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Alternative Non-Chemical Pest Management Strategies

Ipsita Samal [1], Bhupen Kumar Sahu [2] and Jayashree Bhattacharjee[3]
[1]Ph.D. Scholar, Division of Entomology, Indian Agricultural Research Institute, New Delhi
[2]M.Sc.Student, Department of Sericulture, Assam Agricultural University, Jorhat, Assam
[3]Block Technology Manager, Department of Agriculture, Govt. of Tripura, Tripura
Corresponding Author*: happyipsu29@gmail.com

SUMMARY

In the IPM era, there is a need to develop eco-friendly and economic management practices, so the alternative pest management strategies will be helpful in this context. Soil preparation, use of indigenous varieties, use of nylon mesh, pruning, intercropping, encouraging biological control, crop rotation, destruction of alternate hosts like cultural, mechanical, physical and biological control methods will be helpful in managing pests below the Economic Injury Level.

INTRODUCTION

The definition of a pest is valid only if it causes economic damage to our cultivated crops. For controlling these diverse methods have been suggested such as, cultural, mechanical, physical and biological control. Most of these are preventive measures, whereas, chemical control is often used as curative control measures which is used only when the pest crosses economic threshold (Risch, 1987). This is an approach that utilizes different techniques other than the use of chemical pesticides to control pests. It involves natural pest population-control methods, including cultural and biological controls the use of botanical pesticides as needed.

Cultural Method of Pest Control

These methods are aimed either at reducing the sources of inoculum or at reducing the exposure of plants to infection. Its primary objective is the prevention of pest damage and not the destruction of an existing and damaging pest population.

1. Good soil preparation: This is the first important element in pest control strategy. A healthy soil means healthy plants which are relatively more resistant to pests. A soil rich in humus hosts a wide variety of beneficial microflora that trap nematodes and destroy or keep in dormancy disease organisms, thereby encouraging beneficial insects.
2. Use of indigenous varieties: Traditional varieties are hardier and relatively more resistant to pests (Herzog and Funderburk, 1986). They can withstand harsh environmental conditions better than modem hybrids.
3. Pest control through the use of mesh screen (nylon nets): Younger plants are usually preferred by insects and they suffer significantly from such attacks when compared to older plants. Therefore, a single netting over the plants during the first 3045 days of their growth can reduce pest damage. Also, the net helps diffuse sunlight thereby improving the quality of some vegetables. Finally, the net breaks the impact of raindrops thus (i) reducing physical damage to the plant and (ii) reducing soil erosion from the beds.
4. Roguing or Pruning: Removal of diseased plants or plant parts prevents the spread of microorganisms to uninfected areas.
5. Intercropping with aromatic herbs: Several types of odorous plants can be grown together with the main crop to repel insects. The following are some examples: *Allium cepa* (onion), *Allium odorum* (leek), *Ocimum basilicum* (sweet basil), *Ocimum sanctum* (sacred basil), *Tagetes spp*. (marigold), *Coleus amboinicus* (oregano).
6. Encouraging insect predators: Pests can be controlled by their natural enemies. By growing a variety of flowering plants, specifically those belonging to Umbelliferae family, such as,

fennel (*Foeniculurn vulgare*) and celery (*Apium graveolens*), insect predators will be attracted to stay in the garden. These beneficial insects feed on pests, keeping the pest population below economic injury level.

7. Multiple cropping: This provides genetic diversity to minimize pest increase. Variation in susceptibility among species or varieties to a particular disease is great. Given abundant hosts of a single species or variety, a pest could easily be spread from host to host. When the number of hosts declines, the pest incidence will also decrease for lack of necessary food for the organism.
8. Mixed cropping: in this approach, more than one crop is grown on the same piece of land. This reduces phytophagous insect pests by encouraging increases in natural enemies due to:

a. Greater temporal and spatial distribution of nectar and pollen sources
b. Increased ground cover, particularly important for diurnal enemies
c. Increased prey, offering alternative food sources when the pest species are scarce or at an appropriate time in the predator's life cycle. It also affects the pest's ability to find host plants by conferring associational resistance, by the non-host plant masking the odours of the host plant.

9. Crop rotation: This is a practice of following a crop susceptible to a pest by a resistant crop. There is no build-up of the organism to a high level since the growth cycle of the organism has been broken.
10. Destruction of volunteer plants:Such plants are very attractive to many insects and serve as the focal point for future infestations. Unless they are destroyed they can help perpetuate a pest problem by furnishing a food source to long life- cycled pests of preceding crops.
11. Management of alternate hosts: Many insects reproduce on weeds or other alternate hosts and then attack the main crops. It is therefore usually desirable to destroy brambles and other weeds on uncultivated land to assist in the control of nsects such as aphids, beet leafhopper and raspberry cane borer. Care must be taken, however, not to destroy nursery sites for the pest's natural enemies.

Biological Pest Control

Biological pest control is the suppression of pest populations by living organisms such as predators, parasites and pathogens. These agents are responsible for keeping pests under control most of the time. Predators are usually other insects and spiders. Both, but particularly spiders, feed on a wide range of insects. Adults and immatures are often predatory. Praying mantis, Dragonfly, Damselfly, Assassin bugs Feed on all types of insects. Lacewings, White-banded Robber files feed on aphids and soft-bodied insects. Ground beetles, Whirligig beetles, Rave beetles, Tiger beetles, Green carabid beetles feed on other insects. Ladybird beetles feed on scales and aphids only. They eat 40-50 insects per day. Their larva eats even more. Toads, snakes and spiders eat insects and other garden pests. Toads eat as many as 10,000 insects and other pests in three months, including cutworms, slugs, crickets, ants, caterpillars and squash bugs. Some birds are omnivorous. Some examples from the temperate zone provide a good illustration of what birds eat.

A house wren feeds 500 spiders and caterpillars to her young in one afternoon; a brown trasher consumes 6,000 insects a day; a chickadee eats 138,000 canker . Parasitic insects are usually small flies or wasps which attack one or a few closely related pest species. They are parasitic in their larval stages but free-living as adults. Tachinid flies, Braconid wasps complete their life cycle on insect pests. They usually attack the egg of the host pest or the caterpillar by laying an egg into its body. The wasp larva hatches inside the caterpillar body and feeds on it (Flaherty *et al.,* 1985).

Encouraging Predators

In nature, pests are usually controlled by the presence of insect predators and parasites which keep the populations of the harmful insects in control Most of the insects in nature are either beneficial or at least harmless. There are many ways to encourage insect predators in one's garden are as follows:

Create a Suitable Habitat for Insect Predators	Flowering shrubs and trees throughout the garden will attract many beneficial insects, including parasitic wasps which require pollen and nectar for their growth and maturity. Plants belonging to Umbelliferae family are particularly effective in attracting natural enemies of pests
Provide Alternate Hosts for Pests	To ensure availability of food for the beneficial organisms, grow alternate host plants along fence lines and in between cultivated crops. The natural enemy populations on these alternate host plants will control pests attacking the cultivated crop
Create Nesting Sites for Frogs, Reptiles and Birds	Logs of dead trees, irregularly shaped rocks with crevices and cavities and plenty of mulch can be a good nesting sites for snakes, lizards, frogs, rove beetles and carabid beetles, which feed on insects
Increase Humidity by Providing Water Holes	Humidity is much needed for the survival of natural enemies. It serves as a source of drinking water for reptiles, birds and frogs. Many predatory insects live in, on and near water. Well-vegetated small dams, little water pools and swales scattered throughout the garden will create conditions for the build-up of natural enemies
Practice Mixed Cultivation	Growing mixed crops and harvesting them in strips help maintain natural enemies and confuses pests. For fungal pathogens, the practice of mixed cropping is desirable as the root exudates of another crop can be toxic to the pathogen. Mixed cropping also encourages soil microbes which, in turn, act as barriers to the fungal pathogen
Reduce Dust Build up in Crop Plants	Dust inhibits the functioning of natural enemies. Growing well-designed windbreaks and ground cover crops like centrosema and lablab bean will reduce dust. Use of overhead sprinklers will also help periodically in washing off the dust
Avoid Spraying Chemical Pesticides	Chemical pesticides eliminate beneficial insects. If pest infestation reaches economic threshold levels and spraying cannot be avoided, use selective chemicals, such as: a soil incorporated granular systemic insecticides for sucking insects b. stomach poisons; avoid broad-spectrum contact poisons c. insecticides with short-term residual action rather than persistent action

CONCLUSION

Considering the economies of crop loss, usually chemical control is advisable. So the non-chemical methods can be more useful as a preventive control measure. Furthermore, these methods have no reported adverse consequences such as resistance, residue and resurgence of pests like problems adding another point to its beneficial usage.

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