INTEGRATED MANAGEMENT OF PESTS

Dr. Mahesha H B, Yuvaraja's College,University of Mysore, Mysuru.

In the preceding chapters amongst other things like the description of the pests, their life cycle, extent of damage, periods of occurrence etc., their control measures have been described in detail involving various methods like physical, chemical and biological. It may, however, be seen that none of them is perfect by itself, each one having its advantages and disadvantages. Further, one has to distinguish between a short term and a long term control and try always to achieve the latter instead of the former. In this connection, it may be worthwhile to see that instead of choosing one method, a combination of methods is chosen having an integrated approach. But before choosing a method or methods it is imperative to know precisely the advantages and disadvantages of each of them individually and collectively so that the most rational, economic and effective method/methods are chosen to the best advantage of the individual, the society and the environment. Advantages and disadvantages of different methods and possibility of their combining having an integrated approach are discussed below which may provide useful guidance in the matter.

Integrated Pest Management (IPM) is an 'ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as physical, chemical, biological, habitat manipulation, modification of cultural practices, and use of resistant varieties'

or

"Integrated Pest Management (IPM) is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks"

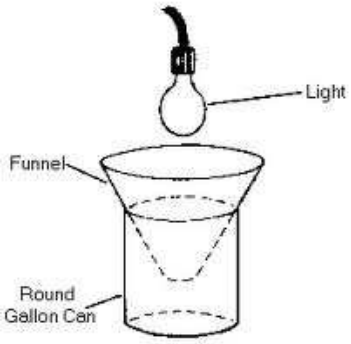
Physical control

This covers the elimination of the pest by various physical means like mechanical, Photo tropical and cultural.

(a) ***Mechanical****:* The mechanical elimination may be through hand and net collection of egg masses, larvae, pupae, scrapping of the bark *etc*. It is always advantageous to adopt this method when the insects are gregarious and are in an inactive stage. The other forms of mechanical destruction could be brought about through the cutting of the infested shoots and branches and their destruction, preferably by burning but that may be integrated with cultural control also involving the adjustment of pruning and destruction of the pests.

(b) ***Phototropical:*** Another method of physical control may be through light trapping taking advantage of the phototrophic nature of certain insects. This has been found to be particularly effective against the Lepidopteran pests forming one of the largest groups of phytophagous insects.

Light trap



Internal structure of light trap

(c) ***Cultural:*** Cultural control is brought about by turning up of the soil, flooding etc., which expose the pests to physical stress. During the process they are killed by exposure to sunlight, water and the predators. As already stated pruning of the plants and burning of the infested twigs may also lead to the control of certain foliar pests. All the physical control methods have the advantage that they are pollution free and do not affect the environment but have the disadvantages of being limited in reach and labour intensive. For the physical control, one should have a thorough knowledge of the life history, bionomics as well as the habit and habitat of the pests.

Chemical Control

Chemical control is done mostly through commercial pesticides. They are, no doubt, very quick in action but are be set with a number of disadvantages like pollution of the environment and danger to other than the target group of insects. They are mostly indiscriminate in action killing many useful insects thereby breaking the agro-eco-system. They may affect higher animals also. Use of chemicals for mulberry pest control may have special implications as the mulberry leaves are to be fed to the silkworm and any overdose or miscalculation regarding the safe period could play havoc with the cocoon crop.

Use of resistant varieties

Varietal resistance to pest infestation is known in almost all plants. Thus one way to avoid the pest infestation could be the selection of pest resistant varieties. Again one strain may not be resistant against all the pests. So, depending on the area and survey of the varieties, those particularly resistant to the pest prevalent in the area could be used/ introduced.

The following criteria could be used in the screening of pest resistant mulberry varieties:

(a) Visual damage rating.

(b) Determination of the number of plants surviving infestation at regular intervals.

(c) Comparison of yield loss between the infested and the non-infested plants.

Genetical / Autocidal:

Pests are controlled by the introduction of sterile or genetically altered individuals into the wild population.

"a method of pest control using area-wide inundative release (involves releasing large numbers of natural enemies for immediate reduction of a damaging or near-damaging pest population) of sterile insects to reduce reproduction in a field population of the same species".

It is therefore a type of "birth control“

Eg., Control of Uzi menace by releasing sterile male uzi flies.

Legislative (Quarantine): Quarantine means to keep materials in isolation to prevent spreading of diseases, pests *etc*.

Legislative or regulatory method is a method mainly employed to prevent the introduction of pests from other countries or to prevent the spread of a pest from one area to another. The method is operated through specific regulations known as plant-quarantine laws. In India some states have special pest acts, by which it becomes obligatory on the part of the cultivators and governmental authorities to take appropriate steps to control a particular pest when it appears in an epidemic form.

BIOLOGICAL CONTROL OF MULBERRY PESTS

Practically every crops pest has its natural enemies in the form of parasites, predators and disease causing organisms.

The biological control involves a large scale multiplication of and liberation of such agents, or creating conditions under which the naturally occurring agents can act effectively.

The following mulberry pests can be controlled effectively under this method.

Biological control may be of various types

1. Use of hyper parasitoids to attack the primary parasitoid.
2. Use of attractants and repellents including pheromones to trap and kill the insects.
3. Use of hormones and other physiology impairing chemicals to upset the normal metabolism.
4. Use of sterile male technique.
5. Use of bacterial, viral, protozoan and fungal insecticides are ruled out as many of them are known to be pathogenic to silkworm itself.

1. <u>Bihar hairy caterpillar:</u> *Spilosoma obliqua* Walker (= *Diacrisia obliqua)*

Trichogramma chilonis is an egg parasitoid of many lepidopteran pests. It is widely used as biocontrol agent of several crop plants. Release twice *T. chilonis* at the rate of 5 tricho-cards (20,000 parasitised eggs in each tricho - card) per acre, at an interval of 3 days. Parasitoid releases have to be undertaken 20 days after pruning or harvesting.

Tricocards **Tricocard on mulberry plant** **Tricograma parasitizing the egg**

Tricograma parasitizing the egg (magnified)

2. <u>Leaf-roller:</u> *Margaronia pulverulentalis*

This pest can be biologically controlled with the help of its natural enemies like *Apanteles* spp. and *Diadegma* spp. Also, *Trichogramma chilonis* can also be used to control this pest as described for Bihar hairy caterpillar. *Tetrastichus howardii,* is an pupal parasitoid can be used at the rate of 1 lakh adults/acre.

Two alternate examples are given below to know the mechanism of controlling the pests.

Larvae of *Apanteles* sp. (parasitoid) emerging from *Pieris* sp (Host).

Larva Parasite *Diadegma insularis* (parasitoid) ovipositing on Diamondback Moth larva(Host).

3. Thrips: *Pseudodendrothrips mori*

This pest can be biologically controlled by Ladybird beetles, *Menochilus sexmaculatus* and *Scymnus coccivora* were observed to feed on thrips in the field and laboratory.

4. Mealy bug: *MaconelIicoccus hirsutus*

Successful biological control of mealy bug can be achieved by employing predatory cociinellid Ladybird beetle like *Cryptolaemus montrouzieri* at the rate of 125 adults per acre twice, during October-November and January and February. Alternatively, 500 adults of *Scymnus coccivora* per acre are also useful.

Cryptolaemus montrouzieri* feeds on *MaconelIicoccus hirsutus

5. Termites:

The use of entomopathogenic fungi and plant extracts for termite control is currently being investigated.
