

Insect management

and healthy environment go hand in hand

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Insects are an inseparable part of today's agriculture. More than 10,000 species of insects attack the crop plants used as food by human beings in the world. However, less than 10% of the total identified species are generally considered as major pests. Timely management of these insects is necessary to increase crop productivity and uplift socio-economic condition of the farming community. We may control such harmful insects with the use of strong insecticides, but our coming generations will face ill consequences in future because the residues of these insecticides remain in soil, water and plants for a long time. Such insecticides not only affect human health but also animals, birds and natural enemies of insects as well. In this article, we have shared various management strategies which are eco-friendly and effective against harmful insect-pests of various crops. These practices can help in reducing crop yield losses while managing insect pests.

Keywords: Agriculture, Eco-friendly, Insect-pests, Insecticides

AGRICULTURE is backbone of India's economy and is highly incomplete without mentioning insects. There is significant increase in cropping area under insect-pest attack, resulting in crop damage and high reduction in crop yield. In the recent years, due to irrational use of harmful insecticides, the stress on human health has increased further. Although scientists are trying hard to get rid of harmful insects since centuries but due to ability of insects to better adapt according to the changes in environment, they are still in existence on various crop plants. Insecticides provide quick pest control which ultimately leads to increase in crop yield, but overuse of these insecticides can adversely impact the sustainability of the region. Some of these chemicals pose a potential risk to humans and other life forms. In addition, they may contaminate air, water, soil and non-target organisms as well as agriculture ecosystem. There is strong need to adopt proper insect management strategies which can help in reducing crop yield losses

while managing insect pests without causing harm to environment and non-target organisms.

The experts team of Krishi Vigyan Kendra, SAS Nagar (Mohali) after visiting various farmer fields in the district observed that some farmers are unable to differentiate between beneficial and harmful insects. Wrong identification of insects and the cost incurred on insecticides will lead to heavy economic loss to the farmers.

Keeping record about life cycle of the harmful insects is the first necessary step for their effective management which requires important information regarding appearance of insects and their numbers. Further, the information is also required for the life stage of insects during attack, the degree of crop damage and the part of plant being attacked, strategies employed to control the insects and whether the employed control measures are eco-friendly or not. These records keeping will help the farmers to effectively plan and manage the target insects in the coming years.

Insect attack on the crop depends upon crop variety, cultivation practices and climatic conditions of that place. To manage these insects on different crops, it is necessary to go through the following steps:

- Follow crop cultivation practices as recommended by ICAR institutes and state agricultural universities such as use of varieties that are resistant or tolerant against insect attack, timely sowing and harvesting of crop, use of adequate quantity of seed and fertilizers. For example, Gobhi sarson should be preferably sown up to 3rd week of October for the management of mustard aphid under Punjab conditions.
- It is important to regularly monitor the fields for target insect appearance so that they can be controlled before they reach economic threshold levels.
- Mechanical control is another safe option under insect management. In paddy crop, if the leaf damage reaches up to 10% or more by leaf folder attack, we can adopt

mechanical control which can be done before flowering by passing the 20–30 m long coir/jute rope, forwards and then backwards, both ways by touching the crop canopy. While passing the rope, ensure that water must be standing in the crop.

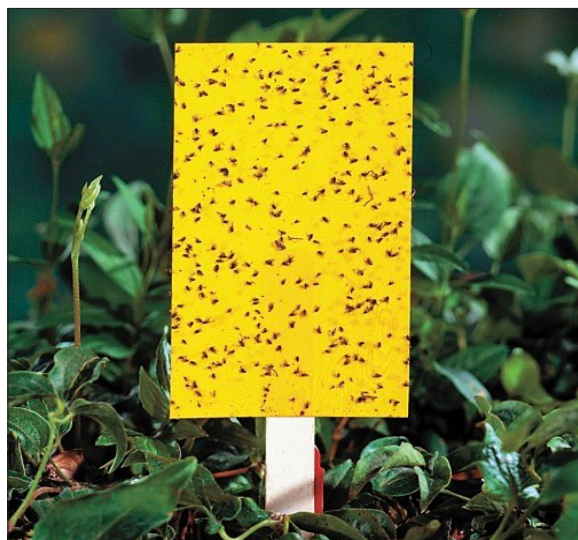
- Farmers can use pheromone traps to capture fruit fly; light traps to capture moths; and yellow sticky traps to capture white fly. In Punjab, different fruit flies attack different host crops such as Oriental fruit fly (*Bactrocera dorsalis*) has been observed to infest fruits of citrus spp., guava, peach, pear, plum, mango, sapota, grapes, jamun, pomegranate. *Bactrocera zonata* infest on peach and *Bactrocera cucurbitae* on vegetables preferably melons. For the best management of male fruit flies in kinnow, guava, mango, pear, peach and plum, PAU fruit fly trap has been devised @16 traps/acre.
- Attracting the insects on trap crops such as marigold, okra, and castor; and to destroy these crops later is a good strategy for insect management. Trap crop is a crop that is planted to lure insect pests away from the main crop. Marigold was the preferable trap crop for egg laying of *Helicoverpa*. In addition, some crops attract natural enemies of main crop insect-pests. Sunflower crop attracts *Helicoverpa* pest. It shall

be surrounded by two rows of mustard to attract natural enemies such as *Chrysoperla* and Lady Bird Beetle. Coriander crop also attracts different natural enemies of main crop pests. Some crops grown either as border crop or main crop which repel the pests away from the crop mainly due to the release of volatile repellent plant chemicals such as Basil repels flies, mosquito, tomato borer; Garlic repels beetles, aphids, weevils, spider mites, carrot fly; Radish deter cucumber beetle; Mint repel cabbage moth and Marigold repels beetles, cucumber beetles, nematodes.

- The crop becomes more prone to attack of insects and diseases if same crop is grown at same place every year. Crop rotation is the best strategy to deal with this problem as it will break life cycle of the insect. Pink stem borer (*Sesamia inferens*) can be effectively managed in wheat crop by adopting crop rotation.
- In our cropping environment, so many predators, parasitoids and pathogens of insects are available naturally. Coccinellid beetles, green lacewing/aphid lions, praying mantid, syrphid flies, dragonflies, reduviid bug, pentatomid bug, *Trichogramma* spp., *Aenasius* spp. and *Aschersonia aleyrodis* fungus are most common examples of such naturally occurring insects. These

will help to reduce harmful insect population surviving on crop plants. Farmers can collect and release these natural enemies with the advice of entomologists. Besides, they can grow maize, sesame, flowers around the space of tube wells or periphery of fields on bunds where beneficial insects and birds can survive. For control of maize borer (*Chilo partellus*), farmers can use trichocards twice having 40,000 eggs of *Corcyra cephalonica* parasitized by *Trichogramma chilonis*/acre where first release is on 10 days old crop and second on 7 days after the first release. Cut trichocards into 40 strips, each having approximately 1000 parasitized eggs. Staple these strips uniformly on the underside of the central whorl leaves in evening hours.

- If insect population does not come under control with the above given strategies, then farmers can opt for biopesticides (neem, onion, garlic, eucalyptus extract/oil) or green chemistry insecticides. Farmers should spray in the afternoon when pollinators are less active. In wheat crop, if aphid infestation exceeds economic threshold level of 5 aphids per earheads (recorded from 10 randomly selected earheads in each of the 4 quarters of one-acre field), spray 2 litre PAU homemade neem



Yellow sticky trap in vegetables

Source: <https://vikaspedia.in/agriculture/agri-inputs/bio-inputs/production-of-ipm-inputs/traps/yellow-sticky-traps>



Marigold as a trap crop in tomato

Source : <https://www.manage.gov.in/publications/edigest/jun2019.pdf>



Sarson crop infested with aphid



Larva of lady bird beetle (Natural enemy of aphids)

extract twice at weekly interval in 80–100 litres of water/acre using knap sack sprayer or in 30 litres of water/acre with power sprayer under Punjab conditions. For management of Jassid (*Amrasca biguttula*) in okra, farmers can spray 80 ml Ecotin 5% (Neem based insecticide) or 2000 ml PAU Homemade Neem Extract in 100–125 litres of water per acre. Method of Preparation of PAU Homemade Neem Extract is to boil 4.0 kg terminal parts of the shoots of Neem trees including leaves, green branches and fruits in 10 litres of water for 30 minutes. Filter the material

through muslin cloth and use the filtrate for spraying.

SUMMARY

For sustainability of agriculture, there is a need to identify harmful crop insects and their effective management without any adverse effect on our environment. There is need to identify the life cycle of harmful insects during the attack and their visibility for effective planning of eco-friendly management strategies. Regular monitoring of the crop fields for target insect appearance is very necessary to control them before they reach economic threshold levels. The role

of biological control agents/natural enemies cannot be ignored here which help to reduce harmful insect population surviving on crop plants. Right identification and timely release of such natural enemies with the help of entomologists leads to effective management of harmful crop insects. In addition, attracting the insects on trap crops is a good strategy for insect management. Border rows of various crop plants can also be used to attract natural enemies of insect-pests of main crop. If insect population does not come under control with such strategies, then farmers can opt biopesticides or green chemistry insecticides. Although we can enhance the crop yield from today's agriculture but maintaining healthy life should be our top priority which is being neglected totally. Today's need is not to kill the insects with harmful chemicals but to manage them with wisdom and common sense by keeping them below economic threshold level to get good crop yield along with healthy environment. Such environment can be maintained by the collective efforts of farmers and advisories provided by Central Agricultural Institutes, State Agricultural Universities (SAUs) and Krishi Vigyan Kendra's (KVKs).



KVK SAS Nagar team helping farmers in identification of natural enemies in Gobhi sarson crop

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