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Non Pesticidal Management of Capitulum Borer (*Helicoverpa armigera*)

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SUMMARY

Sunflower (Helianthus annuus L.) a member of family Asteraceae (Compositae) and was introduced to India during 1969. The commercial cultivation of sunflower started in India during 1972-73. Average yield of sunflower (629 kg/ha) in the country is the lowest in the world due to several biotic and abiotic production constrains. Among biotic constrains in sunflower production, insect pests and diseases are the major concern. As many as 251 insect and acarine species have been recorded on sunflower at global level. In India more than 50 insect species have been found to damage the crop at different phenological stages of the crop of which polyphagous pests capitulum borer (Helicoverpa armigera Hubner), considered of major economic importance.

INTRODUCTION

There is a universal opinion that the chemical pesticides have failed to give desired outcome in the management of crop pests. The pesticide has done more damage to human and ecosystem than benefits, even though the consumption of pesticides is very low in India (Subramanyam et al., 2012). The indiscriminate use of pesticides has led to the contamination of air, soil, water, elimination of beneficial insects, and accumulation of pesticide residues in agricultural products (Karanth, 2002;). Killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish, beneficial insects and non-target species. In addition, augmented use of pesticides cause development of resistance in insects of agriculture, veterinary and public health importance. In response to these negative implications of intensive pest usage the following alternative strategies have been developed like Integrated Pest Management (IPM); Non-Pesticidal Management (NPM).

Integrated Pest Management – Concept and components

Realizing the dangers of chemical pesticides, an eco-friendly integrated pest management (IPM) program was initiated in 1980s. IPM is a farmer participatory community activity rather than one imposed from outside. IPM means the use of different methods to effectively control pests to minimise the loss and optimise the returns from crops. It favours greater use of all ecofriendly practices, like natural pesticides (bio pesticides), beneficial insects, birds, and special cultivation practices. Yet, it does not rule out the use of less harmful chemical pesticides in a complementary role, in serious condition.

Components of IPM

IPM is an integrated approach for effective pest management to save crops. The different components in IPM are cultural method, physical method, mechanical methods, Use of bio pesticides and bio control agents, Use of bird predators. In addition, use of chemical pesticides in a complementary role.

Non-Pesticidal Management (NPM)

NPM is an substitute model of agriculture for the most part depends on replacing external inputs with locally existing resources. It utilizes farmers' knowledge and skills apart from traditional pest management practices. It is nothing but understanding the biology of insects and preventing it reaching the damaging stage. Instead of controlling insects when it is damaging, understanding the weak stages in the lifecycle to control them. The concept of Non pesticide management is based on eco-friendly and sustainable system of crop protection which leads to maximum productivity and profitability with least possible adverse effect on the environment. The NPM components needs to be tested under different agro-ecological situations to reach near to farmer through participatory research extension and group action by NGO's.

Non-Pesticidal Management (NPM) of Capitulum borer

Deep summer ploughing - Diminish soil insects and those which pass any developmental stages under the soil by mechanical damaging, burying and exposing the developmental stages of pest.

Stubble burning in farm- It is traditional method that keep incidence of pests to lower degree by killing pupae within soil.

Inter cropping- growing of two or three different crops within the same field reduces the chance of losses incurred due to the failure of the crop being loss due to some constrains.

Trap crop- Growing of trap crop like marigold with tomato, corn with tomato, chickpea or ladyfinger with cotton to deflect target insect pests from main crop.

Collection and destruction of larvae- hand picking, collecting and killing of larvae is easy as it found on capitulum, which is the last resort adapted by farmer experiencing the danger of Helicoverpa. The larvae after collection will be destroyed.

Cow dung+urine extract-the mixture helps in reducing the pests load-the moth shows non preference to lay the eggs

Jaggery extract-Because of the sweetness of solution ants are attracted that predates upon the eggs of Helicoverpa besides preying upon the initial inster stage of the larvae.

Chilli and garlic extract-Female moth do not preferred to oviposite on the crop due to pungency. Kerosene in the extract turns smooth and glossy skin of the larvae to wrinkled and grooved.

Neem seed kernel extract/ Tobacco extract -Act as oviposition deterrent. The leaves and other part of the plant sprayed with NSKE/tobacco extract repel the larvae from feeding which results in starvation and killing of larvae.

Pheromone trap- Attracts and traps a male insect which in turn helps in disruption in mating as well as help in pest monitoring. Monitoring: Based on the number of males caught, the timing and frequency of control measures can be determined.

Organic manures- Wide usage of organic manures like tank silt, farm yard manure, green leaf manuring (with Glyricidia, Pongamia, Cassia tora), green manuring (with sunhemp, Daincha, different legumes), processed manures (like vermicompost, neem cake, pongamia cake), penning (sheep and goat stalling overnight in the field) etc are encouraged to make "soil fertile and healthy". A fertile and healthy soil acts as first defense mechanism against pest and diseases.

Natural enemies- Trichogramma egg parasitoids. The ichneumonid wasp, Campoletis chlorideae is an important larval parasitoid of H. armigera. The dipteran parasitoids Carcelia illota, Goniophthalmus halli, and Palexorista laxa have been reported to parasitize the larvae. Predators such as Chrysopa spp., Chrysoperla spp., Nabis spp., Geocoris spp., Orius spp., and Polistes spp. are common in India. Provision of bird perches or planting of tall crops that serve as resting sites for insectivorous birds such as Myna (Acridotheris tritis) and Drongo (Dicrurus macrocercus) helps to reduce the numbers of H. armigera larvae.

Biopesticides- The use of microbial pathogens such as H. armigera nuclear polyhedrosis virus (HaNPV), entomopathogenic fungi, Bacillus thuringiensis (Bt), nematodes like Heterorhabditis and Steinernema in association with bacteria viz., photorhabdus and xenorhabdus cause disease to many insect pests from lepidopteran and coleopteran. The entomopathogenic fungus- Nomuraea rileyi. Beauveria bassiana in addition helps in reducing Helicoverpa population. Bt formulations are also used as sprays to control Helicoverpa. Spraying Bt formulations in the evening results in better control than spraying at other times of the day.

CONCLUSION

NPM should be used whenever possible and should be an integral part of an overall ecological IPM program. Recognizing the externalities associated with chemical pesticides, such as environmental degradation, human health hazards, pests becoming resistant to pesticides, secondary pest outbreaks and uneconomic and unsustainable production as well as in view of growing interest among farmers for using NPM. The concept of NPM is eco-friendly and more acceptable to low income groups of the farming community because of local availability of raw materials, low costs and feasibility for preparations at home.

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