Foreign Country Visit Report of FTFNIPM

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Country Visited: India

Place Visited: National Bureau of Agriculture Insect Resources

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Duration of visit: 20th May 2023 to 28th May 2023 (9 days)

20th to 21st May 2023	Travel: Kathmandu to New Delhi New Delhi to Bangalore
21th to 26th May 2023	Training program: National Bureau of Agriculture Insect Resources (ICAR-NBAIR), Bengaluru.
27th to 28th May 2023	Travel: Bengaluru to Kathmandu (Flight delayed by 6 hours thus, landed Kathamandu on 28th May)

Purpose of the Visit: To participate in International training program on ***"Production Protocol of Bio-control Agents for Management of Fall Armyworm"***

Description of activities of training program:

1. **The First day of training on 22.05.2023**

Registration and other institutional formalities was started at 9 am. At 10 am inaugural session was conducted in the conference hall, followed by the technical session from 11 am onwards. Th inaugural session was chaired by Dr. S. N. Sunil, Director, ICAR-NBAIR. Self-introduction of the participants from Nepal and Bangladesh including scientific and other staffs of NBAIR were performed. The welcome speech was delivered; objectives of the training were described during the program.

1.1 Lecture on "Regulatory mechanism to contain the spread of alien invasive species"

The first lecture of technical session was delivered by Dr. S.N Sushil, Director and Principal Scientist of NBAIR on Regulatory Mechanism to contain the spread of alien invasive. This topic covered major challenges in food security due to invasive pests. With the increase in international trade, there has been an enhanced risk of the introduction of exotic pests into India including South Asian countries. Plant quarantine is the first line of defense in plant protection which keeps these injurious pests away from the territory. When considering the present pest status in India, that a vast majority of them are mere introductions. Pathways of the introduction of exotic pests may be either natural or human-mediated. The consequences of these introductions are manifold including imbalance of native ecosystem, loss of biodiversity, transmission of dreadful diseases, creating genetic changes, and threatening the existence of endangered species. According to him the plant quarantine system should be strengthened by various means like exotic pest surveillance, building up more infrastructural facilities, creating public awareness and formulating pest incursion management plans.

Plant Quarantine regulatory measures in India are operative through the 'Destructive Insects & Pests Act, 1914 (Act 2 of 1914)' (Govt. of India, 1914). The purpose and intent of this Act are to prevent the introduction of any insect, disease, or other pests from abroad or from one place to another in India which is or may be destructive to the crops in the country. The Directorate of Plant Protection, Quarantine & Storage (DPPQ&S) established in 1946 under the Ministry of Agriculture & Farmers Welfare (Department of Agriculture, Cooperation & Farmers Welfare) implements Plant Quarantine Regulations issued under the Act to prevent the introduction of invasive pests. The import of plants and plant materials are covered under the Plant Quarantine (Regulation of Import into India) Order, 2003 (PQ Order, 2003) issued under Section 3 (1) of DIP Act, 1914 and amendments issued there from time to time.

The strategies for prevention of invasive species includes extensive surveys in the areas where the invasive were first reported is needed to identify the extent and nature of the damage, biology, native natural enemies, and host range of the pest which aid in fore-warning the farmers regarding the outbreak of the invasive and adopting appropriate control measures. Pest surveillance at the borders of the country and other high-risk entry points should be a regular feature for the early detection of invasive pests. Techniques used for eradication, containment or control should be cost-effective, safe for the environment, humans, and agriculture, as well as socially, culturally and ethically acceptable.

1.2 Lecture and practical "Identification of *Trichogramma* and Trichogrammatoidea"

Dr. Omprakash Navik deliverd lecture on the topic. He showed the distinguishing features between *Trichogramma* and *Trichogrammatoidea,* in wings the marginal fringe of setae short, not more than one-fifth the width. Distal setae close, arranged in distinct rows of wings in *Trichogramma.* While, in Trichogrammatoidea marginal fringe of setae on fore wings distinctly much longer, measuring one fourth to three-fourth the width of wing. Distal setae sparser and arranged irregularly. In *Trichogramma* flagellum of male antenna unsegmented while in *Trichogrammatoidea* flagllum of male antenna segmented.

1.3 Visit to NBAIR insect Museum

We visited the museum of ICAR – National Bureau of Agricultural Insect Resources where the insects of different orders, families, genera and species were preserved. Here we observed different method of curation of insects. Insects are kept in according to order and families in separate cabinet with naphthalene power in the corner of the wooden box. Boxes were arranged in a cabinet. Temperature and humidity were maintained in the museum.

1.4 Lecture on "Identification of parasitoids of FAW"

Lecture through zoom was conducted by Dr. Ankita Gupta on identification of various parasitoids of fall armyworm found in India. The lecture mainly focused on morphological identification of major parasitoids of FAW. The parasitoids of various families like Icheneumonidae, Braconidae and Trichogrammatidae were described with key identification markings. Importance of molecular identification was also highlighted during the lecture.

1.5 Lecture on: Mass production on *Corcyra cephalonica* and *Trichogramma* spp

Theory and practical lecture on mass rearing of host insect *Corcyra Cephalonica* and egg parasitoid *Trichogramma* spp. was delivered by Dr. Richa Varshney. We visited the laboratory to observe and conduct these process. For mass production of host insect *Corcyra cephalonica*, the major ingredients used were - Bajra/sorghum: 2.5 kg/box, 75 g of Groundnut seed powder, 5 g of yeast powder, 0.7 g of Streptomycin sulphate, 0.125 CC (Approx.2000 eggs). While, in NERC, Nepal we are using coarse maize grit instead of Bajra or Soghum. The box size was mentioned as - Length - 450mm; Width - 300mm; Height - 200mm with 12 mm thick plywood of fine quality. After 40 days, adult moth starts emerging and moth collection performed with semi-automatic device. Collected in the breeding cage for mating and eggs were collected from the base of the breeding cage. Then the fresh eggs were collected and sterilized to prepare the tricho-cards as much as needed and rest of the eggs were stored in refrigerator. 16 x 12 cm size card were used to prepare ticho-card, where fresh eggs were glued on the top layer of card. Method we observed to release of Trichogrammatids in field are:

- Before release of Tricho cards in the field, each card cut into 16 small pieces.
- Each bit of Tricho cards stapled under surface of leaves and eggs should not expose directly to sunlight.
- About 6 cards per ha could be utilized for field releases.
- Releases should be done at weekly interval till the availability of host eggs in the field.
- Initial release of Trichogrammatids could be decided by putting pheromone traps of FAW or visual observation of the target pest.

2. <u>The Second day of training on 23.05.2023</u>

2.1 Lecture on "Identification, biology and current status of FAW in India"

The second class of was held by Dr. A.N. Shylesha, Principal Scientist on Identification, Biology and Current Status of FAW in India. According to their report, in 2017, 28.7 million metric tons of maize was produced in India. In 2018, however production fell by 3.2% to 27.8 million tons which was primarily attributed to damage caused by FAW. In 2019, Karnataka

had the highest acreage of maize affected by FAW (2,11,300 ha) Followed by Telangana (24,288 ha), Maharashtra (5,144 ha) while various levels of infestation where recorded in Tamilnadu, Madhya Pradesh, West Bengal and Arunachal Pradesh (<500 ha). In the North East a total of 10,772 hectares of maize crop was affected. This pest caused losses of about a third of the annual production in Kenya which was estimated at approximately 1 million tons.

He discussed about biology of FAW in their context. Insect passes through four different stages. According to his presentation eggs of fall armyworm has diameter and height ranged as 0.49-0.51 mm and 0.35 – 0.37mm, respectively. Larval development takes about 14-21 days with six instars followed by pupal stage lasting for 9-13 days in Bengaluru conditions. Pupae are reddish brown and pupation occurs 2-6 cm deep in the soil. Adults are nocturnal with an average life span of 10 days while in laboratory range from 7-10 days. The pre-ovipositional period of adult female moths lasts for 2-3 days.

2.2 Lecture on "Mass production of indigenous *Spodoptera frugiperda* nucleo-polyhedrosis virus

Lecture on mass production of SfNPV was delivered by Dr. G. Shivakumar, Principal Scientist of NBAIR. Diseased larvae of *Spodoptera frugiperda* showing characteristics viral infection symptoms were observed. He discussed on the extraction of nucleo-ployhedrosis virus from the infected larva. Following processes are followed.

Collection of the diseased larvae and addition of 1ml of sterile distilled water to each infected cadaver and then will be disrupted by vortexing for about 2 min. The extract will be filtered through sterile double layered muslin cloth and then the extract will be subjected to differential centrifugation. The extract will be centrifuged for 5 min at 500 rpm to remove the larger particles and debris. The supernatant will be carefully centrifuged for 20 min at 5000 rpm to collect the pellet containing occlusion bodies(OBs). The pellet will be re-suspended in 5 ml of sterile distilled water and stored at 40°C. A drop of suspension will be released over the glass slide and can be viewed under phase contrast microscope at 10 x 40 magnification for presence of occlusion bodies. We have also observed the occlusion bodies under the electron microscope.

2.3 Practical on *Spodoptera litura* rearing for mass production of *Telenomus*

S. litura is more easy to rear in laboratory condition than *S. frugiperda* as there is no canabilism in *S. litura*. In laboratory condition, *S. litura* were reared on the castor leaves. After second molt, they were transferred on the semi-synthetic diet. We learned to prepared semi-synthetic diet for rearing *S. litura* larval. The main composition for Semi-synthetic diet for rearing *S. litura and H. armigera* were Kabuli-gram *flour* – 100g, Methyl parahydroxy benzoate – 2g, Sorbic acid – 1g, Yeast – 10g/30 tablets, Agar agar – 12.75g, Water - 780ml, Ascorbic acid – 3.25g, Multivitaplex- 2 caps, Vitamin E- 2 caps, Streptomycin sulphate-0.25 gm, 10% formalin - 5 ml. While preparing the diet, 390ml of water was mixed with Kabuli-gram *flour*, Methyl parahydroxy benzoate, Sorbic acid, Yeast and blend for 2 minutes. Again boil 390 ml of water with Agar agar and mix with the previous mixture which was further blend for 1 minute. Then, add Ascorbic acid, Multivitaplex, Vitamin E, Streptomycin sulphate, and formalin and again blend for 1 minute. After cooling, the diet was poured into glass vials and one larva was

transferred per tube and plugged tightly with cotton wool. After 20-25 days, pupae were formed inside the vials and collected. Pupae were washed with sodium hypochloride to prevent from infestation and were kept in plastic container for emergence. The inner wall and roof of the contained was lined with paper. Eggs laid on the paper lining were collected by cutting out the portion and placed in a glass vials with cotton plugs. The *Telenomus* were mass reared on the egg of *S. litura* eggs.

Process for Production of *Telenomus remus.*

- Adults are paired for 24 hours
- Adults females are confined in 15 x 2.5 cm glass tubes. A small piece of cotton swab soaked with 5% honey solution is stuck on the side of the glass tube for feeding
- 6000 freshly laid (0-24 hours old) *S. litura* eggs are stuck on a 10 x 2 cm gummed thick paper piece and exposed to 100 parasitoids for 24 hours for parasitisation
- On third and fourth day only 3,000 eggs may be provided and on 5th day only 1500 may be provided.
- Most of the parasitized eggs turn black in 4 to 5 days
- The cards carrying only parasitized eggs are transferred in the fresh clean tubes for emergence of the parasitoids
- The adult parasitoids emerge in 9 to 10 days
- The parasitoids emerged could be used for field releases by retaining 10% for continuation of the cultures. And the process was repeated.

3. <u>The Third day of training on 24.05.2023</u>

3.1 Lecture on "Push-pull strategies for FAW management "

Dr. Amala Udayakumar gave us a presentation on Push-pull strategies for FAW management. This topic included

- Scope and Principle of push-pull strategy in the management of fall armyworm
- Key role of volatile present in Desmodium and its effect on parasitoid of FAW
- Successful models and advantages of push-pull concept for management of fall armyworm

Participants from Nepal and Bangladesh discussed that although Push-pull strategies is most suited model for African countries, its efficacy in countries like Nepal and Bangladesh has been limited and the reasons behind it might be agro-climatic variations, lack of localized adaptation difference in pest behavior etc. Dr. Amala discussed on the advantages of push pull strategy. She showed the successful model of push -pull concept for the management of fall armyworm. Intercropping maize with drought -tolerant green leaf desmodium and planting Brachiaria as a border crop. The result show that average number of larvae per plant damage per plot to 82.7% and 86.7%.

3.2 Lecture on "Glimpse of ICAR-NBAIR Technology available for the management of FAW"

Dr. Kesavan Subaharan, Principal Scientist delivered a comprehensive presentation highlighting various technologies available at ICAR-NBAIR for agricultural advancements. The presentation was detailed and covered all its related aspects like its benefits, scalability, commercial potential, financial requirements, target market, social impact and toxicology data. The available technologies are as follows:

Technology 1	Multiple insecticide tolerant strain of egg parasitoid *Trichogramma chilonis* for FAW management
Technology 2	*Metarhizium anisopliae* ICAR-NBAIR Ma35 for management of FAW in maize
Technology 3	*Bacillus thuringiensis* ICAR-NBAIR BT25 for management of FAW in maize
Technology 4	Aqueous formulation of *Spodoptera furgiperda* nucleo-polyhedrovirus Sprf NPV NBAIR 1 strain for the management of FAW

By harnessing these technologies, farmers and researchers can optimize agricultural practices, enhance productivity and contribute to sustainable and resilient agricultural systems. This presentation served as an important platform to educate and inspire us regarding the potential of these technologies to address current and future agricultural challenges. Dr. Subaharan also shared the knowledge on the use of pheromone, how it stimulates the nerves of insects.

3.3 Visit to pollinator garden at ICAR-NBAIR farm, Yelahanka

A visit was made to a pollinator garden of ICAR-NBAIR at Yelahanka, Bangalore. The garden was specifically designed to provide a suitable environment for pollinators. It aims to showcase the importance of pollinators in agricultural ecosystems, raise awareness about their conservation, and promote sustainable practices that benefit both pollinators and crop production.

Plant diversity: The garden has diverse range of plants (native species as well as exotic flowering plants). Dr. T. Shivalingaswamy and Dr. Amala briefed about the characteristics of the garden and how it was developed. According to them, the selection of plans is based on their nectar and pollen production, blooming period, and suitability for the local climate.

Dr T. Shivalingaswamy and Dr. Amala provided information on different species of beneficial insects and their importance in pollination. There was a collection of different types of trees, herbs and shrubs in the vicinity of farm. Pollinators were visiting the flowers which was very pleasing. We got the opportunity to observe the activity of solitary bee and stingless bee in the farm.

Design features: The garden incorporates mix of different shapes, sizes and color of flowers to attract wide range of pollinators with different feeding preferences. The garden also includes water sources, nesting sites and sheltered areas to create a favorable habitat of different pollinator species.

Research and Education: This garden is also serving as research site for studying pollinator behavior, abundance, and diversity

Conservation Effort: It was a great opportunity to observe and learn about importance and interaction of pollinators in our ecosystem and the effort being made by ICAR-NBAIR to conserve them.

4. The Fourth day of training on 25.05.2023

4.1 Lecture on "Importance of DNA barcoding and molecular approaches for FAW management"

Dr. T. Venkatesan gave us a detailed presentation on understanding, advantages, extraction techniques (CTAB Method, Salting out Technique, DNeasy Kit Method) of DNA barcoding and its application in entomology. We came to know that this technique relies on the fact that DNA fragment exhibits enough genetic variations to distinguish between different species while remaining relatively conserved within the same species. By comparing the barcode sequence to a comprehensive reference library, researchers can rapidly and accurately identify species, uncover cryptic species, even at different life stages and when traditional identification methods are challenging. He also explained us about the effort done by ICAR-NBAIR on DNA barcoding.

The inclusion of DNA barcoding in our training session provided us with a unique opportunity and invaluable experience to explore this cutting-edge technique. As DNA sequencing technologies continue to advance and reference database expand, the scope and impact of DNA barcoding in entomology is for sure to grow. We were familiarized with the underlying principals and laboratory protocols and further discussion enhanced our understanding of the potential application and limitation of DNA barcoding in entomology.

4.2 Lecture and practical on "Mass production and formulation of *Bt* for FAW management"

Dr. R. Rangeshwaran, an esteemed expert in the field of biological control, conducted an informative class and hands-on training session focused on *Bacillus thuringiensis* (Bt), a naturally occurring bacterium with immense potential for pest control. The class provided a comprehensive understanding of Bt, its potential as an eco-friendly pest control agent and its applications and range of pests it targets, while the practical training allowed we participants to gain firsthand experience in the mass production and formulation of this remarkable biocontrol agent. This presentation covered the following key aspects:

- Techniques for isolation of Bt
- Identification of Cry genes by PCR
- LC50 and the International Unit

Hands-on training was conducted on Mass production and formulation of Bt-based products. The training encompassed following activities

- Formulation (Additives, Wettable powder, Flowables)
- Mechanics of Bioassay
- Mass production of Bacillus thuringiensis

Bt culture maintenance: We were guided through the techniques for maintaining Bt cultures, including sub-culturing, storage and quality control measures to ensure the viability and purity of the cultures. His team also demonstrated various formulations methods, such as wettable

powder, liquid suspensions, and granules, and emphasized the importance of appropriate formulation for effective delivery and efficacy.

He discussed on the on the ICAR-NBAIR research that focused on screening for novel strains of *Bacillus thuringiensis* (Bt) expressing novel insecticidal, nematicidal, molluscicidal and biocidal activities and emphasis is on insect cadaver derived Bt strains. Identified Toxin genes from NBAIR-BTAN4. He discussed on *Bacillus thuringiensis* NBAIR BT25 which was found effective against FAW. Liquid formulation developed and evaluated in field. Multiplications trials completed for 2 years. Bt was found to reduce 75 to 85% of FAW incidence. Field trials conducted in Karnataka, Andhra Pradesh, Tamil Nadu &Orissa.

Mass production of Bacillus thuringiensis

- *Bacillus thuringiensis* var. Kurstaki
- Inoculate in T3 broth/bacto tryptone glucose medium
- Starter culture @10ml/L
- Rotary shaker 200rpm, 7 days or fermenter 100 aerated 75 rpm till 90 % free spores are present.
- Quality test 9x108 cfu/ml (minimum).
- Concentrate broth to slurry of around 200g for every L (12-15% solids) by spray drying or centrifugation.
- WP formulation -Active ingredient (20%) + Kaolin (75.25%) + Silica powder (0.75%) + Bevaloid 116 (2%) + Surfynol 104s (2%)
- Quality test of active ingredient is 80,000 IU/mg
- Storage Is up to two years.

Formulation Types

Depending on the formulation and usage liquid formulations of Bt Can be of 2 types:

1.Water based formulations

2.Oil based formulations.

Water based formulations are generally preferred for agricultural uses and oil based formulations for forestry uses. Water based formulations are first choice because of its ease of use in agricultural purposes.

Solid State Formulation

Rice grains was soaked in water overnight, remove wet grains and pack in polypropylene bags (250g). The bags were autoclave or cook in steam cooker. The bags were allowed to cool and inoculate each bag with 0.5 ml culture solution (slant culture dispersed in 100ml of boiled/sterile water). The contents of the bag were mix thoroughly, incubated for 5-7 days till high sporulation (more than 109 CFU/g) is attained. The rice contents were washed with water and centrifuged (5000-6000 rpm for 15 min). Centrifuged four times, and the pellets were suspended in water to get a 2 x 106 spores/ml. The resulting suspension was sprayed in fields.

4.3 Quality control of *Bt* formulation

Dr. M Mohan, conducted an informative class focusing on the quality control of *Bacillus thuringiensis* formulation. The class emphasized the significance of maintaining consistent quality standards in *Bt*-based products to ensure their efficacy and reliability in pest management. The class also includes the related topics like

- Development and use of *Bt*
- Virulence factors produced by *Bt*
- Development of sprayable *Bt* formulations

We were introduced about the essential parameters that ICAR-NBAIR has been adopting as quality check before Bt formulation is being approved for commercial use in India. They are

- Cry toxin content
- Potency test and
- Test on ß-exotoxin production

The class also emphasized that due to their distinct mode of action, efficacy, safety considerations and regulatory compliance, quality control is essential in *Bt* formulation.

4.4 Hands on Training on mass production major entomopathogenic fungi for FAW management

Dr. A. Kandan took a class on mass production of *Metarhizium anisopliae* for management of Fall armyworm in maize. The following major topics were included in this session:

1. Overview of different fungus (*Lecanicillium lecanii, beauveria bassiana, Metarhizium anisopliae, Isaria fumosorosea*) and its role in fall armyworm management
2. Preparation and culture media and sterilization techniques
3. Inoculation and maintenance of *Metarhizium anisopliae* culture
4. Isolation of *Metarhizium anisopliae* spores and determination of spore concentration
5. Techniques for mass production of *M. anisopliae*
   - Formulations (Spore suspension and Dust formulation)
   - Haemocytometer for spore count
   - Spore count using the improved Neubauer Haemocytometer
   - Preparation of fungi inoculum for bioassay
   - Method of inoculation: *Spodoptera furgiperda*

We learned about the design and set-up of production units, including the selection of appropriate formulation techniques. Additionally, this class emphasized the importance of proper storage conditions to maintain the viability and efficacy of the formulated bio-pesticides. We gained insights into method of inoculation, proper timing, dosage and application techniques to maximize the biocontrol agents efficacy. It also emphasized the importance of quality assurance throughout the production process to ensure consistent and effective bio-pesticide formulation.

5. <u>The Fifth day of training on 26.05.2023</u>

5.1 Exploiting the EPN technology for the management of FAW

Dr. Jagadeesh Patil, Senior Scientist provided in-depth knowledge and insights into the application of entomopathogenic nematodes for effective fall army worm management. He

delivered a highly informative and explanatory class on utilization of entomopathogenic nematodes as a technology for managing fall armyworm infestations.

The presentation delved into the identification, biological characteristics and mechanism of action of entomopathogenic nematodes (process of host finding, penetration, and nematode reproduction within the pest). Dr. Patil addressed on the

1. Isolation method of entomopathogenic nematodes (details on soil sample collection and nematode isolation from soil samples: Insect baiting technique and recovery of EPNS from infected cadavers by modified white trap)
2. Culturing of entomopathogenic nematodes (inoculation, harvest, concentration and decontamination if needed)
3. Mass production of entomopathogenic nematodes

- In-vivo culture method

The wax moth *Galleria mellonella* was used as the insect host for in-vivo production of EPN because for its easier handling, large body mass, and easier to mass multiply on an artificial diet). A detailed procedure was observed in laboratory where we were acquainted with detail rearing technology of *Galleria mellonella; f*rom its production technology to its formulation process.

- In-vitro culture method

The in-vitro liquid culture (bioreactors) method is being used by major companies in the world market due to its cost effectiveness to produce nematodes (*S. khusidai, S. glaseri, S. scapterisci, S. carpocapsae, S. feltiae, S. riobrave, H. bacteriophora and H. megidid*)

Nematodes are microscopic, non-segmented, elongated roundworms with lacking appendages. They do exist in the environment, as free -living as well as parasitic to plant and animals. Among the various parasitic nematodes, some beneficial nematodes exist in the soil environment. These nematodes have the ability to kill the insect pests.

We learn to collect soil sample for nematode collection. Sample were collected from 2-4 m^2 area for each sampling site and collected from the depth of 15-20 cm. 5 random samples with 3 sub sample should be drawn per sample then combine the all sample. Place each sample in a plastic bag and labelled them. Sample should not expose to sunlight during transport to laboratory. The production of EPNs required an insect host. The wax moth larva, *Galleria mellonella* were selected because easily mass reared on artificial diet, large body mass, easy to handle. Dr. Patil also shared field trial results and case studies showcasing the successful utilization of of entomopathogenic nematodes in real-world fall armyworm scenarios. These examples highlighted the practical application and efficacy of this technology.

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Positive Outcomes and Observation:

Several positive outcomes and observations were noted during the training.

In-depth Understanding: The training significantly enhanced our understanding of uses of bio-control agents against FAW. The training focused on the implementation of biocontrol agents as a sustainable approach to managing FAW. We learned about the selection, release and monitoring of biocontrol agents such as parasitoid, predators and pathogens. The practical demonstration allowed participants to witness the effectiveness of these agents in action, boosting our confidence in utilizing them.

Enhanced Technical Skills: We had the opportunity to learn from one another experiences, exchange ideas, and explore innovative approaches and acquired practical skills during the training, including proper handling and application techniques for biocontrol agents.

Collaboration and Knowledge Sharing: The training provided a platform for networking and collaborative environment among the participants. Professionals from both research and academics from India, Nepal and Bangladesh exchanged experiences, ideas, and best practice, creating opportunities, fostering an environment of mutual learning, for networking and future collaborations in the field of biological control.

Positive Participant Feedback: Feedback from our side highlighted our satisfaction with the training program. We expressed appreciation for the trainers' expertise, the well-structured content, delivery and the hands on approach. This training fully equipped us with necessary tools and resources for implementing biocontrol strategies effectively.

Conclusion: The training session on biocontrol agents proved to be exceptionally valuable and applicable program. The comprehensive content, combined with interactive discussions and practical demonstrations, made the training highly useful and engaging for all attendees. The inclusion of practical demonstrations significantly enhanced the learning experience. Witnessing the application of biocontrol agents and the hands-on approach in real life scenarios not only reinforced the theoretical knowledge but also enabled us to gain firsthand experience and instilled confidence to adopt these techniques in our own pest management practices.

Some Glimpses of training: