Intercropping of temperate medicinal plants with horticultural plantation

A. **Nature of technology**: Field and Demonstration

B. Process in Brief

The interspaces in the orchards of high hill temperate region can be better utilized and economic benefit from the orchards can be enhanced by intercropping selected commercially important medicinal plants.

1. Intercropping *Angelica glauca* (Chora) with Apple

Angelica glauca Edgew. (Family Apiaceae) is a high value medicinal and aromatic plant species distributed from 2000 to 3,700 m amsl in the North-Western Himalaya. The plant is used as stimulant in the treatment of dyspepsia and constipation. The dried roots contain about 1.3% essential oil.

In the apple orchards of the high hill temperate region, field beds (as per the availability of interspaces) should be prepared in the interspaces during the month of February-March. Farm Yard Manure 20 tonnes/ hectare should be applied in two split doses to improve the fertility/nutrient content of field beds prepared in the interspaces. The field beds should be prepared along with sufficient paths to facilitate the movement and carry out routine horticultural operations easily. Seedlings should be planted in the spacing of 45x75 cm^2 in the field beds during the month of July-August. Irrigation after weekly interval during hot summer season along with fortnightly weeding during April to September is recommended for optimum growth and yield. For intercropping Chora, apple orchard of age between 16 to 30 years with spacing of 6x6m has been found to be best for optimum yield. Root parts are of commercial importance. The root part of the plant has to be harvested after two and half years generally during the month of September-October. After harvesting roots have to be thoroughly washed with clean water and dried under shade and packed. After two and half years the average yield was 23 quintals/ hectare. The market rate may vary from Rs.60 to 100/- per Kg. In addition to apple crop, intercropping of *Angelica glauca* with apple could generate income of Rs.38,000 to 1,30,000/ hectare.

2. Intercropping of *Picrorhiza kurrooa* (Kutki) with Apple

Picrorhiza kurrooa (Scrophulariaceae) is widely distributed in the alpine and temperate Himalayas in Kashmir, Himachal Pradesh, Uttrakhand and Sikkim between 2700-4000 m amsl. The dried rhizomes

and roots of the plant consist of bitter principle, named picrorhizin. It has a cooling effect and is used as a cardio tonic, antipyretic, anthelmintic, laxative and in diseases of liver and spleen.

In the interspaces of apple orchard, field beds should be prepared along with sufficient paths during the month of February-March. Two split doses of FYM 25 tonnes/ hectare should be applied in the field beds. Seedlings of *Picrorhiza kurrooa* (Kutki) should be planted in the spacing of 30x40 cm^2 in the field beds during the month of July- August. Irrigation after weekly interval during hot summer season along with fortnightly weeding is recommended during the months of April to September for optimum growth and yield. Apple orchard of age between 21 to 30 years with spacing of 6x6m has been found to be best for optimum yield of *Picrorhiza kurrooa* . Root parts contain active ingredient called Picroside-I and Picroside-II which is of commercial importance. The root part can be harvested after two and half years generally during the month of September-October. The average yield was 07 quintal/ hectare after two and half years of planting. After harvesting roots have to be thoroughly washed with clean water and dried under shade and packed. The market rate may vary from Rs. 200 to 225/ Kg. In addition to apple crop, intercropping of *Picrorhiza kurooa* with apple could generate income Rs.40,000 to 57,000/ hectare.

3. Intercropping of *Valeriana jatamansi* (Muskbala) with Apple

Valeriana jatamansi Jones (Mushakbala) belongs to family Valerianaceae, widely distributed in temperate Himalayas between 1500-3500 m amsl is one of the major income generating non-timber forest products of the region. It has been used for the treatment of hysteria, epilepsy and asthma. It is also used as Antispasmodic, Carminative, Diuretic, Hypnotic, Sedative and Stimulant.

In the apple orchards of the high hill temperate region, field beds should be prepared in the interspaces during the month of February-March. Farm Yard Manure 20 tonnes/ hectare should be applied as a two split doses to improve the fertility/nutrient content of field beds prepared in the interspaces. The field beds should be prepared along with sufficient paths to facilitate the movement and carry out routine horticultural operations easily. Seedlings of *Valeriana jatamansi* (Muskbala) should be planted in the spacing of 30x40 cm^2 in the field beds. Irrigation after day's interval is recommended during hot summer season for optimum growth and yield. Maintenance of the intercropping field should be carried out by regular weeding and hoeing etc. Monthly or half monthly weeding is recommended during the months of April to August, failing which the weeds will suppress the growth of medicinal plants, thus hampering the yield of the species. Apple orchard of age 21 to 30 years with spacing of 6x6m has been found to be best for optimum yield. Harvesting of the species has to be carried out after two and half years generally during the month of September-October. After harvesting roots have to be thoroughly washed with clean water and dried under shade and packed. Root parts contain active ingredient called Valepotriate and Volatile essential oil (0.5%) which is of commercial importance. After two and half years the average yield was 12 quintal/ hectare. The market rate may vary from Rs. 120 to 150/Kg. In addition to apple crop, intercropping of *Valeriana jatamansi* with apple could generate income of Rs.40,000 to 80,000/ hectare.

C. Beneficiaries of technology

1. **Prominent Beneficiaries/User groups**
   Farmers having orchards in the high hill temperate region are the major beneficiaries of this technology.

2. **Number of clients to whom technology has been transferred / sold**
   About 250 farmers of Kullu and Shimla districts of Himachal Pradesh through training and demonstration programmes.

3. **Potential for future dissemination**

4. The technology has great potential for future dissemination in the entire apple belt areas of Himachal Pradesh and Jammu & Kashmir.

D. Economic significance

1. **Potential to address livelihood issues and generated additional income**
   Intercropping technology will help the farmers in the long run to go in for crop diversification and commercial cultivation of medicinal plants in organically raised orchards in a sustainable manner.

2. **Productivity enhancement and Economic Benefits over replaced technology**
   Owing to changing climatic conditions returns from single apple crop are uncertain and unpredictable. Hence, intercropping with medicinal plants not only increases the net returns but also ensures against failure of main crop. The market demand of these species also attracts farmers for intercropping of these species with the horticultural plantation and enhancing the productivity.

3. **Impact of Technology**
   Some progressive farmers in Kullu and Shimla Districts have already initiated intercropping of these medicinal plants in their orchards.