PROCEEDING OF THE INSTITUTE LEVEL MONTHLY RESEARCH SEMINAR HELD ON 30.03.2021

Monthly Research Seminar on the title **"BIO-PESTICIDES: An Ecofriendly Approach to control Pests in Forest Nurseries and Plantations for Improving Biodiversity Status**" under the thrust area "**Managing forests and forest products for livelihood support and economic growth**" was organized on **30th March, 2021** in the Conference Hall of Himalayan Forest Research Institute, Panthaghati, Shimla. The seminar was presented by Smt. Savita Kumari Banyal, Chief Technical Officer, Forest Protection Division of the Institute. All the Scientists, Officers, Technical staff, JRFs, JPFs and PAs and Fas attended the seminar in the conference hall and field staff of the Institute attended the seminar through online platform. **Dr. S. S. Samant, Director, HFRI** Chaired the proceeding of this research seminar. **Dr. Sandeep Sharma, Scientist G** and Group Coordinator Research welcomed all the participants and explained about the broad structure of the seminar including the content to be adopted and the expected outcomes. He invited Smt. Savita K. Banyal for delivering the seminar.

Smt. Savita Kumari Banyal, **Chief Technical Officer,** Forest Protection Division made a detailed presentation on **"Bio-pesticides: An Ecofriendly Approach to control Pests in Forest Nurseries and Plantations for Improving Biodiversity Status**" and discussed the history of Bio-pesticides particularly in India. She mentioned that In India, the concept of bio-control of plant insect pests has been practiced very long back by using neem tree and its derivatives for minimizing the risk of post-harvest loss in stored cereals. She further told that the Common wealth Institute of Biological Control (CIBC) is the pioneer Institute devoted to taking lead in bio-control research at global level. The heavy use of these chemicals has already caused grave damage to human health, ecosystems and ground water. It is therefore, increasingly urgent that environment friendly methods like using of bio-pesticides in the place of chemical pesticides should be encouraged for pests and disease control.

She deliberated upon characteristics, types and advantages of bio-pesticides; uses of microbial, biochemical, botanical pesticides, Plant incorporated Protectants and biotic agents in the field of forestry. She stated that greatest strength of these bio-pesticides is their specificity as most are essentially non-toxic and non-pathogenic to animals and humans. She informed the audience that Botanical pesticides are naturally occurring plant material that may be crude preparation of the plant parts, ground to produce a dust or powder that can be used in full strength or dilute form in a carrier such as clay, talc or diatomaceous earth. Derivatives of Bt strain HD1 subspp. kurstaki have been widely used to control the forest pests such as the gypsy moth (*Lymantria dispar*), spruce budworm (*Choristoneura fumiferana*), the pine moth (*Thaumetopoea pityocampa*), the European pine shoot moth (*Rhyacionia buoliana*) and the nun moth (*Lymantria monacha*). Whereas *Pseudomonas fluorescens* is used to control damping off disease caused by *Pythium* spp., *Rhizoctonia solani* and *Gaeumannomyes graminis* in nurseries.

She further elaborated that the total number of insect species is estimated between six and ten millions, which contributes 52% of total biodiversity of the world but, potentially over 80-90% of the animal life forms on Earth are insects. Some insect act as severe pests of plants but some Insects are polyphagous predators and are considered important for biological control. The speaker enlisted in detail research works carried out in past at International, National, State / Regional level on uses of various types of insects as predator and parasitoid like *coccinella septempunctata* (Lady Bird Beetle), *Chrysoperla carnea* (lacewing) and *Trichogramma* spp. in forestry.

She informed that out of the total global bio-pesticide market, North America has maximum Bio-pesticide market (33%) followed by Europe (27%), Asia-Pacific (24%) and rest of the World (16%) and in case of Microbial pesticide products, maximum bio-pesticide products are of Bacterial origin (60%) followed by fungal products (27%), viral products (10%) and others (3%). India is one of the major pesticides producing countries in Asia with annual production of 90,000 tonnes, and it stands at twelfth position in the world in the manufacturing of pesticides. In India, the usage of bio-pesticides is growing at a faster pace than that of the chemicals. According to the Indian Ministry of Agriculture & Farmer Welfare, the consumption of bio-pesticides increased by 23% in the last 10 years. Currently, there are 970 bio-pesticide products registered with the Central Insecticides Board and Registration Committee (CIBRC) and 361 Bio-control Laboratories and Units are working in India. In India, Evaluations with the crude and organic extracts of botanicals against the forestry insect pests were initiated only in nineties.

Ms. Savita also highlighted the works carried out by **ICFRE, CSKHPKV, Palampur, UHF Nauni and HFRI, Shimla** on testing of bio-pesticides against various insect-pests and diseases. She elaborated upon the **TREEPAL, CRAWL CLEAN** products developed by various Institutes of ICFRE and work done by HFRI in the field of Biological Control as use of Nuclear Polyhedron Virus (NPV) in management of Indian Gypsy Moth (*Lymantria obfuscata*) in Himachal Pradesh; Biological Control of *Thysanoplusia orichalcea* with the help of Neem Cake and entomopathogens; Management of Insect Borer Complex with pheromone trap in Chir- Pine Forests of Himachal Pradesh and management of *Ectropis deoadara* which is a serious defoliator of *Cedrus deodara* with the help of bio Control agents and bio-pesticides.

She also informed the house that presently, HFRI is doing research on development of Bio-pesticides products/formulations from extract of tree borne oil seeds and tissues of wild plants for the management of insect-pests of forestry trees and rearing of *Chrysoperla carnea*, which is voracious predator of maximum all the Lepidopterous insects and aphids and the rearing of its host *Corcyra cephalonica* for the multiplication of predator and parasitoids is also carried out in FPD laboratory.

She gave a detailed talk on Bio-pesticides in forest management along with prospects/future agenda / research needs at the State and National level. During the course of presentation, Ms. Savita emphasized upon the relevant research needs on insects as Bio Control Agents and highlighted the collaborative research between HFRI and other research organizations for Survey, population assessment and evaluation of potential of native plant spp. and plants products as bio-pesticides.

The speaker presented the future roadmap in this direction in the shape of the formulation of research project on similar lines and evolves strategies for proper networking of the same.

During discussion, **Dr. S. S. Samant, Director**, appreciated the presenter for a nice presentation and also to cover each and every aspect on bio-pesticides. He suggested that Institute should submit more research proposals on extaction of bio-pesticides oils and active ingredients from the native plants as little work has been done in forestry in India. He further stressed upon the need to study extraction of oils from weeds like *Lantana camara* and their efficacy on insects-pests.

Dr. Joginder Singh Chauhan, CTO, SFM enquired upon the side effects of bio-pesticides. In response, presenter informed that the major disadvantage of bio-pesticide is their short shelf life so we have to do some research on it to increase the shelf life of these bio-pesticides.

Sh. Jagdish Singh, Scientist-F & Head Extension Division enquired upon the field applicability of bio-pesticides and Bio Control Agents (BCA) suggested for the control of *Saussurea costus.*

To this, presenter informed the house that Institute conducted a research on Biological Control of *Thysanoplusia orichalcea* which is a serious defoliator of *Saussurea costus.* She informed that Neem cake, Grownim @ 5.0 % and summer oil @ 5.0 % is proved to be effective to keep the population of *T. orichalcea* below Economic Threshold Level in *Saussurea costus* and its field trails were conducted at Brundhar nursery.

Outcomes of the Seminar

A. Identification of research needs

- Identification of suitable native plant species for evaluating their potential against different insect-pests of forestry species particularly in nurseries and plantations
- Need for optimization of Bio-pesticides effectiveness as well as the production of data on their efficacy and safety
- Need of more studies to determine the environmental effects on the fate of Bio Control Agents (BCA)
- Research needs on technological breakthrough in enhancing shelf-life of Bio-pesticides
- Adoption of New technology such as micro-encapsulation of Bio-Control Agents may be of high priority in enhancing their potential
- Research need on survey, population assessment and evaluation of potential bio-pesticidal plant/product to evaluate their status and predator parasite relationship

- Research need on production, formulation and delivery in commercialization of bio-pesticides
- Documentation of traditional knowledge of local communities on bio-pesticides.

B. Formulation of future strategies / roadmap

- Survey, population assessment and evaluation of potential of native plant spp. like Pisumar (*Boeninghausenia albiflora*), Basuti (*Justicia adhatoda*), Tirmira (*Zanthoxylum armatum),* Jatropha (*Jatropha curcas),* Kari Patta (*Murraya koenigii)* against major nursery pests.
- Extensive surveys for population assessment of important Bio-Control Agent insects like *Coccinella septempunctata* (lady bird beetle)*, Chrysoperla carnea*, etc.
- Mass culturing and lab rearing techniques of parasitoids and predators (Coccinelids, *Chrysoperla carnea*, microbial pesticides) of major Insect-pests of forestry.
- Study the effect of changing environmental conditions like increased CO_2 and global warming on Biological Control Agents of forests.
- Mass awareness to encourage public in adopting Bio-pesticides and participation in programmes and schemes.
- Documentation of rich traditional knowledge base available with the highly diverse indigenous communities in India which provide valuable clues for developing newer and effective Bio-pesticide.
- Brochure on Identification and control of Important (Key Insect pests) of Important Forestry Plants eg. fuel wood, medicinal plants, fodder, timber spp.

C. Networking research options identified

- ICFRE Institutes
- State Forest Departments of H.P., J&K UT and Ladakh UT
- HIMCOSTE (H.P.)
- IHBT, Palampur (H.P.)
- UHF, Nauni, Solan (H.P.)
- HPU, Shimla (H.P.)
- CSKHPKV, Palampur (H.P.)
- IIIM, Jammu (J&K UT)
- ICAR regional Institutes/ Centers
- SKUAST (Jammu) & SKUAST (Kashmir)
- ZSI, regional Centers

D. Future research directions discussed for implementation and opportunities for funding

- DBT, New Delhi
- DST, New Delhi
- NAFED, New Delhi
- NABARD, Mumbai
- MoEF&CC, New Delhi
- National Medicinal Plants Board, New Delhi
- ICFRE, Dehradun
- SFD's
- NBA(National Biodiversity Authority), Chennai
- SBB(State Biodiversity Board)
- National Centre for Integrated Pest Management (ICAR), Delhi
- National Bureau of Agriculturally Important Insects, Bangalore, Karnataka

In the end, the GCR thanked **Dr. S. S. Samant, Director HFRI, Shimla** and Chairman of the Seminar, presenter and all the participants for their active participation and suggestions for making it successful.

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