilambur (South) Forest Division incorporating

propagules of all the 30 clones. All the clones survived and initial growth was promising. The results showed that the production of teak clones from mature elite teak trees and establishing clonal plantations are practical propositions for meeting the urgent requirements of tree improvement programme for teak.

## KFRI Research Report No. 486

### Cost effective soil and water conservation: Establishment of a demonstration area with people's participation

Sankar S, Thomas P Thomas and Unni KK.

Water is a vital natural resource which is indispensable for the existence of all living matter: plant, animal and man. From the very beginning of the history of mankind, the need for water has attracted man to settle near river banks. All ancient civilizations of the world developed on the banks of rivers. Today also, the availability of water influences to a considerable extent the pattern of land use and the social and economic well being of the people. Since water is a vital resource, the necessity for its conservation needs emphasis. To control the water yield and to improve the water resources, the proper approach is sound watershed management. Watershed integrates all the hydrological phenomena pertaining to its boundaries and as such is a logical unit for planning optimal development of soil and water resources (Holton, 1969). The State of Kerala, although receives an annual rainfall of 3000 mm is affected either by floods or droughts. This is due nature of the terrain with steep slope, absence of vegetative cover and intensive downpours of short duration. Conventional methods of creating reservoirs, dams, inter-basin transfers have failed to achieve the desired results on the one hand and cost the exchequer dearly on the other. In this context, cost effective localized methods to control the flow of water and also to enhance infiltration gather importance. Although, such methods have been tested and tried at various places throughout the state, a demonstration area for experimenting and learning is visibly absent.

## KFRI Research Report No. 487

### Environmental and social impact assessment of increasing the water level at Periyar lake in Periyar Tiger Reserve

Sankar S, Easa PS, Menon ARR and Sasidharan N.

The Mullaperiyar dam across the headwaters of Periyar in Thekkady was constructed in 1895 to provide water to Tamil Nadu (erstwhile Madras Presidency). The height of the dam was fixed to store water at a full reservoir level (FRL) of 152 feet from bed level. The total water spread area at this height is 25.527 sq. km. During 1979, the Central Water Commission instructed the Tamil Nadu PWD to keep the FRL at 136 feet as the dam was weak. During the years from 1979 to 2000 the area was below 152 feet but above 136 feet was constituted and wildlife conservation and tourism attained priority. At present the Tamil Nadu PWD is of the view that the height of FRL can be raised to 152 feet. Both the governments *viz.* Kerala and Tamil Nadu are negotiating on this issue. The present report is to determine the impact of raising the water level in Mullaperiyar dam on the land, vegetation, wildlife, tourism and communities.

## KFRI Research Report No. 488

### Conservation of microfungi: A voice for unprotected and vulnerable organisms

Sankaran K V and Hussain KH.

Fungi, which play a crucial role in evolution, ecosystem function and human progress, are under great threat globally due to factors such as climate change, habitat loss, pollution and incursion by invasive species. A significant decline in fungal population has already been reported from several parts of the globe. However, fungi remain almost completely unprotected compared to plants and animals. Against this background, this

project has made a pioneering attempt to 1) produce a red-list of Ascomycetes to assess their conservation status, 2) provide a Hindi version of the two well known global websites on fungi *viz.* Cybertruffle's Robigalia and Cybernome and 3) prepare a database on 'Fungi recorded from India' till date. Of the 1500 species of Ascomycetes (sampled red list) evaluated, 1308 species did not have sufficient data to decide their conservation status. Of the rest (192 species), though data deficient, 51 were evaluated as possibly least concern, 43 as probably least concern, 3 as probably vulnerable, 6 as possibly endangered, 1 was possibly critically endangered and 9 were possibly extinct. The database on fungi of India is hosted in www.indianfungi.org for search and retrieval. The URL is connected to KFRI wesite, www.kfri.org. The data contained in the database have been extracted from around 14,000 references. It contains over 75,000 occurrences of fungi.

## KFRI Research Report No. 489

### Vegetative propagation of selected medicinal plants for enrichment of resources

Surendran T.

Medicinal plants have played a significant role in many ancient traditional systems of medication in both developed and developing countries. Less than 10 per cent of the medicinal plants traded in the country are cultivated, about 90 per cent are collected from the wild, very often in a destructive and unsustainable manner. Over exploitation of the natural resources is quite common and relatively less effort has been made to conserve this valuable natural resource for its sustainable use. Habitat destruction is the major threat for the survival of medicinal plants. The conventional propagation method takes a long time for multiplication because of a low rate of fruit set, and/ or poor germination and also sometimes clonal uniformity is not maintained through seeds. The present study attempts to standardize vegetative propagation methods to mass propagate selected medicinal plant species. IBA in varying concentrations (1000-6000 ppm) was suitable for root induction on stem cuttings of the selected species in different seasons. The concentration of hormones and the success varied with the species. The methods were standardized and could be practiced for large scale cultivation of these valuable species. The study also provides a brief account of the conventional propagation methods by utilizing seeds or rhizome/ root tubers.

## KFRI Research Report No. 490

### Vegetative propagation of selected medicinal plants for enrichment of resources-Phase II

Surendran T.

A study was undertaken for detailed investigation on vegetative propagation studies for five medicinal plant species, by rooting stem cuttings. The results of the investigation clearly showed that four of the selected five species of medicinal plants *viz. Clerodendrum serratum, Coscinium fenestratum, Gloriosa superba* and *Asparagus racemosus* which are conventionally propagated through seeds, could be propagated by rootings of stem cuttings or pieces of rhizome/ root tubers. IBA is found suitable for induction the rooting, but at different concentrations, depending on the species and seasons. *Clerodendrum serratum, Coscinium fenestratum*, could be propagated by rooting of stem cuttings by the application of IBA (4000 ppm) during summer months (January-April). *Embelia ribes* also rooted with the application of IBA (4000 ppm) during summer months. In *Gloriosa superba* and *Asparagus racemosus*, attempts were made to root stem cuttings but success was very much limited. For these species, the vegetative propagation methods were standardized by rooting rhizome/ root tuber pieces or by separating tillers. The propagation methods standardized for these species could be used for large scale production of propagules.

## KFRI Research Report No. 491

### Assessment of crop damage by wild animals in Trichur District, Kerala

Jayson EA.

The objective of the study was to suggest suitable remedial measures to reduce and prevent the crop damage by wild animals. Study area consisted of three Forest Divisions and nine Forest Ranges. Crop damage incidences were recorded from quadrates in each month (n=36) and the damaged crop species was quantified. Seven species of wild animals namely Asian elephant (*Elephas maximus*), wild pig (*Sus scrofa*), Indian crested porcupine (*Hystrix indica*), Indian giant squirrel (*Ratufa indica*), Indian peafowl (*Pavo cristatus*), bonnet macaque (*Macaca radiata*) and sambar (*Rusa unicolor*) were damaging the crops. During the study period, Asian elephant did the highest damage (Rs. 17,35,625/- per annum), followed by wild pig (Rs. 3,736/- per ha. per annum) and Indian crested porcupine (Rs. 615.47/- per ha. per annum). Highest damage was documented in the Peechi Forest Range (Rs. 3,528/- per annum), followed by Machad (Rs. 3,009/- per annum) and Palapilly (Rs. 205/- per annum). Consumption of coconuts was highest in the Peechi Forest Range (4.6±2.2 nuts/tree/month) followed by Machad (2±1.02 nuts/tree/month) and Palappilly (0.46±0.44 nuts/tree/month) Forest Ranges. Marginal farmers are facing severe economic loss due to crop damage by wild animals in the District. Highest crop damage by Indian crested porcupine was recorded from Mattathur grama panchayath (34%), followed by Kondazhy (23%), Erumapetty (21%) and Kodassery (17%) grama panchayaths.

## KFRI Research Report No. 492

### Developing an information system for the Rare Endangered and Threatened (RET) plants of Southern Western Ghats

Jose PA, Hussain KH and Sreekumar VB.

Literature from 26 sources were used for the compilation of RET plants in the Southern Western Ghats. The information covers particulars of the species such as threat status, references in support of threat status, family, citations, synonym, habit, distribution in the three states covering the Southern Western Ghats etc. A total of 760 RET flowering plants recorded from the Southern Western Ghats are included in the database of which 558 species has been with 'present status' and 202 species included under 'needs updation'. Out of 760 RET plants recorded from the Southern Western Ghats, studies were undertaken in 260 species and publications were available and the same has provided whereas, 500 species are yet to be studied. In simple search, query can be built through the fields such as Status, State, Criteria, Species and Habit. The search shows all hits with list of all species. The 'State' wise search shows the species distribution in 10 combinations *viz.* Kerala; Tamil Nadu; Kamataka; Kerala only; Tamil Nadu only; Kamataka only; Kerala, Tamil Nadu, Kamataka; Kerala, Tamil Nadu; Kerala, Kamataka and Tamil Nadu, Kamataka. The 'Species' wise search shows all listed species. In all the five fields of search, the information regarding *viz.* Status/ State, Criteria, Reference/ Abstract of publication of each species is made available.

## KFRI Research Report No. 493

### A Decision support system for monitoring and forecasting timber prices of Kerala State

Sivaram M and Sandeep S.

The timber market in developing countries including India is mostly unorganized. There is no proper statistical system available to track the timber market trends. TMIS (Timber Market Intelligence System) is a computer based decision support system tool to gather, store, search, retrieve and analyze timber price trends. A large number of timber species is available in the market for sale. Timber quality is assessed mainly based on attributes such as girth, length, straightness and soundness of timber logs. The number of quality classes for a given species is huge. The timber classification system also varies within and across countries. If one wants to know the timber market trends, it is difficult to assimilate the timber prices of so many species across wide range of quality classes. However, it is possible to track the timber market if there is a timber price index summarizing the prices of various timber species and quality classes. In this regard, TMIS enables the user to organize a database on timber prices and develop timber price indices based on a standard methodology for his/ her own region to monitor timber prices. TMIS produces graphs showing trends in timber price indices for decision making. Selected models for forecasting future timber price trends are also integrated in the system. The use of TMIS in monitoring timber prices has been demonstrated through a case study of timber market of Kerala State, India.

## KFRI Research Report No. 494

### Ecophysiological responses of tree species elevation gradient in the shola forests of Kerala

Chandrashekara UM.

This study describes changes in the structure and composition of tree community and growth and physiological properties of seven tree species in the shola forests, Anamudi Shola National Park, Kerala over an altitude range of 1900m-2400m. A total of 61 tree species, belonging to 48 genera and 29 families were recorded. The total number of species per plot decreased as the altitude increased. Density of mature trees, saplings and seedlings and basal area of mature trees and saplings also declined with increase in elevation. Seven species found in all three phases in all elevations were selected to compare and contrast their ecophysiological and growth properties along the elevation gradients. In the present study, strong and positive relationships between relative growth rate (IRGR), photosynthetic rate (Pn) and transpiration rate (Gs) was observed in Cinnamon whereas in species like *Persea, Syzygium* and *Turpinia* the Gs did not influence their RGR and Pn. However, the other five species showed least responses to changing altitude and thus have the ability to acclimate to a wider range of environmental conditions prevailing in the shola forests.

## KFRI Research Report No. 495

### Use, management and nutritive value of edible non-crop plants in agroforestry and tribal landscapes of Kerala

Chandrashekara UM.

The homegardens of Kerala are known for the high diversity of their species in both cultivated and non-cultivated (hereafter, non-crop) plant communities. The non-crop plants can be categorized into edible and non-edible plants. A study was conducted to identify edible non-crop plants in homegardens of a village located in the midland agroclimatic zone of the State. Among the 27 edible non-crop species identified six species namely, *Cassia occidentalis, Cassia tora, Centella asiatica, Oxalis corniculata, Phyllanthus urinaria* and *Portulaca oleracea* were found in more than 40 homegardens. In homegardens, all edible non-crop plants are managed at a minimal level by tolerance and protection. Being rich in protein (19.3 mg g-l to 54.3 mg $g^{-l}$), fat (0.004 mg $g^{-l}$ to 0.016 mg $g^{-l}$), fibre (12.6 mg $g^{-l}$ to 49.8 mg $g^{-l}$), minerals (25.7 mg $g^{-l}$ to 58.3 mg $g^{-l}$), calcium (3.3 mg $g^{-l}$ to

13.3 mg $g^{-1}$), phosphorous (0.3 mg $g^{-1}$ to 3.2 mg $g^{-1}$) and iron (0.2 mg $g^{-1}$ to 0.8 mg $g^{-1}$), these species are nutritionally comparable to or even better than several cultivated vegetables in the country.

## KFRI Research Report No. 496

### Storage practices in recalcitrant tropical forest seeds of Western Ghats

Chandrasekhara Pillai and Pandalai RC.

De-coating of seeds helped to enhance germination potential of the seeds of *Calophyllum inophyllum* and *Dysoxylum malabaricum*. Fresh seeds of *Artocarpus hirsutus* had 49.99 per cent moisture content and its critical moisture level was 40 per cent. Germination of the fresh seeds in each species was 88, 94, 97, 99.7, 98, and 58 per cent respectively. However, desiccated seeds of *A. hirsutus* showed higher germination (97 %) than that of fresh seeds. Seeds in earthen pot kept inside wet vermiculite/ saw-dust at 16°C and 45 per cent relative humidity (RH) was the optimum storage condition for *A. hirsutus* (32% germination during 8th month and decreased to 11% at the end of 10th month), *C. inophyllum* (20% germination at 14th month), *Syzigium cumini* (24% germination during 3rd month and gradually decreased to 10 % at 6th month).

## KFRI Research Report No. 497

### Bamboo resources development and utilization in Karassery Grama Panchayath

Raveendran VP, Sankar S, Seethalakshmi KK and Mohammed Kunhi KV.

The Karassery Grama Panchayath, Kozhikode District, Kerala launched a project in collaboration with the Kerala Forest Research Institute (KFRI), Peechi, Thrissur on bamboo resources development and utilization in the Panchayath. The project aimed at creating a bamboo resource base in Karassery Grama Panchayath, which could be primarily used for stabilizing the river bank of two rivers - Iruvanjipuzha and Cherupuzha - draining the Panchayath. KFRI provided technical support and material assistance and further provided training and capacity building in developing and managing bamboo resources. Training programmes on 1. Bamboo planting stock production, 2. Cultivation management and utilization of bamboos 3. Bamboo crafts were organized in Karassey Grama Panchayath. Field visits and exposure visits were conducted for farmers, Kudumbasree members, stakeholders and ward members of the panchayath to different locations such as bamboo industries, bambusetum, bamboo nurseries and handicraft units in Kerala to create awareness on bamboo resources, value addition and uses of bamboos. The bamboo species namely *Bambusa bambos, Bambusa, tulda, Bambusa. vulgaris, Dendrocalamus asper* and *Ochlandra travancorica* were planted along a stretch of about 8 km on both sides of the rivers. Bamboos were also planted in other potential areas in the panchayath with people's participation and growth and survival of bamboo species were monitored.

## KFRI Research Report No. 498

### Development of seed handling technologies for selected bamboo species

Chandrasekhara Pillai, Seethalakshmi KK, Raveendran VP and Mallikarjunaswamy GE.

Seed attributes such as seed weight, length, width, thickness, moisture content and physical purity were determined. Rapid viability tests (tetrazolium & hydrogen peroxide tests) and germination tests were carried out for assessing seed viability. Periodical viability tests and moisture analysis were carried out to study the effect of storage condition, seed moisture variation and seed longevity. Mycoflora associated with seeds under storage were also studied. Seed moisture content significantly influenced seed viability and germination; an increase of moisture content from 8-12 per cent resulted in complete loss of germination (0%) for *D. endrocalamus brandisii* and *D. sikkimensis*. Thirteen fungal species were identified on stored seeds. Seeds stored at 4°C and 45 per cent RH had minimum fungal incidence.

# Academic activities

## Research Papers in Journals

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## Participation in Seminars/Workshops etc.

- ☐ 27th Kerala Science Congress at Vijaya Camelot Convention Centre, Alappuzha, during 27- 29 January 2015
- ☐ State Expert Appraisal Committee (SEAC) meeting at Dept. of Environment, Trivandrum ( By Dr. EA Jayson)
- ☐ Consultative Committee meeting of Institute of Climate Change Studies, Trivandrum ( By Dr. EA Jayson)
- ☐ 2nd Biodiversity Congress on 'Biodiversity: Access and Benefit sharing' organized by Kerala State Biodiversity Board during 23-27 February 2015 at Kanakakkunnu Palace, Thiruvanatha- puram (By Sani Lookose)

## Thematic Exhibitions

During the period of 2014 – March 2015 Extension and training division of KFRI organised 15 exhibitions state-wide covering about 90 days. The exhibition display well researched and illustrated information panels, information booklets of topical interests, research publications and multimedia products featuring research and development programmes, programmes of technology transfer, outreach and suply of quality planting materials including seedlings and forest tree seeds. Some of the thematic exhibitions organised during the period include two exhibitions featuring research development and community organisation activities of KFRI in bamboo resources and one theme exhibitions featuring the wetland conservation and awareness. Out of these on two occasions KFRI stalls won accolades for information content and presentation.


To support a planned teak conservation programme in original teak growing countries in an effort to prevent natural teak from disappearing completely, a project planning workshop was jointly organised by International Teak Information Network (TEAKNET), India in association with Plant Genetic Conservation Project under the Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG), Thailand, International Union of Forest Research Organizations (IUFRO), Austria, Food and Agriculture Organization (FAO) of the United Nations, Rome and during 26-27 May 2014 in Bangkok.

# Training programmes organised by the Extension and Training Division

The programme division organised 35 training programmes spanning over 150 training days. The agencies who sponsored programmes include Kerala Forest Department, Kerala Veterinary and Animal Sciences University, Department of Forest Research Survey, Nepal, . Kerala State Council for Science Technology and Environment, Ministry of Environment and Forests, Government of India, National Bamboo Mission, Food and Agriculture Organisation of the United Nations etc. Details of the training programmes conducted are provided in the table below:

| Sl. No. | Training Programme | Sponsoring agency |
|---|---|---|
| 1 | Industrial Training on "Arc GIS and ERDAS" to 3rd Semester M. Tech Students of Govt. Engineering College, Thrissur | Govt. Engineering College, Thrissur |
| 2 | Workshop on Environmental Journalism. | KFRI and Institute of Communication, Kerala press Academy, Kakkanadu. |
| 3 | Training in forestry to MS (Wild Life studies) students, of the Kerala Veterinary and Animal Sciences University, Pookkodu, Wyanadu | Kerala Veterinary and Animal Sciences University |
| 4 | Capacity building for the field staff of Kerala Forest Department in Forestry and Forest Management Training Programme on " Captive elephant management . | Kerala Forest Department |
| 5 | Refresher Course in Forestry Research | Kerala Forest Research Institute |
| 6 | Exposure Visit of officials from Department of Forest Research and Survey, Nepal | Department of Forest Research Survey, Nepal. |
| 7 | Orientation Programme for CAT@ School Students | Kerala Forest Research Institute |
| 8 | Inauguration by Chief Minister<br>1. CAT@ School Programme for Students<br>2. KFRI Research scholars Hostel<br>3. Release a digital compilation of 482 KFRI Research Reports | Kerala Forest Research Institute |
| 9 | Workshop for Preparation of Perspective Plan for Nilgiri Biosphere Reserve | Kerala Forest Research Institute |
| 10 | Personality Development camp for CETA HOPE Students | Kerala Forest Research Institute & CETA, Thrissur Chapter |
| 11 | Workshop on Mangrove Conservation and Management | Kerala Forest Research Institute & Kerala Forest Department |
| 12 | Hands on Training Programme on KOHA, as open source software for Library Automation | Kerala State Council for Science Technology and Environment |
| 13 | Training cum Exposure visit of Farmers from Karnataka State | Bamboo Technical Support Group, National Bamboo Mission |
| 14 | Prakruthiyum Madhyamavum (training on Nature and Media) for the media professionals | Kerala Forest Research Institute |

| | | |
|---|---|---|
| 15 | Training course on Resource Enhancement and Utilization of Bamboo | National Bamboo Mission |
| 16 | One-Week Training Course on Collection, Compilation, Validation and Dissemination of Forest Statistics for Indian Forest Service Officers | Ministry of Environment and Forests, Government of India |
| 17 | Training course on Resource Enhancement and Utilization of Bamboo | National Bamboo Mission |
| 18 | Tally training for KFRI Assistant staff | Kerala Forest Research Institute |
| 19 | Regional Training on Data analysis for tree volume, biomass and carbon stocks assessment | Food and Agriculture Organisation of the United Nations |
| 20 | Training on Forest Invasive Species Management | Food and Agriculture Organisation of the United Nations |
| 21 | Training course on Resource Enhancement and Utilization of Bamboo | National Bamboo Mission |
| 22 | National Training Programme on: Forest Health Surveillance and Early Detection of Forest Invasive species | Food and Agriculture Organisation of the United Nations |
| 23 | National Children Science Congress | Kerala State Council for Science Technology and Environment |
| 24 | Two-Day Training Workshop on Medicinal Plants - Role of State Forest Departments in Conservation, Cultivation, Harvesting, Marketing and Benefits Sharing by the Communities | Ministry of Environment and Forests, Government of India |
| 25 | Training course on Resource Enhancement and Utilization of Bamboo | National Bamboo Mission |
| 26 | Propagation, Cultivation and Management of Bamboos | Bamboo Technical Support Group, National Bamboo Mission |
| 27 | Training for MS (Wildlife studies) students at KFRI | Kerala Veterinary and Animal Sciences University |
| 28 | One day training programme on Teak Cultivation | Kerala Forest Research Institute |
| 29 | Two day training Programme for CAT@ School Students | Kerala Forest Research Institute |
| 30 | Orientation training programme IFS probationers of Kerala Forest Department | Kerala Forest Research Institute |
| 31 | Training on Quarantine Control and International Standards for Phyto-sanitary measures. | Food and Agriculture Organisation of the United Nations |
| 32 | Mechanisation and value addition of Bamboo | National Bamboo Mission |
| 33 | Capacity Building of Field Staff of Kerala Forest Department in Forestry and Forest Management -Training Programme on Human - Wildlife Conflict | Kerala Forest Department |
| 34 | Rural Innovators Meet 2015 | Kerala State Council for Science Technology and Environment |
| 35 | Sacred Groves Conservation | Kerala Forest Research Institute |

## Training programmes at Sub Centre, Nilambur

- Summer Training Course for students during 20-30 April 2014 through prior registration
- Teak Study Training programme for Teacher trainees during 10-25 January 2015

## Outreach programmes at Teak museum, Nilambur

A two day Science Camp for Students is organised by Kerala State Council for Science Technology and Environment (KSCSTE) in collaboration with KFRI Sub Centre, Nilambur, during 26-27 May 2014, to create an awareness in children on Science in daily life.

Awareness programme on World Environment Day for Students of Fatimagiri English School, Nilambur on 5 June 2014

One day orientation workshop on 'Biodiversity conservation' for students of Bharath Scout and Guides, Malappuram on 7 June 2014

Orientation programme on 'Natural forests and plantations in Kerala with special reference to Teak' for BTTM Degree Students (Bachelor of Travel and Tourism Management) of M.E.S College, Perinthalmanna, Malappuram (Dt) 22-23 September 2014

Wild Life Week Activities for nature club members & students from various Educational Institutions during 01-07 October 2014

One day Orientation programme on Biodiversity of Western Ghats for Student and trainee teachers group on 26 October 2014

Orientation programme on teak cultivation and management for students of VMHEM School, Makkaraparamba , Malappuram (Dt) on 29 November 2014

Two-day Nature Study Programme during 18-20 December 2014 in association with Regional Museum of Natural History, Mysore(M/o Envt.& Forests) for the Winter Nature Camp Participants of RMNH, Mysore.

Two day orientation workshop on theme 'Teak- scientific and historical aspects' Students of Malabar Special School, Malappuram during 10-11February 2015

One day awareness programme for the members of Literacy mission, Nilambur Block Panchayath, Malappuram on 21 March 2015 in connection with World Forestry Day.

Documentary fest on topics related to Forest, Wildlife & Nature conservation and various environmental issues was organized in teak museum at KFRI Sub centre for the public and other organized groups during 21- 30 May 2014 in connection with the Teak Museum Day on 21st May.

# Dr. C. Chandrasekharan Memorial Award 2014

The 'Dr. C. Chandrasekharan Memorial Award' for innovative Research in Conservation of Forests and biodiversity is awarded every year by KFRI.. The award was instituted in memory of former KFRI Director Dr. C. Chandrasekharan, an expert in tropical forestry who had served as economist for Food and Agriculture Organisation of United Nations. Dr. V.P Thomas, Assistant Professor at Catholicate College, Pathanamthitta shared the Award with Sandeep Das, Junior Research Fellow at KFRI. Prof. (Dr.) K.V. Kunhi Krishnan, Former Registrar – CUSAT & Visiting Professor, School of Social Sciences – MG University delivered Dr.Chandrasekharan memorial lecture at KFRI on 09th October 2014 and gave away the award to the winners. The award consist of a gold medal, a certificate and a cash award (Rs.20,000/-each). While delivering the Dr. C Chandrasekharan memorial lecture, Prof. Kunhikrishnan provided the a glimpse of the processes involving liberalisation of market economy and how these affect long term conservation of biological diversity. He further elucidated how these affect inter and intra-generational equity as far as the redistributional justice of natural resources are concerned.

Dr. V.P Thomas receiving 5th Dr.C. Chandrasekharan Memorial award

Mr. Sandeep Das receiving 5th Dr.C. Chandrasekharan Memorial award

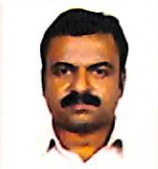
# Dr. KM Bhat Memorial Award 2015

The 6th Dr. K. M. Bhat Memorial award carrying a Gold Medal, Certificate of Merit and cash prize of Rs. 5,000/- was awarded to Dr. Roby, T. J, Post-Doctoral Fellow, Dept. of Zoology, St. Thomas College, Thrissur. The Endowment was instituted by the family of late Dr. K. M. Bhat for the best emerging Research Scholar of KFRI. His doctoral work was on "Floristic structure and diversity of Myristica swamps at Kulathupuzha in a GIS perspective". The award was presented to him on 6th January 2015 in a function organised at KFRI coinciding with 6th death anniversary of Dr. K. M. Bhat. The Endowment Lecture was delivered by Dr. KKN Nair, Sr. Scientist and Head (Rtd.), Botany Division, KFRI.

Dr. Roby TJ, receiving KM Bhat Memorial Award

# PhD Awarded and Academic Attachment Programmes Completed

## PhD Awarded

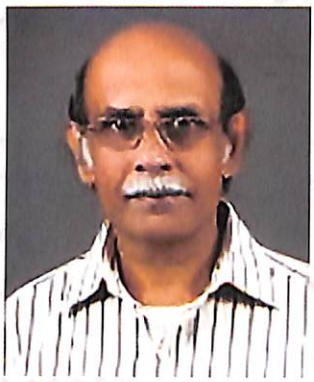
| Name | Title/Topic | University | Year | Supervisor |
|---|---|---|---|---|
|  Sujesh S.M. | Breeding system of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii* two endemic trees of Western Ghats | FRI-DU | May 2014 | Dr. E.P. Indira |
|  Nishad V.M. | Effect of cover crops, mulching and organic manure on below ground microbial diversity in different land use systems in the Kerala part of the Nilgiri Biosphere Reserve | FRI-DU | May 2014 | Dr. M. Balasundaran |
|  Jijeesh C.M. | Litter dynamics and carbon sequestration potential of selected bamboo species of Kerala | FRI-DU | July 2014 | Dr. K.K. Seethalakshmi |

## M.Sc. Academic Attachment Programmes 2014

| Name of the student | Year | Supervising guide | Name of College | Subject |
|---|---|---|---|---|
| Manisha Mohan | Jan-March, 2014 | Dr. E.M. Muralidharan | Bishop Heber College, Trichy | Biotechnology |
| Ramziya Mohd. Haneefa<br>Athira D | March - June, 2014 | Dr. T.B. Suma | St. Josephs College, Irinjalakuda | Molecular Biology |
| Lulu P.K.<br>Nimmy Antony | April - June, 2014 | Dr.Mallikarjuna Swamy | SNGIST& Arts & Science College, Karunallur | Microbiology |
| Semi Peter<br>Neena R. | Feb- June, 2014 | Dr. T.V. Sajeev | SreeSankara College, Kalady | Environmental Science and Management |
| RajithaNath O. | Feb -June, 2014 | Dr. M.P. Sujatha | SreeSankara College, Kalady | Soil Science |
| Preethi P.<br>Greeshma Gopi | Feb-June, 2014 | Dr. S. Sandeep | SreeSankara College, Kalady | Soil Science |

# Retirements 2014

Dr. R.C. Pandalai



Dr. R.C. Pandalai, doctorate in Botany (Wood Science) from Sardar Patel University, Gujarat, was working as the Programme Coordinator, Extension and Training Division and superannuated as the Registrar in charge of Kerala Forest Research Institute, Peechi on 30th April 2014. Earlier he had also worked in various capacities as the Officer in charge, Kerala Forest Research Institute Sub centre, Nilambur, Scientist in charge, Division of Silviculture and Kerala Forest Seed Centre. Dr. Pandalai, specialized in *"Heartwood formation of Indian trees"*, had successfully completed a two-year training course for a Diploma in Forestry as *Assistant Conservator of Forests*, at the State Forest Service College, Coimbatore (1985-86). His specific interests are in the field of Bamboo Silviculture, Nursery/Plantation management, Eco-restoration in degraded sites and species recovery studies. Among his notable achievements, the establishment of a Sympodial Bambusetum, at the Field Research Center, Velupadam with as many as sixty six species from various parts of the country is praise worthy. He also initiated establishment of a Monopodial Bambsetum at Devikulam near Munnar. He was instrumental in conducting a number of field studies on introduction of Rattans in Rubber plantations in Kerala. As an associate his contributions in research programmes on municipal waste land afforestation, development of green belt around industrially polluted areas, eco-restoration of degraded sites at Attapady, are noteworthy. He also developed a unique collection of *Ochlandra* (Bamboo reed) with a number of accessions at the Field Research Centre, Velupadam, from different forest divisions of Kerala and Karnataka as a part of the KFRI, CSIR-NMITLI research programme. Dr. Pandalai has authored more than sixty two scientific papers, fifty eight research reports, sixty four consultancy reports, five chapters in edited books and a number of popular articles. He also attends regularly to the All India Radio programme on Farm and Home. Three research students worked for their PhD programme with him.

Sri. A.R. Rajan

Shri. A.R. Rajan joined KFRI on 16-8- 1978 and superannuated on 30-07 -2014 as Scientist E2. During his service, he was actively involved in the computerisation, development of local area net work and email facilities in KFRI.

Dr. P.S. Easa

Dr. P.S. Easa joined KFRI in 1978 and was the Head of the Department of Wildlife for about ten years. He has undergone training in Wildlife Conservation and Management at Smithsonian Institution. Dr. Easa associated with Centre for Economics and Social Studies, Hyderabad and has also worked in a National NGO at Delhi as Senior Director-Conservation for four years. Currently, he is the Chairman of Care Earth Trust, Chennai. He was a Consultant for International Fund for Animal Welfare (IFAW) for preparing Report on priorities for Elephant Conservation in Asia. He was member in National Board for Wildlife, Govt of India; State Wildlife Board of Govt. of Kerala; IUCN Species Survival Commission of Asian Elephant Specialist Group; State Wildlife Board of Chattisgarh and various other national and international agencies and advisory councils of Wildlife Institute of India, Dehra Dun, Salim

Ali Centre for Ornithology and Natural History, Coimbatore and various committees of Ministry of Environment, Forests and Climate Change and National Tiger Conservation Authority, Govt. of India, Project Elephant Steering Committee, Elephant Task Force, Protected Area Management Effectiveness Evaluation of Eastern Indian PAs, Tiger Conservation Plan Approval Committee of Tiger Reserves in South India, Management Effectiveness Evaluation of Tiger Reserves in North East, Advisory Committee of National Museum of Natural History, New Delhi and Expert Group on Eastern and Western Ghats; Thematic Working Group, National Biodiversity Strategy and Action Plan and Technical Committee of Govt. of Odisha for Reviewing the Forest and Wildlife Protection Measures. Dr. Easa is also the Chief Technical Co-ordinator of Nilgiri tahr Population Estimation in Kerala; Western Ghats Regional Core-Group, National Biodiversity Strategy and Action Plan; Member of the Expert Panel for delineating Periyar and Parambikulam Tiger Reserves in Kerala. He was also the Member Secretary of the State Steering Committee of Kerala State Biodiversity Strategy and Action Plan. Dr. Easa superannuated from KFRI on 30.11.2014 as Director-in-Charge after holding the post for seven months.

Dr. C.K. Somen

Dr. C.K. Somen, joined Kerala Forest Research Institute, Peechi, in 1978 and superannuated in November, 2016 as Head of the Department of Tree Physiology. He has obtained M.Sc. in Botany, from Sardar Patel University, Gujarat and Ph D from Cochin University of Science and Technology, Kerala. Dr. Somen has carried out pioneering research on bamboo vegetative propagation and bamboo seed storage in KFRI and has published several research papers in the area. He was involved in research in estimating comparative water usage by different plantation tree species such as eucalypts, acacias, cashew, teak, rubber etc. grown in Kerala. For the first time in Kerala, tracing the absorbing roots of *Eucalyptus tereticornis* to a depth of 9.3 meters was carried out during the study. He was also involved in the studies of Teak seed orchards, selected RET species, medicinal plants, evergreen and semi-evergreen species, and collation and enrichment of Bambusetum etc. He is an expert in the use of several sophisticated instruments used in weather monitoring and ecophysiological studies. He was actively involved in the Bamboo Technical Support Group and its training programmes. He has been involved in many research projects supported by CSIRO, MoEn, DST, KFD, K-Bip, RRI, etc. He also held charge of KFRI Field Research Centre, Palappilly for the period from 2012 to 2014. He has 45 publications to his credit including scientific papers and research reports.

Smt. Mary Kuruvilla

Smt. Mary Kuruvilla joined the Institute on 7th July 1980 and she assumed the office of Assistant Office Manager in 2002 and promoted to Section Officer on in 2010. She retired from service on 31st May 2014 as Section Officer. During her thirty years of service she played an active role in various sections of KFRI in administration, accounts and purchase sections of the institute.

Sri.Sankarankutty P.A.

Sri. Sankarankutty, P.A. joined the Institute on in 1978 and retired from service on 30-11-2014 as Senior Attendant. after more than three decades of active service to the institute. Ever green wishes him a happy retirement life.

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