

Integrated Pest Management

Introduction

Pest insects have an adverse impact on agricultural production, natural environment and our lifestyle. Pest insects may cause problems by damaging crops and food production, parasitising livestock or a health hazard to humans.

The spread of plant pests and disease has increased in recent years. Outbreaks and upsurges can cause huge losses to crops and pastures, threatening the livelihoods of farmers and the food and nutrition security in future time.

The crop losses due to insect pests in India are around 15.7% which accounts for the annual losses of 36 billion USD\$ (Dhaliwal et al. 2015). Insects are becoming hungrier day by day due to climate change.

What is IPM?

- IPM is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices.
- IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment.
- This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

Definition:-

“Integrated Pest Management is an ecosystem approach to crop production and protection that includes different management strategies and practices to grow healthy crops and minimize the use of pesticides.”

- fao.org

“It is ecosystem based strategy that focuses on long term prevention of pests and their damage through a combinations of techniques such as biological control, habitat manipulation, modification of cultural practices and use of resistant varieties.”

Principles of IPM: An American IPM system is designed around six basic components:

- **Acceptable pest levels**—The emphasis is on *control*, not *eradication*.
- IPM holds that wiping out an entire pest population is often impossible, and the attempt can be expensive and unsafe.
- IPM programmes first work to establish acceptable pest levels, called action thresholds, and apply controls if those thresholds are crossed.
- These thresholds are pest and site specific, meaning that it may be acceptable at one site to have a weed such as [white clover](#), but not at another site.
- Allowing a pest population to survive at a reasonable threshold reduces selection pressure.
- This lowers the rate at which a pest develops resistance to a control, because if almost all pests are killed then those that have [resistance](#) will provide the genetic basis of the future population.
- Retaining a significant number of unresistant specimens dilutes the prevalence of any resistant genes that appear.
- Similarly, the repeated use of a single class of controls will create pest populations that are more resistant to that class, whereas alternating among classes helps prevent this.

Principles of IPM...

- **Preventive cultural practices**—Selecting varieties best for local growing conditions and maintaining healthy crops is the first line of defense.
- Plant [quarantine](#) and 'cultural techniques' such as [crop sanitation](#) are next, e.g., removal of diseased plants, and cleaning pruning shears to prevent spread of [infections](#).
- Beneficial [fungi](#) and [bacteria](#) are added to the potting media of [horticultural](#) crops vulnerable to root diseases, greatly reducing the need for [fungicides](#)
- **Monitoring**—Regular observation is critically important. Observation is broken into inspection and identification.
- Visual inspection, insect and spore traps, and other methods are used to monitor pest levels.
- Record-keeping is essential, as is a thorough knowledge of target pest behavior and reproductive cycles.
- The degree days of an environment determines the optimal time for a specific insect outbreak.
- Plant pathogens follow similar patterns of response to weather and season.

... Principles of IPM

- **Mechanical controls**—Should a pest reach an unacceptable level, mechanical methods are the first options.
- They include simple hand-picking, barriers, traps, vacuuming and [tillage](#) to disrupt breeding.
- **Biological controls**—Natural biological processes and materials can provide control, with acceptable environmental impact, and often at lower cost.
- The main approach is to promote [beneficial insects](#) that eat or parasitize target pests.
- [Biological insecticides](#), derived from naturally occurring [microorganisms](#) (e.g.—[Bt](#), [entomopathogenic fungi](#) and [entomopathogenic nematodes](#)), also fall in this category. Further 'biology-based' or '[ecological](#)' techniques are under evaluation.
- **Responsible use**—Synthetic [pesticides](#) are used as required and often only at specific times in a pest's life cycle.
- Many newer pesticides are derived from plants or naturally occurring substances (e.g.—[nicotine](#), [pyrethrum](#) and insect [juvenile hormone](#) analogues), but the [toxophore](#) or active component may be altered to provide increased biological activity or stability.
- Applications of pesticides must reach their intended targets.

IPM Approaches for managing pests are often grouped in the following categories

- **Biological control**
- Biological control is the use of natural enemies—predators, parasites, pathogens, and competitors—to control pests and their damage.
- **Cultural controls**
- Cultural controls are practices that reduce pest establishment, reproduction, dispersal, and survival.
- For example, changing irrigation practices can reduce pest problems, since too much water can increase root disease and weeds.

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- **Mechanical and physical controls**
- Mechanical and physical controls kill a pest directly, block pests out, or make the environment unsuitable for it.
- Traps for rodents are examples of mechanical control. Physical controls include mulches for weed management, steam sterilization of the soil for disease management, or barriers such as screens to keep birds or insects out.
- **Chemical control**
- Chemical control is the use of pesticides.
- In IPM, pesticides are used only when needed and in combination with other approaches for more effective, long-term control.
- Pesticides are selected and applied in a way that minimizes their possible harm to people, nontarget organisms, and the environment.
- With IPM you'll use the most selective pesticide that will do the job and be the safest for other organisms and for air, soil, and water quality; use pesticides in bait stations rather than sprays; or spot-spray a few weeds instead of an entire area.