

A Study on Plant Pathology in Integrated Pest Management in Manipur

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Abstract

Integrated Pest Management combines cultural, mechanical, physical, biological and chemical methods for pest control. Cultural methods rely on a strategy to make the crop unacceptable to pests through practices like mixed cropping, crop rotation, management of trap crops to divert insects away from the main crop. Mechanical methods on the principle of soil management include tillage, mowing, cutting, mulching and organic soil coverage provide unhealthy environment for weeds and disrupt pest life cycle, and physical methods include use of pheromone traps, light traps, sticky traps etc. Biological method is a strategy of controlling insect pests and diseases using other organisms like predators, parasitoids and pathogens. Chemical methods involve use of pesticides in pest management and are used when other measures are not enough.

Keywords: Pest management, Insects, Method, Chemical, Physical, Measure

The Integrated Pest management in Manipur of insect pests is necessary to ensure food security. The yield loss caused by both field and storage insect pests is estimated to be 20 to 30%. Indiscriminate use of chemical pesticides has resulted in environmental pollution and ecological imbalance causing insecticide resistance, pest resurgence and pesticide residue in food and environment.

Integrated Pest Management (IPM) is an environmentally friendly approach that integrates different practices and strategies for control of pests. Integrated Pest Management aims to suppress pest populations below the economic injury level. The lowest pest population density that will cause economic damaged. IPM is a method for analysis of the agro-ecosystem and the management of its different elements to control pests and keep them

at an acceptable level with respect to the economic, health and environmental requirements (FAO).

There has been a shift to more Integrated Pest management in Manipur sustainable strategic and Bio intensive Integrated Pest Management viz., Agro-Eco System Analysis (AESA) based IPM and Ecological Engineering for Pest Management. Agro-Ecosystem Analysis (AESA) is a procession which farmers observes the crop, analyze the field situation and take crop management decisions based on field observations. Ecological Engineering for pest management is a new paradigm to enhance the natural enemies of pests in an agro ecosystem and

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relies on use of cultural techniques to bring about habitat manipulation and enhance natural. Enemies of pests in the crop micro and macro environment. Plant Pathology in intensive Integrated Pest Management is an approach that considers the farm as part of an agro ecosystem and relies on diagnosis and field observation, combined with ecologically based solutions to pest problems. Bio intensive IPM is “a systems approach for management of crop pests based on an understanding of pest ecology. It begins with steps to accurately diagnose the nature and source of pest problems, and then relies on preventive tactics and biological control to keep pest population within acceptable agricultural ecosystem to the disadvantage of a pest and to the advantage of its parasite and predator (Dufour, 2001).

RESULTS AND DISCUSSION

The general rule to be adopted for management decisions relying on the P: D ratio is 2:1. However, some of the parasitoids and predators can control more than 2 pests. Whenever the P: D ratio is found to be favorable, there is no need for adoption of other management strategies. In cases where the P:D ratio is found to be unfavorable, the farmers can be advised to resort to release of parasitoids/predators depending upon the type of pest. In addition, bio pesticides such as insect growth regulators, botanicals etc. can be used before resorting to chemical pesticides.

(i) Field Observations: Farmers may go to the field in groups at least 5 ft. away from the bund, walk across the field and choose 20 plants/acre randomly. Then each of these plants is observed and observations are recorded.

(ii) What to observe: Observations are recorded relating to the plant pathology in Manipur (height, branches, leaves, deficiency symptoms etc.); Insect pests; Defenders (natural enemies); Diseases; Weeds; Water situation of the field; whether condition rodent burrows. One may also manually collect insects in a plastic bag; and collect parts of the plant which have disease symptoms.

(iii) Drawing and Discussion: After observation, the group would sit together for discussion. Each group identifies the pests, defenders and diseases collected and then analyze the field situation and present their observation in a drawing. The drawing (on a

chart) sows a plant representing the field situation, disease symptoms, etc., pests, Defenders, the plant part where the pests and defenders were found, soil condition, weed population, rodent damage etc. Each group then discussion the situation and makes a crop and pest management recommendation in Manipur. The facilitator facilitates the discussion and ensures that all are actively involved in this process. The group comes to a consensus on the field/Pest management practice required in the AESA plot and make sure the required activities (based on the decision) are carried out. The drawing is kept for comparison in subsequent weeks.

Ecological Engineering Integrated pest strategies focus on pest management both below ground and above ground. The main emphasis is to improve the soil health below ground by developing soils rich in organic matter and microbial activity and above ground plant health by habitat manipulation to increase the biodiversity of beneficial natural enemies.

- ♦ Focus is on making the habitat less suitable for pests. and more attractive to natural enemies.
- ♦ Raising flowering plants along the border by arranging. shorter plants towards main crop and taller plants. Towards the border to attract natural enemies as well as to avoid immigrating pest population.
- ♦ Inter-cropping, border-cropping and mix cropping of the flowering plants provide nectar/pollen as food for various bio-control agents. Trap crops and repelling crops for pests are also grown as intercrop along with the main crop.

Not uprooting weed plants which are growing naturally like *Tridax procumbens*, *Ageratum* sp, *Alternanthera* sp etc. as they act as a nectar source for natural enemies. Not applying chemical pesticides, when the P: D ratio is favourable. The compensation ability of the plant should also be considered before applying chemical pesticides.

1. Attractant Plants -Attract the Natural Enemies of pests.
2. Trap plants - Trap the crop pests.
3. Repellent plants - Repel the crop pests.
4. Barrier/Border plants - Prevent the entry of pests.

During a demonstration of ecological plant pathology in Cole crops conducted by the Directorate of Plant Protection in Manipur that Quarantine & Storage, Cole crops were bordered by Sunflower, Mustard, Marigold and Coriander crops. The Sunflower was the tallest crop to attract the *Helicoverpa* pest; it was surrounded by two rows of mustard to attract *Chrysoperla* and Lady Bird Beetle. Coriander crop attracts different natural enemies of main crop pests; Marigold was the preferable crop for egg laying of *Helicoverpa*. It was observed that the cabbage and cauliflower crops found affected with aphid and the aphid population on Cole crops was found parasitized by *Aphidius*, a potential parasite of aphid. This parasite was able to manage the aphid population in Cole crops.

- ♦ Basil and marigold as a border crop management (main crop-Garlic) controls Thrips.
- ♦ Castor plant as a border crop in Cotton and chilli field controls Tobacco caterpillar.
- ♦ Legume as inter/alternate crops in sugarcane enhances the population of fungal and bacterial BCA for the management of nematodes & other soil borne diseases.
- ♦ Inter crop rows of *Tridax procumbens* in paddy crop enhances the natural parasite and predator populations..

Grown either as border crop or main crop, these repel the pests away from the crop mainly due to the release of volatile repellent plant chemicals.

- ♦ Basil repels flies, mosquito, and tomato borer.
- ♦ Garlic repels beetles, aphids, weevils, spider mite, carrot fly.
- ♦ Radish deter cucumber beetle.
- ♦ Mint repel cabbage moth.
- ♦ Marigold repels beetles, cucumber beetles, nematodes.

These protected the main crop against small soft bodied flying insects which migrate from one field to other field such as whiteflies, hoppers, aphids, mealybugs thrips et. E.g. Maize, Sorghum, Bajra, Redgram etc. as barrier crops.

Integrated Pest Management

This focuses on improvement of soil health.

- ♦ Keeping soils covered round the year with living vegetation and/or crop residue.

- ♦ Adding organic matter in the farm yard manure (FYM). Vermicompost, crop residue which enhance below ground biodiversity occurs in urban and rural areas of Manipur.
- ♦ Reducing tillage intensity so that hibernating natural enemies can be saved.
- ♦ Applying balanced dose of nutrients using biofertilizers.
- ♦ Applying mycorrhiza and plant growth promoting rhizobacteria (PGPR).
- ♦ Applying *Trichoderma* spp. and *Pseudomonas fluorescens* as seed/seedling/planting material, nursery treatment and soil application.

There is a need to integrate based Integrated Pest Management and principles of ecological plant pathology for pest management to help farmers maintain biodiversity and keep pests under control while at the same time maintain the eco-system to overcome the Pest Management.

There are three types of strategies in Plant Pathology control:

- (a) **Classical biological control:** This involves the introduction of natural enemies to a new locality by importing, and releasing natural enemies to control an insect pest. *Acerophagus papaya*, a parasitic wasp was imported for controlling papaya mealy bug in India.
- (b) **Augmentation:** Thus includes all activities to increase numbers of locally occurring natural enemies. This is done through inoculative release or inundative or Mass release.

Inoculative release involves releasing small numbers of a natural enemy into a crop cycle with the expectation that they will reproduce in the crop and continue to provide pest control for an extended period of time. Mass release involves mass culture and release of natural enemies to suppress the pest population. For Eg: Mass release of *Trichogramma* egg parasitoids, predators like green lace wing, and lady bird beetles. The cropping system may also be modified to favor or augment the natural enemies.

CONCLUSION

India coordinated research programme on vegetable crops, Indian Institute of Vegetable Research.

Similarly Integrated Pest Management technology developed in collaboration with Asian Vegetables Research and development Centre. Taiwan on the control of brinjal shoot and fruit borer has gained wide popularity among farmers in many status of North and north eastern region in the country. Integrated Pest Management technology has also been developed, validated and implemented for the management fruitfully in cucurbits on large scale in Plant Pathology Management.

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