Externally Aided Project (EAP)

Completed EAP 2011-12

Project Sl. No.	Name of Project	PI	Thrust Area	Research Findings
1	Collection Of Quantitative Field Data Through Rapid Assessment of Population, Growing Stock And Natural Regeneration Status of *Pterocarpus santalinus* L. For *CITES* Non-Detriment Findings Study (MoEF- 5)	Dr. Maheshwar Hegde	Forest Genetic Resource Management	Population structure, growing stock and regeneration status of natural populations of *Pterocarpus santalinus* was studied and NDF report for this species as per CITES requirement was prepared and submitted to MoEF.
2	Differential Analysis of Transcript Expression in *Casuarina-Trichosporium* Interaction to Isolate Defense Related Genes	Dr. Modhumita Dasgupta	Genetic Improvement (Biotechnology)	a. Transcript profiling revealed over expression of 14% pathogen defense-related; 6% other abiotic stress related; 2% symbiotic; 2% cell wall related transcripts and 2% regulatory genes while 70% of transcripts were unknown. Major group of transcripts included chitinase, glucanase, cytochrome oxidase, signal recognition particle, proteasome, arabinogalactan, R gene, heat shock proteins and cyclin dependent kinase involved in all pathogenesis related pathways including HR, PCD and SAR.

				b. Transcripts like nodulin which are expressed during early nodulation in *Casuarina* was also found to be over expressed when challenged during pathogen elicitation. c. Several transcripts expressed during abiotic stresses like LEA dehydrin and transcripts with similarity to drought stress related ESTs were up-regulated during pathogen elicitation. The up-regulation of an unknown transcript with heavy metal binding domain was documented during both biotic stress (fungal elicitation) and abiotic stresses (water deficit, salt stress and elevated temperature). d. qRT-PCR analysis revealed 28 fold increase in expression of the glucanase; 13.6 fold increase in expression of chitinase; 16 fold increase of gene coding for cytochrome oxidase; 9 fold increase of gene encoding nodulin and 2.7 fold increase in expression for gene having a heavy metal domain was observed. Transcript coding for signal recognition particle showed 1-fold increase in expression after 48 hours of pathogen elicitation.

				e. Fifty two EST sequences were submitted to NCBI and is the first set of EST sequences representing this species with accession numbers GR228669 to GR228718 and GR312926 and GR312925. f. Two pathogen defense – related (PR) genes viz. class I chitinase (*CeChi1*) and glucanase (*CeGlu*) were isolated and characterized. This is the first report on isolation of PR genes from this species. g. Complete specifications for joint IFGTB-DBT process patent titled "A simple protocol for isolation of undegraded total RNA from *Eucalyptus* and *Casuarina* and cDNA synthesis from unpurified RNA" was filed with application no. 1927/CHE/2009 dated 13-08-2009. It is a low cost and high recovery protocol for isolation of total RNA from guanidine recalcitrant tissues with high phenolic content using non toxic chemicals. The protocol also describes the down-streaming of total RNA to cDNA without purification.
3	Exploitation and utilization of beneficial microflora from	Dr. V. Mohan, Scientist-F; Dr. R. Anandalakshmi,	Managing Forests and Forest Products for Livelihood	*Field surveys undertaken in different shola sites and collected roots and rhizosphere soil samples

	the sholas for restoration of degraded shola forests in the Nilgiri Hills, Tamil Nadu. (IFGTB/EAP/ HADP)	Scientist-D	Support and Economic Growth (Theme: Mycorrhizae, Rhizobia and other useful microbes)	from selected 18 different shola species in Kotagiri, Glenmorgan, Governor Shola, Kariamandu and Pykara areas in the Nilgiri Hills, Tamil Nadu to study the status of beneficial micro flora such as Plant Growth Promoting Rhizobacteira and AM fungi.. All the soil samples collected from different shola sites were analyzed and estimated for the physico-chemical properties such as pH, E.C., macro nutrients. *Rhizosphere soil samples collected from the root zone of different sites were analyzed and recorded the status of AM fungal spore population. Three types of AM fungi *Acaulospora, Gigaspora* and *Glomus* were recorded. 94 isolates of PGPRs (PSB 42 isolates, *Azotobacter* 26 isolates and *Azospirillum* sp. 26 isolates) were isolated and identified and pure cultures of these strains are maintained in the Institute's germ plasm for further studies. Screening of efficient PGPR isolates was done by IAA production and phosphate solubilization and the best isolates were selected for nursery experiments. *Fruits of fourteen shola species namely, *Michelia nilagirica, Mappia foetida, Viburnum erbuscens, Photonia notoniana,*

				Michelia champaca, Berberis tinctoria, Syzigium cuminii, Syzigium arnottianum, Dysoxylon malabaricum Symplocos cochinsinensis, Evodia luna, Neolitsea zeylanicum, Litsea wightiana and *Eleocarpus oblongus* were collected from Naduvattam, Glenmorgan, Kariamandhu, Kodanadu and Kotagiri areas of Nilgiris. Seed extraction and processing methods were standardized. *To understand the seed biology of the selected species, the initial seed moisture contents were determined followed by which the effect of desiccation on viability on seeds were tested for *Syzigium arnottianum, Mappia foetida, Syzigium cuminii* and *Michelia champaca.* These species could fairly tolerate desiccation. Effect of storage temperature was also studied for *Mappia foetida* and *Berberis tinctoria*. Further studies are in progress. Flowering and fruiting phenology of shola species have been recorded in Glenmorgan, Kodanad and Doddabetta sholas. *Nursery experiment was conducted and inoculated with different bio-inoculants (PGPRs and AM fungi) to selected shola plants. The results revealed that the bio-

				inoculants inoculated seedlings had better growth performance and shoot and root biomass over uninoculated (control) seedlings. *Roots of both inoculated and uninoculated (control) seedlings of different shola tree species were harvested and processed for estimation of percent root colonization and population density of both PGPR and AM fungi and revealed persistence of inoculated beneficial microbes. *Two field trials were established by planting both bio-inoculants applied and uninoculated (control) plants of different shola tree species at Longwood shola, Kotagiri and Glenmorgan RF, Ootacamund, Nilgiri Hills respectively. Periodical observations were undertaken and recorded data on survivals percent and performance of bio-inoculants applied plants in both the field trials and better survival percent was observed in both the trial plots. *3 research papers were presented in National Seminars/ Conferences. *A book on "Seed Biology and Bio-inoculants for Shola Tree Species – A Field Guide" was prepared.