

CHAPTER VII

HIMALAYAN FOREST RESEARCH INSTITUTE, SHIMLA

Himalayan Forest Research Institute (HFRI,) Shimla is one of the institutes engaged in forestry research on natural resources of Himalayas for preservation of this unique natural heritage. This institute started its journey as Conifers Research Centre (CRC), Shimla with the aim to address the problems of regeneration of Fir and spruce faced by the State Forest Departments of the region. The CRC took up the regeneration problems of these species and soon devised the nursery technology for the ultimate benefit of the State Forest Department of Himachal Pradesh enabling it to rehabilitate the felled areas. After reorganization of forestry research at the national level, the institute has given the responsibility of addressing specific forestry research problems of western Himalayan states of Himachal Pradesh and Jammu and Kashmir.

PROJECTS COMPLETED DURING THE YEAR 2002-2003

Project 1: Development of suitable field planting models using different combinations of indigenous species in lower hills of Himachal Pradesh including evaluation of their economics [HFRI - 014/08 (AF-01) PLAN-2000]. For technical report contact, Principal Investigator - Mr. K.D. Sharma.

Findings: Seedlings of *Bauhinia variegata*, *Toona ciliata*, *Terminalia tomentosa*, *Grewia optiva*, *Morus alba* and *Leucaena leucocephala*, preferred by the farmers, were raised in the nursery and established in the agricultural fields of farmers in Bhangwanpur and Jorhon villages of Paonta valley (Himachal Pradesh) to demonstrate and develop agri-silviculture model. Data were recorded for various growth parameters and preparation of draft report is under progress.

Project 2: Studies on floristic composition and associated mycorrhizae of dominant species in Baspa valley of district Kinnaur, Himachal Pradesh [HFRI-018/02(EBC-06)PLAN-2000]. For technical report contact, Principal Investigator - Dr. K.S. Kapoor.

Findings: On periodical survey of Baspa valley, 550 plant species including 374 species of orchids, climbing herbs and cultivated crops, 121 species of shrubs



comprised trailing and climbing plants, lianas and under shrubs and later 1123 new plants specimen sheets were added to HFRI Herbarium, 55 tree species out of which important medicinal plants encountered during the survey included *Podophyllum hexandrum*, *Aconitum heterophyllum*, *Angelica glauca*, *Bergenia ciliata*, *B. stracheyi*, *Betula utilis*, *Heracleum lanatum*, *Jurinea dolomiaea*, *Meconopsis aculeata*, *Polygonatum verticillatum*, *Rheum australe*, *Rhododendron anthopogon*, *R. campanulatum*, *Selinum tenuifolium*, *Asparagus filicinus*, *Ainsliaea aptera*, *Achillea millefolium*, *Phytolacca acinosa*, *Caltha palustris*, *Cassiope fastigata*, *Corydalis govaniana*, *Dactylorhiza hatagirea*, *Digitalis lanata*, *Dioscorea deltoidea*, *Jasminum humile*, *Prinsepia utilis*, *Prunella vulgaris*, *Taxus wallichiana*, *Taraxacum officinale*, *Thymus serpyllum*, *Trillidium govanianum*, *Valeriana jatamansi* and *Viola serpens*.



Rheum



Atropa sp.

Mycorrhizal studies of 15 plant species comprising of herbs (*Heracleum lanatum*; *Polygonatum verticillatum*; *Saussurea costus*; *Podophyllum hexandrum*; *Dioscorea deltoidea*); shrubs (*Rhododendron campanulatum*; *Hippophae salicifolia*; *Hippophae tibetana*; *Sophora mollis* and *Piplanthus nepalensis*) and trees (*Betula utilis*; *Pinus gerardiana*; *Juglans regia*; *Cedrus deodara* and *Quercus glauca*) were carried out and AM fungi was isolated.

Project 3: Studies on the growth and pathogenicity of *Phytophthora cinnamomi* rands on deodar and standardization of control measures thereof [HFRI-008/06(FPT-01)PLAN-1998-2003]. For technical report contact, Principal Investigator - Mr. Charan Singh.

Findings: The application of *Trichoderma viridae* @ 15 ml suspension in the month of June on the tree trunk of infected deodar trees shown changes in the colour of needles from yellowish to green. Treatment of the infected trees increased about 35% in size and four times in weight of needles. This biological control agent. *Phytophthora cinnamomi* was found growing successfully in the infected forest and thereby arresting further growth of the pathogens. Treated plots also showed an increase in regeneration potential as compared to control. pH of the soil was moderately alkaline in the diseased plot and acidic in the healthy plot. Nutrients level in the healthy plot was higher than the diseased plot.



PROJECTS CONTINUED DURING THE YEAR 2002-2003

Project 1: Comparative studies on the ecology of degraded forests viz-a-viz relatively undisturbed forests in different eco-climatic zones including autecological studies on the selected promising species of the region [HFRI-010/01(EBC-04) PLAN-00]. *Principal Investigator - Dr. R.K. Verma.*

Status: Demonstration plantation of dominant species viz. *Grewia optiva*, *Bauhinia variegata*, *Acacia catechu* and *Leucaena leucocephala* over an area of 1 ha was established. Preliminary floristic survey revealed that 45 m² and 26 m² herb species were present in plantation and out side the plantation area. On the basis of Importance Value Index (IVI), *Andropogon* sp. was found to be the dominant species both in plantation and out side the planted area. Index of dominance and index of diversity for herbs were 0.078 and 4.358 in plantation and 0.105 and 3.752 out side the plantation area.

Project 2: Assessment of conservation status of hill bamboos (nirgals), collection of germplasm from various eco-climatic zones in Sutlej catchment area and establishment of germplasm bank [HFRI-011/02 (EBC-05) PLAN-00]. *Principal Investigator - Dr. K.S. Kapoor.*

Status: Hill bamboos, *Arundinaria falcata* (*Sinarundinaria falcate*) growing in the lower altitude and *Arundinaria spathiflora* (*Thamanoacalamus spathiflorus*), a species of higher elevations commonly known as nirgals were screened. It was revealed that these species showed peculiar distribution in the areas of their natural occurrence. Ecological studies were also conducted, where the clump size, no. of stems, no. of new shoots in a single clump, maximum and minimum diameter of shoots, etc. were recorded for detailed analysis. It is also noticed that *A. falcata* flowered in 2000 whereas *A. spathiflora* flowered in 2001.



Utilisation of bamboo

Project 3: Development of model for integrated pest management with special reference to *Cedrus deodara* [HFRI-017/06 (FPT-03) PLAN-00]. *Principal Investigator - Mr. Ranjeet Singh.*

Status: Adult emergence of *Ectopis deodarae* started in February (6.6%) and reached its maximum in April (51.3%) whereas the emergence was found to be at minimum in the month of June (2%). Light green colour larvae after hatching out



from the eggs were found changing their colour to pale straw and pinkish brown in the last larval stage during their growth and development. The larvae feed on the foliage for about 32 to 37 days and cause maximum damage during May to June.

Economic Threshold Level (ETH) was worked out to be seven larvae per meter branch. Low to moderate larval parasitization by the hymenoptern parasites *Apanteles glomeratus* Linn.,



Ectropis deodarae

Apentalus ruficours Haliday, *Dusoma deodarae* Cruch., *Brechmymeria obscurata* Walk. and *Campoplegidae deodarae* were reported. The larvae and pupae of this pest are highly susceptible to various types of insect pathogens like *Beauveria bassiana*, *Aspargillus flavus*, *Bacillus thuringiensis*, *Bacillus cereus* ver. *Mycoides* (Flugge) and nuclear polyhedrosis virus.

Project 4: Screening and selection of insect pest and diseases resistant phenotypes/provenances of important tree species viz., *Cedrus deodara*, *Pinus roxburghii*, *Dalbergia sissoo* and *Poplar* sp. [HFRI-013/06(FPT-02)PLAN-00]. *Principal Investigator- Mr. Ranjeet Singh.*

Status: Provenances and clones of *Cedrus deodara* (deodar) and *Dalbergia sissoo* surveyed for insect-pest and disease incidence and examined for deodar defoliator attack. It was observed that deodar seedlings raised from Sarahan, Solan, Kalpa and Himgiri seed sources have shown resistance against *Ectropis deodarae* while *sissoo* seedling screened against *Plecoptera reflexa* have shown maximum 97.0 to 100% and minimum 21.91 to 25.98% susceptibility infestation in different clones.

Project 5: Standardization of nursery technology for mass propagation of selected medicinal plant species [HFRI-009/07(NWFP-01)/PLAN/2000]. *Principal Investigator - Dr. Sandeep Sharma.*

Status: Germplasm of 30 species of medicinally important plants of temperate Himalayas is maintained separately at Manali and Solan. Trials are in progress for improving the agrotechniques of these economically important medicinal plant species. It was found that the *Picrorhiza kurooa* can be easily propagated through off shoots with >95% success during rainy season.

Project 6: Standardization of methodology for collection of seed, its handling, storage, testing and certification of seeds of important tree species [HFRI-012/05(SFG-04)/PLAN/2000]. *Principal Investigator - Mr. K.S.Thakur.*

Status: It was observed that the seeds of *Hippophae tibetana* (Tibetan Seabuckthorn) retained viability even after one year of its collection under ambient conditions. Seed germination of *Arundinaria falcata* (hill bamboo) improved from 7.33% control to 16.00% on treating with 200 ppm GA₃ for 24 hours. Germination of *Ribes alpestre* seeds improved to 43.50% on soaking in water for 24 hours as compared to 32.50% in control. Germination of *Rauwolfia serpentina* (sarpagandha) was found to be (<1.0).



Project 7: Developing efficient methods for preparation of compost from different locally available raw materials in different eco-climatic zones [HFRI-015/05(SFG-05)/ PLAN/ 2000]. *Principal Investigator - Dr. Sandeep Sharma.*

Status: Compost production studies from different locally available raw materials of lower Himalayas indicated that in temperate Himalayas aerobic composting of weeds, grasses and leaves of broad-leaved species could be easily done from the month of March to November.

Project 8: Standardization of nursery techniques of raising containerized seedlings of conifers and their broadleaved associates [HFRI-016/05(SFG-06)/PLAN/2000]. *Principal Investigator - Dr. Sandeep Sharma.*



Nursery techniques of raising containerized seedlings

Status: Rooting trials in cold desert species indicated that in case of *Fraxinus xanthoxyloides*, shoot cuttings (of diameter ranging between 10-15 mm) treated with 6000 ppm IBA in talc improve rooting (44.44%) as compared to untreated cuttings (3.70%). *Rosa webbiana* could be propagated easily through root cuttings (80.0%) as compared to shoot cuttings (8.33%).

NEW PROJECTS INITIATED DURING THE YEAR 2002-2003

Project 1: Development of suitable models for afforestation of mined areas [HFRI-018/01 (EBC-07)/ PLAN/2002]. *Principal Investigator - Dr. R.K. Verma.*

Status: Nursery experiments were initiated, in polythene bags of different size using different combinations of lime mine spoil and forest soil, on the performance of five tree species viz. *Bauhinia variegata*, *Robinia pseudoacacia*, *Eucalyptus* hybrid, *Grewia optiva* and *Toona ciliata*.

Eucalyptus hybrid showed the maximum value for height, collar diameter, shoot, root dry weight and total biomass whereas, survival was observed highest in *Grewia optiva*. The performance of *Eucalyptus* hybrid was followed by *Bauhinia variegata*, *Grewia optiva*, *Robinia pseudoacacia*, and *Toona ciliata* in term of growth and biomass parameters.



Project 2: Standardization of nursery techniques of five dominant species (*Capparis spinosa*, *Ribes* sp., *Caragana* sp., *Collutea* sp. *Cratagus* sp.) of cold deserts [HFRI-019/03(EBC-08)/PLAN/2002].
Principal Investigator - Dr. K.S. Kapoor.

Status: Facilities at Tabo research station were strengthened during the year by erecting poly-tunnels and digging trenches, etc. for carrying out trials.

Project 3: Studies to evaluate impact of ban on green felling on regeneration of conifer species (deodar) [HFRI-020/05(SFG-07)/PLAN/2002].
Principal Investigator - Mr. Rajesh Sharma.

Status: Cheog forest, which represents one of the best known deodar-forests, was found having profuse regeneration in about 10 hectare area which was scientifically maintained during 1982-83. Other areas in the same forest where scientific working was not followed did not show the same regeneration pattern.

Research achievements

Name of the state	No. of projects completed in 2002-2003	No of ongoing projects in 2002-2003	No. of projects initiated in 2002-2003
Himachal Pradesh	3	8	3
Jammu & Kashmir	-	1	-

Education and trainings

1. Shri K.D. Sharma attended a training on remote sensing at Indian Remote Sensing Institute, Dehra Dun from 24th to 27th September, 2002.
2. Shri K.S. Thakur attended one week's compulsory training course on "Environment Sustainable Development and Effect of Globalization on Forestry" held at Gope Bandhu Academy of Administration, Chandrashekharpur, Bhubneshwar from 17th to 21st December, 2002.

Publications

Research papers

1. Kumar, S. and Sharma, S. (2002). Explanation and export of important medicinal plants from Himachal Pradesh and their conservation strategies. *ENVIS, Forestry Bulletin*, 2(1): 25-30.
2. Singh, Ranjeet; Singh, Charan; Panday, V.P. and Kumar, Surinder (2002). Resurgence of Deodar defoliator, *Ectropis deodarae* in Suket forest division of Himachal Pradesh. *Indian Forester*, 1-8 (11): 1269 1270.

Brochures and pamphlets

1. Bakshi, Meena; Kumar, Surinder and Sharma, K.D. (2003). Youth Awareness on Important Environmental Issues.



2. Kapoor, K.S.; Kumar, Surinder and Singh, Ombir (2003). Chilgoza (*Pinus gerardiana*, Wall) Champion of the Rocky Mountains.
3. Sharma, S.; Kumar, Surinder and Thakur, K.S. (2003). Model Nursery: A Way for Production of Quality Planting Stock.
4. Singh, Ranjeet; Kumar, Surinder and Singh, Charan (2003). Deodar Defoliator and its Management.
5. Amla- Aik Bahu Udashiye Paodha (in Hindi)
6. Tulsi- Aik Adbhut Aushdhi (in Hindi)

Conferences/meetings/workshops/seminars/symposia

1. Kumar, Surinder; Kapoor, K.S.; Singh, Ranjeet and Kumar, Shailendra (2003). Drying of *Dalbergia sissoo*, Roxb. (Shisham) in Subathu Forest Range of Solan Forest Division, Himachal Pradesh. Published in Proc. Regional Symposium on Shisham and Kikkar Mortality, 3-4th March, 2002, organized by Department of Forestry and Natural Resources, Punjab Agricultural University, Ludhiana at Regional Research Station, Bhatinda.
2. Kumar, Surinder; Singh, Jagdish; Sharma, Sandeep and Verma, R.K. (2002). Prospects of Intercropping of Medicinal and Aromatic Plants with Horticultural Plantations in Himachal Pradesh. Paper presented in National Workshop on Agroforestry Prospects and Challenges held on 21st November 2002 at IFGTB, Coimbatore.
3. Kumar, Surinder Kapoor; K.S. and Verma, R.K. attended a workshop on Intellectual Property Rights as organized by State Council of Science, Technology & Environment, Himachal Pradesh.
4. Singh, Ranjeet and Sharma, Sandeep attended a national symposium on Agroforestry in 21st Century as organized by the Department of Forestry & Natural Resources, Punjab Agricultural University, Ludhiana.
5. Singh, Ranjeet; Singh, Charan; Kapoor, K.S. and Bhalai, R.R. (2002). Evaluation of Insecticides against Defoliators of *Populus ciliata* in Himachal Pradesh. Paper presented in national symposium on Agroforestry in 21st Century held at PAU, Ludhiana.
6. Sharma, S.; Kumar, Surinder and Thakur, K.S. (2003). Effect of hedging height on production of shoots and shoot cuttings in selected clones of *Dalbergia sissoo* Roxb. Paper accepted for international Conference on Short rotation forestry for industrial and rural development, September' 2003 at UHF, Solan.
7. Sharma, S.; Kumar, Surinder; Thakur, K.S., and Negi, P.S. (2002). Estimation of variability in branching, production of woody cuttings and rooting of branch cuttings in selected clones of *Dalbergia sissoo* Roxb. Paper presented in national symposium on 'Agroforestry in 21st century' held at Punjab Agricultural University, Ludhiana, w.e.f. 11-14, Feb. 2002.
8. Verma, R.K; Kapoor, K.S.; Kumar, Surinder, and Rawat, R.S. (2003). Performance of different tree species in lime stone mine spoil and impact



of *Cupressus torulosa* and *Robinia pseudoacacia* plantation on plant diversity and soil quality. Paper presented in national seminar on Management of Degraded Forest for Productivity Enhancement and Carbon Sink Expansion held at TFRI, Jabalpur on 15 to 16 , January, 2003.

Consultancy

Consultancy of one week's duration at a total cost of Rs. 10,000/- (Rs. Ten Thousand only) for Inventorization of Floral Wealth of Gamgul Siyabehi Wildlife Sanctuary, Wildlife Division, Chamba provided to the Divisional Forest Officer of Wildlife Division, Chamba.

Linkages and collaboration

1. Linkages in the field of research and training with the State Forest Department of Himachal Pradesh and Jammu & Kashmir were established.

Distinguished visitor

1. Brig. J.N. Koul (Retd.), Ex-Member, Planning Commission and Sr. Programme Advisor, FRLHT, Bangalore visited the institute.

