

PROJECTS COMPLETED DURING THE YEAR 2008-2009

PLAN PROJECT

Project 1: Processing and evaluation of plantation grown *Simarouba glauca* DC from Orissa. (IWST/WPU/X59/2006-2009)

Findings: Studies carried out on *Simarouba glauca* showed that the timber is dimensionally stable. Dries very quickly (4-6 days from 80% to 14-16%) without any sawing and seasoning defects. The timber was classified as moderately heavy, weak, not tough, very soft and very steady.

The timber has been found suitable for making artifacts and meet the requirements. The timber was also found suitable for match sticks. The timber can be used for tool handles, light furniture, light packing cases and found good for making 'BWR' grade plywood. Preliminary work indicated the potential of using wood for pencil making. Larger quantity of wood is required for commercial application. The timber has around 62-65% cellulose content. The seeds of the tree contain around 50-55% oil.



Various products made out of *Simarouba glauca* DC

Project 2: Evaluation of wood quality of Eucalyptus clones and plantation grown *Grevillea robusta* A. Cunn. Based on Spiral grain (IWST/WPU/XI 73/2007-2009)

Findings: 60 poles of *Eucalyptus* clones have been procured from two different locations (Mandya and Kolar) and also 5 trees of *G. robusta* for determination of specific gravity, shrinkage, spiral grain angle and nail holding properties. Heritability study of spiral grain and description of gross anatomy were also made. Screening of clones based on lesser grain distortion and shrinkage values completed. Data being analyzed for identifying better clones. Project completion report is under preparation.

Project 3: Effect of particle size on properties of wood filled polypropylene composites. (IWST/WSP/X 53/2006-2009)

Findings: Combining biological fibres and commercial plastics can bring in transition to safer and more environmentally friendly composites. Addition of wood flour to polypropylene, at all levels, resulted in more rigid and tenacious composites. Particle size and filler morphology was found to have significant effect on properties of filled composites. Particles having size between 52 and 85 mesh provides the best properties. A micromechanics model was developed based on shear lag theory. The properties predicted by the model were in good agreement with experimentally observed values.

A fast and reliable method to measure elastic constants using vibration method was developed. A significant improvement in density, dynamic MoE and shear modulus was

observed in wood-filled polypropylene composites with the increasing wood content. The improvement in modulus was nearly 100% as against 17% improvement in density at 50% filler loading. Higher aspect ratio in wood flour resulted in better MoE. The changes in the modulus of the composites with the change in filler content were further explained using Halpin-Tsai model. The model predicted values were in close agreement with the experimentally observed values.

Project 4: Studies on the durability of treated and untreated timbers of selected species. (IWST/WSP/X34/2004-2009)

Findings: Six species of plantation grown timbers (12-15years) *Artocarpus heterophyllus*, *Lophapetalum wightianum*, *Lagerstroemia lanceolata*, *Spodias pinnata*, *Melia azadirachta* and *Sterospermum personatum* were subjected to Pressure treatment by adopting Full cell process with conventional wood preservatives like Copper Chrome Arsenic (CCA), Copper Chrome Boric composition for 4 different loading of absorption viz. 4, 8, 12 and 16 kgm³ and with Creosote + Furnace oil (1:1) the absorption was 40, 80, 120 and 160 kg/m³. The treated specimens were exposed to field test in the Test yard along with untreated controls. After 45 months of exposure, it was found that the *Lagerstroemia lanceolata* is the highly durable and the *Lophapetalum wightianum* is the least durable timber as all the specimens destroyed by the termites within 18 months of exposure. All the treated specimens are in sound conditions showing that even 4 kg/m³ of preservative is sufficient to increase the durability non durable timbers.

Coppiced and non-coppiced poles of *Eucalyptus tereticornis* and *Eucalyptus camaldulensis*, 2.15 m - 3.10 m length and girth varied from 5 cm to 24 cm. were treated in green condition by Sap displacement method and Boucherie method using 2 different concentration of CCB preservative with 2 treatment time. Distribution of preservative along the length of the pole was analyzed. Results show that the specific gravity of coppiced wood was less than the non-coppiced. In both coppiced and non coppiced poles, BIS recommended absorption for structural poles and fence posts is 16kgm³ which can be easily achieved in both treatments with 4.25% concentration preservative for 4days in Sap displacement method and 3 hours in Boucherie method. Analysis of preservative chemicals shows that chromium and copper were present throughout the length of the pole. The treatment is more effective at higher moisture content of the pole and it also reduces the treatment time. The absorption of preservatives in coppiced poles is more than that in non-coppiced poles in *Eucalyptus tereticornis* and almost same in the *Eucalyptus camaldulensis*. Dried poles (Moisture content <15%) can also be treated by vacuum pressure method by adopting the treatment schedule, initial vacuum for 30minutes followed by pressure of 3 kg for 3hours followed by the final vacuum for 15 minutes. Depending upon the end uses and available facility, proper treatment schedule can be followed to enhance the service life of the coppiced wood and can be used rationally for better purposes without much wasting of the natural resource.

Project 5: Isolation and anti-fungal activities of the chemical compounds of *Baccaurea courtallensis* Muell.Arg. - a wild edible plant of Western Ghats. (IWST/CFP/X64/2006-2009)

Findings: Fatty oil content was found to be 22.5% in *Baccaurea courtallensis* Muell. Arg., an endemic tree species of Western Ghats. One saturated fatty acid namely palmitic acid showed 43% and one unsaturated fatty acid namely oleic acid showed 36% as major constituents in the oil which are the first reports so far as fatty oil content and fatty acid composition of this species are concerned. Qualitative phyto-chemical analysis of ethyl acetate extract of the fruit rind of *Baccaurea courtallensis* showed the presence of Tannins and Flavanoids and methanol extract showed the presence of Tannins, Flavonoids and Quinones. Ethyl acetate and Methanol extracts of the fruit rind of *Baccaurea courtallensis* were found to be highly inhibitive to *Fusarium oxysporum* fungi as tested under laboratory conditions.

Project 6: Investigations on chemical composition and utility of AESP oil from exhausted sandalwood powder (IWST/CFP/X60/2006-2009)

Findings: The exhausted sandalwood powder which was considered to be a waste was subject of study for which the optimum acid treatment to yield maximum amount of new oil named AESP oil from exhausted sandalwood powder was determined. UV and GC analysis of AESP oil has been carried out and found that this oil was altogether different from sandalwood oil. The oil was evaluated and found acidic and pungent in nature and the colour of the milky white soap is getting changed. The cosmetic value of the oil is very poor and is not suitable for its application in soap making. Cost effectiveness for 1 kg of AESP oil was worked out. Its potential for other uses has to be worked out.

Project 7: Analysis of active principles in *Gymnema sylvestre* and *Phyllanthus amarus* from the forest of southern India. (IWST/CFP/X46 2005- June 2008)

Findings: The study was conducted in five states namely Karnataka, Tamil nadu, Andhra Pradesh, Kerala and Goa. Among these five states, 35 MPCA (Medicinal plant Conservation Area) were selected on the basis of climatic condition. Results show higher active principle content at drier part of MPCA when compared to moist region. It was seen that the variation of active principle ranged from 2% to 6% in *Gymnema sylvestre* and in *Phyllanthus amarus*, Phyllanthin varied from 0.3% to 0.6%. Results show that Kolli hills and Davaryan durga contain highest active principles respectively. Results are also showing higher active principles content in coastal, dry deciduous and scrub jungle region.

Project 8: Screening and evaluation of wild varieties of *Emblica officinalis* fruit in various Agro-climatic zones of Western Ghats. (IWST/CFP/X48 2005-June 2008)

Findings: This study was conducted at ten different locations within the Agro-climatic zones of Western Ghats. Results show that two places of Western ghats namely Thenmalai and BRT hills contain high ascorbic acid content. So far as fruit yields are concerned, trees from BRT hills gave higher yield than trees from Thenmalai. Results show that fruit yield is higher in deciduous forests and ascorbic acid content was found to be higher by about 30-40% in deciduous forests.

Project 9: Productivity and interaction studies in *Acacia hybrid* based agroforestry practices in Karnataka (IWST/TIP/X40/2004-2009)

Findings: *A. mangium* hybrid block plantation and line planting field trials in Doddaballapur and Kolar (on-farm trials) in 2004-05 were established. In 2008, in Kolar the average ht and gbh of *A. hybrid* in line planting was 12m and 40cm and in Gowribidanur it was 8m and 22cm, respectively. The average height and gbh of *A. hybrid* in Block planting in Kolar was 13m and 28cm and in Gowribidanur, it was 6m and 17cm respectively. Intercropping carried out for 3 successive years. Nearly 25-30 % reduction in intercrop yields was observed within 5m distance from tree line under line planting method. Canopy and root management practices helped in minimizing loss in agricultural crop yields in line planting method of planting in both sites. Above ground biomass (ABG) was 20-25% more in *Acacia* hybrid trees under line planting. The ABG consisting of stem, branches and leaves in block planting method ranged from 70-80 kg/tree and 90-100kg/tree in line planting in Kolar site.

Project 10: Assessment of seed quality in unimproved populations, seed production areas and seed orchards of *Tectona grandis* (IWST/TIP/X48/2005-2009)

Findings: Seeds were collected from unimproved populations and SPA at Virnoli, Barchi, Baghwathi and Tittimathi, from CSO at Tittimathi and SSO at Tirupathi. Fruit, seed and seedling variability studies showed that overall Tittimathi seed sources was better as compared to other seed sources. Subsequent studies from fruits collected from unimproved population, SPA and CSO at Chandrapur, Maharashtra and Warangal, A.P. revealed that germination was highest for seeds from SPA, Chandrapur. Morphological parameters, germination and seedling growth studies revealed improvement in quality of SPA seeds as compared to unimproved populations.

Project 11: Comprehensive tree improvement program for *Gmelina arborea* in Karnataka – Phase I- Progeny trial (IWST/TIP/X41/2004-2009)

Findings: Progeny trial was established using progenies of 27 plus trees (17 from Karnataka and 10 from Andhra Pradesh) during July 2007. The progeny trial was established in three replicates with nine seedlings per replicate. Growth data at 15 months indicated that the best performing

families were SGA-17 from Karnataka and AP-10 from Andhra Pradesh. Growth data indicated that best growth in terms of height was seen in case of SGA-17 (192.00 cm) and AP-10 with average value of 101.33 cm. SGA-7 and AP-3 were the poor performing families with respect to height growth with values of 90.00 cm and 53.33cm, respectively. Similar trends were observed for collar diameter with high average values of SGA-17 (23.33mm) and AP-10 with average value of (13.33 mm). Whereas, lower values for CD were observed in case of SGA-7 (7.40 mm) and AP-3 (6.66 mm). It was noted that some of the families from Andhra Pradesh after good initial growth suffered with die-back problem.

Project 12: Fuel properties of important forest weeds (IWST/WE/XI-75/2007-2009)

Findings: Study on calorific value, proximate analysis (ash content, volatile content and fixed carbon content) and elemental parameters (carbon, hydrogen, nitrogen and sulphur content) of two forest weeds i.e., *Lantana camara* and *Eupatorium spp* was carried out. The above study was undertaken with an aim to evaluate the selected forest weeds as a raw material for energy production. Basic density of *Lantana camara* and *Eupatorium spp* was determined. The calorific value of leaves and stem of *Lantana camara* were found to be 19.17 MJ/kg and 19.02 MJ/kg, respectively. The calorific value and other fuel properties of *Lantana camara* are comparable to *E. hybrid* and *C. equisetifolia*, prominent fuelwood species. The calorific value of *Eupatorium spp* was found 18.73 MJ/kg. The lower calorific value of *Eupatorium spp* may be due to their higher ash content (6.07%) as compared to *Lantana* (1.00%). The amount of ultimate carbon in *Eupatorium spp* and *Lantana camara*, ranges from 43 to 48%.

Project 13: Database Development of IWST Xylarium (IWST/IT/X58/2006-2009)

Findings: Web database prepared for IWST xylarium, GASS forest museum wood specimens collection and IPRITI wood specimens collection. It contains wood specimens related information like xylarium rack number, specimen access number, binomial name of specimen, specimen collector name, specimen collection area, specimen collection date, specimen collection country, specimen collection continent, number of specimen available, whether it is available for mutual exchange, scientific classification of wood specimen: kingdom, division, class, order, family, genus, subgenus, species, author of species, common/trade name, vernacular name, distribution of species, uses, normal picture of specimens anatomical picture of specimens, references.