PROJECTS COMPLETED DURING THE YEAR 2007-08

PLAN PROJECTS

Project 1: Eco-Rehabilitation of limestone mine of overburden in Madhya Pradesh [065/TFRI/2004/Ecol.-1(6)]

Findings: *Acacia nilotica, Dalbergia sissoo, Leuciana leucocephala* and *Acacia catechu* among Nitrogen Fixing Tree species (NFTs) and *Jatropha curcus, Gmelina arborea, Eucalyptus* hybrid, *Simaruba glauca, Holoptellia integrifolia* and *A. indica* among non-NFT's were found best suited in overburden dumps of limestone mine areas. Application of a combination of *Rhizobium*, VAM and phosphorous solublizing bacteria helped attaining maximum height and collar diameter in *Albizia procera*. Shoot height and root weight of *A. procera* were found significant at 5% level. Among nitrogeneous fertilizers, ammonium nitrate increased maximum height of *A. procera.* Mulching was found to have significant positive response in height increment of *Albizia procera*. Leaf litter followed by husk and grass mulches helped good shoot growth.

Project 2: Effect of microbial inoculants on growth and productivity of safed musli (*Chlorophytum borivillianum*) [082/TFRI-2005/Patho – 1(11)]

Findings: *Clorophytum borivillianum* (Safed Musli), an important medicinal plant, is being widely cultivated by farmers as it requires marginal soil for growth and development and has good market for its produce. In the present study effect of VA mycorrhizae, *Azospirillum*, PSB in the establishment of Safed Musli was undertaken. On the basis of experimental results, it has been found that the growth and saponin contents were enhanced by application of VAM, *Azospirillum* and PSB treatment. This combined treatment of biofertilizers was found superior.

Project 3: Studies on the role of Actinomycetes in controlling root diseases of *Tectona grandis*, *Albizia procera, Dalbergia sissoo* and *Acacia nilotica* in nurseries [072/TFRI-2004/Patho–2(9)]

Findings: One actinomycete (*Streptomyces* sp.) and three bacteria were isolated from soil and was screened in the laboratory for antagonistic activity against pathogens of forest tree species viz. *Alternaria alternata, Curvularia lunata, Sarocladium oryzae, Fusarium oxysporum*, *Ganoderma lucidum* and *Macrophomina phaseolina.* The culture filterate of these antagonistic organisms were also tried to control the seed microflora of *Albizia procera, Dalbergia sissoo* and *Acacia nilotica.* A formulation contains farm yard manure and chicken manure was selected after growing *Streptomyces* sp. in seventeen different substrates. *Streptomyces* sp. was also multiplied in bulk by using lab fermentor in liquid PDA medium. The inoculum was prepared in bulk by using farm yard manure as the carrier for field application. The bulk culture of bacteria was prepared in PDA broth as well as in lignite. Post-emergence damping-off disease of *A. procera, A. lebbek* and *D. sissoo* and *Acacia nilotica* were also controlled by using above formulation. The use of this bio-agent also safe guards the soil from pesticidal residue in nursery and plantations. It is self-multiplying in soil and appears a new species of *Streptomyces.* It is concluded that this *Streptomyces* sp. and antagonistic bacteria (T_1, T_2, T_3) can be used to control

the different pathogens which are responsible for seed deterioration, causing seed borne infections, root rot and damping off diseases of above selected species in nursery.

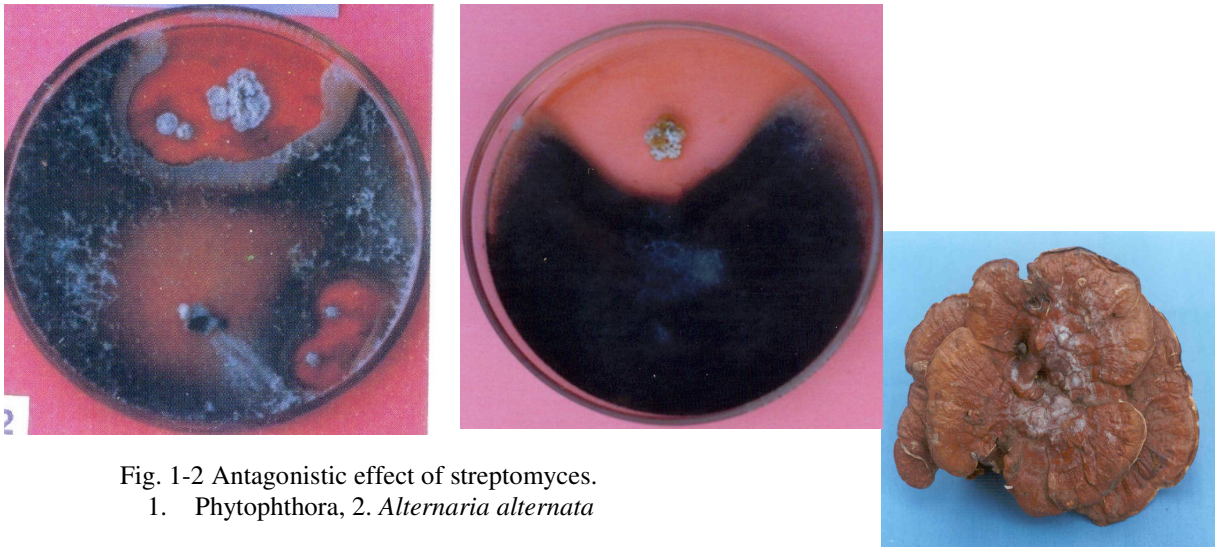

Fig. 1-2 Antagonistic effect of streptomyces.
1. Phytophthora, 2. *Alternaria alternata*

Project 4: Standardization of the cultivation technique and utilization of laccate, stipitate species of Ganodermataceae (*G. lucidum*) [056/CFRHRD-2003/2(6)]

Findings: Field surveys were conducted in different agro-ecological zones of M.P., C.G. and M.S. Total 89 samples of *Ganoderma* were collected. Screening of *Ganoderma* strains were conducted by adopting cellulose degrading capability. Estimation and production of glucanase by four selected strains of *Ganoderma lucidum* was also carried out. Cellulolytic adequacy index capacity has been tested for 19 isolates of *G. lucidum* and two strains have been selected.

Medicinal mushroom of Central India

Project 5: Studies on inheritance pattern of selected wood traits in teak (*Tectona grandis* L.) [068 / TFRI / 2004 / Gen-3 (9)]

Findings: Analysis of variance of growth and wood traits of the progenies of different parents in the trials at Lohara (Chandrapur) and Mohogata (Nagpur) showed significant variation at family level for all the traits except bark thickness. The important wood traits viz., specific gravity,

heartwood percentage, sapwood percentage, fibre length, fibre diameter, fibre lumen diameter, vessel length and vessel diameter showed highly significant variation at family level.

The study also revealed moderate estimates of genetic gain for growth and wood traits from both the trials, which indicated that significant genetic gains can be realized through a moderately intensive selection programme. Some of the families showed good GCA for important growth and wood traits. The good general combiners identified in the present study can be used for establishment of advanced generation seed orchards and breeding arboreta for improvement of teak for specific or combination of above traits.

Project 6: Chemical investigations on biologically active chemicals of forest species and their utility for pest control [069/TFRI-2004/NWFP-1(9)]

Findings: *Jatropha curcas* seed oil was modified and different physico-chemical properties were assessed. *J. curcas* seeds were collected from different regions of India and estimated oil percentage and antinutritional constituents, saponins and phytates. Maximum oil percentage (kernel basis) 59.78 % was recorded in the seeds collected from Alirajpur, Jhabua (Madhya Pradesh) while oil percentage in different seed sources ranged from 37.88 to 59.78%. Toxic content phytates and saponin ranged from 4.35 to 9.10% and 0.52 to 2.52%, respectively. There was no correlation between oil concentration and toxic content.

Biological activities of different oil component were assessed against termite (*Odontotermes* spp.), fungi (*Fusarium oxysporum* and *Alternaria alternata*), bacteria (*Pseudomonas tectonae*) and weed (*Parthenium hysterophorus*). 4.7% weight loss of wooden block was recorded in control while minimum weight loss (1.4%) was observed in 10% formulation of sulphated oil when tested against termites. Maximum fungal inhibition (75%) was recorded in diterpenoid fractions. Diterpenoid fraction showed potential efficacy against *A. alternata* and *P. tectonae*.

Herbicidal activity of *Jatropha* oil component was also assessed against a weed *Parthenium hysterophrus.* There was 100% root inhibition over the control.

Project 7: Evaluation of wild edible plants of central region for polysaccharides and other food [070/TFRI-2004/NWFP-2(10)]

Findings: Sal dominated forest areas of Mandla (Kalpi, Narayanganj, Bichiya, Anjanai and Mangli) of Madhya Pradesh were surveyed and wild edible fruits of Manhar (*Randia dumatorum*) and fruit bodies of edible fungi, Putpura (*Asterus hygromatricus*) were collected. Polysaccharide content (starch/carbohydrate) and other nutrient composition of fruit bodies of *A. hygromatricus* and *R. dumetorum* were estimated. Fruit bodies contain high carbohydrate (29.48% and 35.41%) in outer and inner part respectively and fruits of *R. dumetorum* contain high carbohydrate (18.93%). *A. hygromatricus* is the good source of protein. Water soluble vitamins (ascorbic acid and thiamine) were also present in both *R. dumetorum* and *A. hygromatricus.* Minerals viz., calcium, phosphorus and magnesium were also found in appreciable amount.

The rhizomes of *C. angustifolia*, *C. pseudomontana*, *C. speciosus*, *E. nuda* and *P. tuberosa* rhizomes /tubers are eaten raw or as vegetable in different parts of central region. Polysaccharide (starch) contents in tubers varied from 25.82-38.30%. Maximum content was estimated in the tubers of *P. tuberose* followed by *C. angustifolia,* only 25.82% starch recorded in *E. nuda.* Physico-chemical properties of starch were also determined. Lipid/oil content was also estimated in species, which contribute high energy value of tubers. 6.16% oil was found in *P. tuberosa* followed by *C. pseudomontana* (4.79%). Results showed that species are rich in mineral content. The percentage of potassium, magnesium, sodium ranged from 1.26 to 2.11%, 0.12 to 0.22% and 0.12 to 0.28% respectively. The amount of sodium and magnesium was comparatively low. Phenolic acids were also identified and quantified in species with the help of HPLC.

Diosgenin contents was estimated in *Costus speciosus* collected from different localities of central region. Maximum diosgenin content was found in the rhizomes collected from Kanker followed by Mandla samples. Durg (CG) contained 2.11% diosgenin, while Dhamtari samples possessed 1.37% diosgenin respectively. Anti nutritional contents, phenol was ranged from 0.24-1.09%. Maximum phenols was found in *P. tuberosa.* The tannin content of tubers varied from 0.03-0.34%. Level of oxalate in different tubers ranged from 0.02-0.09% which was considerably lower than those found in most other starchy staples. All the plant species contain high food value. Food energy provided by the edible parts of the species varied from 126 g calories to 336 g calories which is comparable with other commonly used edible species.