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Agro-Eco System Analysis (AESAs) Based Plant Health Management

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Abstract

Decision making and farmers participation in adoption of Integrated Pest Management (IPM) is a crucial tool. Agro Ecosystem Analysis (AESAs) is an approach, which can be employed by extension functionaries and farmers to analyze the field situations and monitor the population of pests, defenders, soil conditions, plant health and the influence of climatic factors to make informed decisions for growing a healthy crop. Thus IPM is acting as an interdisciplinary approach, that starts from monitoring to decision making for a successful outcome.

Introduction

Agricultural crops are widely distributed in different agroecological regions and thus in different regions the pest management practices differ on various crops. Decision making in pest management requires an analysis of the agro eco system. During the late 90s, FAO started advocating Agro-Ecosystem Analysis (AESAs) based IPM (Gurr *et al.*, 2004). Agro Ecosystem Analysis (AESAs) is an approach, which can be employed by extension functionaries and farmers to analyze the field situations and monitor the population of pests, defenders, soil conditions, plant health and the influence of climatic factors to make informed decisions for growing a healthy crop. In AESAs, farmers observe the crop, analyze the field situation and take decisions for crop management based on field observations. Focus in AESAs based IPM is on pest-defender dynamics, abilities of plants to compensate for the damage caused by pests and the influence of abiotic factors on pest build up.

The health of a plant is determined by its environment which includes abiotic factors (sun, rain, wind, soil nutrients etc.) and biotic factors (i.e. pests, diseases, weeds etc.). These factors play a role in the balance which exists between insects and their natural enemies. Understanding these interactions can help in pest management. The activity takes place in the farmer field. It is season-long so that it covers different developmental stages of the crop and their related management practices. The process is learner-centered and necessitates active participation of farmers and promotes decision making based on experiential learning and discovery

Principles of AESAs based integrated pest management (IPM)

- i. Grow a healthy crop
- ii. Observe the field regularly
- iii. Plant Compensation Ability
- iv. Understand and Conserve defenders
- v. Insect zoo
- vi. Pest: Defender ratio (P: D ratio)

by farmers. Experiences show that AESA has resulted in reduction in chemical pesticide usage and in cost of production, increase in yields and also conserves the agro-ecosystems.

i. Grow a healthy crop

Select a variety which is resistant/tolerant to major pests. Treat the seeds/seedlings/planting material with recommended pesticides, especially biopesticides. Select healthy seeds/seedlings/planting material. Apart from this, soil health can be improved by nutrient management especially organic manures and bio fertilizers based on soil test results. If the dosage of nitrogenous fertilizers is too high the crop becomes too succulent and susceptible to insects and diseases. If the dosage is too low, the crop growth is retarded. So, the farmers should apply adequate amount for best results. Phosphate fertilizers should not be applied every season as the residual phosphate of the previous season will be available for the current season also. Furthermore, proper irrigation and crop rotation can also be helpful in this regard.

ii. Regular field observation

Farmers should monitor the field situations at least once a week (soil, water, plants, pests, natural enemies, weeds, weather factors etc.); make decisions based on the field situation. The Pest: Defender (P: D) ratio must be estimated to take necessary action.

iii. Plant compensation ability

Compensation is defined as the replacement of plant biomass lost to herbivores and has been associated with increased photosynthetic rates and mobilization of stored resources, for eg. From roots and remaining leaves.

iv. Understand and conserve defenders

Know about natural enemies to understand their role through regular observations of the agroecosystem and avoid use of chemical pesticides.

v. Insect zoo

Various types of insects are present in the field where some are beneficial some may be harmful. Generally farmers are not aware about this. The concept of Insect zoo can help in enhancing farmers' skill to identify beneficial and harmful insects. In this method, unknown predators are collected in plastic containers from the field. Each predator is placed inside a plastic bottle together with parts of the plant and some known insect pests. Insects in the bottle are observed to determine whether the test insect is a pest (feeds on plant) or a predator (feeds on other insects).

vi. Pest: defender ratio (P: D ratio)

The natural enemies of crop pests include parasitoids, predators and pathogens. Identifying the pests and beneficial insects helps farmers make appropriate pest management decisions. Sweepnet, visual count etc. can be adopted to arrive at the numbers of pests and defenders. The P: D ratio can vary depending on the feeding potential of natural enemy as well as the type of pest. 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.

AESA through Farmers Field Schools

Adoption of AESA based IPM through Farmers Field School (FFS) programs encouraged reliance on biological control agents as well as substantial reduction in use of chemical fertilizers and pesticides and consequently reduction in cost.

The National Institute of Plant Health Management (NIPHM) and Directorate of Plant Protection, Quarantine & Storage (DPPQ&S) have revised IPM packages for different crops by incorporating agroecosystem analysis, ecological engineering and other IPM options in association with State Agricultural Universities and ICAR institutions.

Conclusion

AESA is a group oriented approach, that requires group participation of farmers for the IPM programme to be implemented successfully, thus extension functionaries act as most important factor in the dissemination of knowledge from scientists to farmers through AESA by using FFS.

References

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