Integrated Pest Management of Deodar Defoliator (*Ectropis deodarae* Prout)

A. Nature of Technology Pest Management in Forest Ecosystem

B. Process in Brief

Deodar (*Cedrus deodara*), one of the most valuable and dominant conifer species of the North-western Himalaya at certain intervals gets affected by a defoliator, *Ectropis deodarae* Prout, (Lepidoptera: Geometridae). This key pest seriously affects the younger crops in deodar forests.

In spite of this sporadic outbreak of this defoliator, it is possible to manage the pest by adopting Integrated Pest Management (IPM), encompassing the silvicultural, mechanical and biological control measures as detailed below;

i. **Increasing Biological Resistance Against Pest**

Maintain the adequate planting stock of deodar through plantations programme and encouraging the under growth of the ground flora like *Cotoneaster bacillaris*, *Berberis aristata*, *Daphne cannabina*, *Desmodium tiliaefolium*, *Deutzia corymbosa*, *Indigofera sp*., *Prinsepia utilis* and *Rosa moschata* in the deodar forest. Besides, control of excessive grazing, lopping and illicit felling of tress in the forest may help in increasing the biological resistance against the pest.

ii. **Mechanical**

Raking of humus during April- June under the tree canopy exposes the pupae of the pest for their predation by the birds like Jungle Crow (*Corvus machrorhynchus*) and Jungle Fowl (*Gallus gallus*). The process also reduces the pupal emergence as observed after comparison of field and laboratory studies which may be due to desiccation of naked pupae brought out of the protective moist humus layer.

iii. **Sticky Band**

Due to the presence of vestigial wings the female crawls from the ground and climbs on the tree trunk to lay eggs on the newly sprouted needles of the twigs in March- April. Application of one sticky band [Sticky band can be prepared by heating the powdered resin (6-12 parts) and castor oil (5 parts) for 10-12 minutes and adding 3 parts of Neem oil] at breast height of the tree helps in trapping the female during April. Neem oil also acts as a repellent against the female moth.

iv. **Biological Control**

Heavy larval and pupal predation by the adult of *Calosoma beesoni* is the major biological control which helps in managing the pest in the field. Single beetle of predator consumed around 200 larvae during the month of June as observed. *Rosa moschata* forms the habitat of *C. beesoni*, hence the shrub needs protection/enrichment. *Campoplegidae deodarae* also act as potential pupal parasitoid of deodar defoliator. Other natural enemies of this pest comprised of 11 parasitoids, 8 predators and 9 entomopathogens out of which three species of parasitoids viz.

Apanteles flavipes, *Apanteles glomeratus* and *Apanteles ruficrus* emerged from the larvae of *E. deodarae*. The extent of parasitization by these species was 6.7, 12.2 and 16.0 per cent in April, May and June, respectively. Among entomopathogens, *Beauvaria bassiana* caused infection to the extent of 12.9 percent.

C. Beneficiaries of technology

1. **Prominent Beneficiaries / User Groups**:

   State Forest Department and local people living around the forest can make use of this pest management technique for keeping their tree / patch of trees / forest healthy and pest population under control.

2. **Number of Clients to whom Technology has been Transferred / Sold**:

   Field functionaries of Suket Forest division and Chail wildlife Sanctuary were given training for the management of this pest.

3. **Potential for Future Dissemination**:

   The technology developed will be disseminated to the deodar growing areas, mainly falling in the temperate region of North-Western Himalaya. Publication in vernacular languages will be developed for creating awareness among the various stakeholders which will also serve as the readymade guidelines in case of emergent situations/outbreaks.

D. Economic Significance

i. **Potential to address livelihood issues and generated additional income**:

Management of pest incidences through the use of this technology will enable the forest department to maintain the healthy growing stock of deodar so as to maintain the environmental services on continuous basis for the ultimate use of communities.

ii. **Productivity enhancement and economic benefits over replaced technology**:

The management of deodar defoliator through this technology will help in productivity enhancement of deodar forests. Earlier technologies provided spray of insecticides which affected even the beneficial insects around. In addition to this the residual effect was also there. In the present technology, sticky bands are Neem oil based in addition to rosin and castor oil based bands as tried by earlier researchers.

iii. **Impact of Technology**

The affected area in deodar forest of Suket Forest Division, Himachal Pradesh managed through this technology showed no recurrence of the pest for the last one decade.

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