Rashtriya Krishi | Volume 6 No. 2 | December, 2011| 26-27

INTEGRATED PEST MANAGEMENT IN TOMATO

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Tomato belong *Lycopersicon* genus of the Solanaceae family originated along the coastal highlands of western South America. The genus is composed of nine generally accepted species, of which only two are used for culinary purposes: *L. esculentum*, the common tomato. Ripe, raw tomatoes consist of approximately 93 per cent water. Consuming one hundred grams of raw tomatoes provides seventeen grams of carbohydrates, three grams of protein, twenty-three grams of vitamin C, or about forty percent of the adult recommended daily allowance (RDA), and about nine hundred international units of vitamin A, or about 30 percent of the adult RDA. Today, insect –pest cause havey losses in tomato thearefore solving thise problem farmer usechmical insecticides.But use of chemical insecticides significantly curtailed the insect pests in the past but in due course it resulted in the development of resistance to insecticides in insects, environmental degradation and increase in the cost of cultivation. To overcome these unfavorable situations, Integrated Pest Management (IPM) strategies were advocated. The use of economic injury levels (EILS) and scouting for the assessment of pest populations have been the main criteria of IPM.

Following are the economic threshold levels of tomato pest, which are used as indicator to adopt IPM actions. The economic threshold is the pest count at which the benefit of taking action is greater than the cost of taken action.

Pest	Economic Threshold Levels(ETL)
Fruit borer	1 larva/m row length or 2% fruits damaged
Gram pod borer	2 larvae/2m row length
Army worm	One larvae/hill
Leaf folder	One damaged leaf/hill
Jassid	5-10 jassids per plant
Leafminer	2-5 miners pr plant

Components: Integrated Pest Management is based on following different components:

Mechanical control: Hand picking of larvae: Larvae of cutworm, leaf eating caterpillar are very sluggish, so they can be hand collected and destroyed easily.

Trenching the field: Pests like army worm, grasshoppers move from one field to other which can be prevented by trenching in field.

Physical control:

Burning : Damaged fruits and crop residue should be burn to avoid carry over of pest.

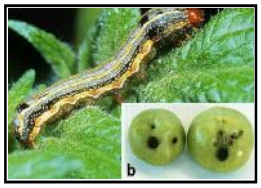
*Refrigeration :*Cold storage of fruits and vegetables reduces pest infection.

Moisture : At optimum moisture there is no infection while at high moisture in field increases infection of pest.

Use of light : Light traps are used for pests like hairy caterpillar, stem borer.

Cultural control:

Summer ploughing: Ploughing the field after summer showers, removing the crop debris from the field, exposing the different stages of insects *viz*., egg, larvae and pupae to sunlight greatly reduce the pest abundance and prevent the pest population buildup.



Certified seeds: Certified seeds free of insects and disease causing organisms should be used. This can prevent the carryover of pest species through the seeds.

Time of sowing: Synchronization of vulnerable host crop stage and pest species determine the extent of damage. Asynchronization can be achieved by adjustment of time of sowing.

Judicious and proper application of fertilizers: Judicious and proper application of manures and fertilizers at proper time can directly manage the insect pests. Excessive use of nitrogenous fertilizer attracts pests. Phosphorus fertilization has been known to reduce the incidence of jassid.

Water management: The availability of water in requisite amount at the appropriate time is crucial to the very lives of the plants. Water can accentuate or hinder growth and development of insect pests. Overmoist soil attracts cutworms, slugs, etc. Water stress has been employed for the management of whitefly (*Bemisia Tabaci*).

Weed management: Weeds serve as the alternate and associate hosts of several insect pests. Weeds support the growth and development of insect pests by providing nutrition and substrates for ovipostion. Hence, removal of

weeds directly control the population buildup of pests.

Crop rotation: Monocropping helps in the sustenance of insect pests throughout the year and aids in great damage by them. It is advisable to rotate the crops and avoid monocropping. Especially, monocropping of cotton, tomato and brinjal is not advocated.

Trap crop: Planting of yellow tall marigold (*Tagetes* spp.) or bidil rustica tobacco around tomato (1:5) has been found promising. All the eggs of *H. armigera* deposited on yellow Tagetes flowerbuds could be destroyed by the inundation of Helicoverpa adapted strain of egg parasitoid (*Trichogramma chilonis*). The main crop of tomatoes is also sprayed either wit hHaNPV or Bt, both of which are compatible with Trichogramma.

Post harvest: Burning of crop residues or grazing by cattle or sheep destroys the egg masses, larvae and pupae present in the field and checks the survival and spread of these harmful agents. careful destruction of damaged and disease affected tomato fruits after harvesting.

Biological control: Study and utilization of natural enemies of insect like predators, parasites and pathogens by man to manage pest population below economic injury level is called biological control of insect pest.

Predators:

Lady bird beetle: This insect feeds on aphids. *Chrysoperla carnea*: The larvae of this insect feeds on all soft bodied insects like aphids, jassids, white files, mealy bug etc.

Parasites:

Egg parasite: *Trichogramma chilonis* parasites egg of *Helicoverpa armigera.*

Larval parasite: Bracon hibitor parasites larvae of *H.armigera*.

Egg larval parasite*: Copidosoma kohleri* parasites egg of potato tuber moth and comes out at larval stage by killing the pest.

Pathogens

Bacteria: *Bacillus thuringiensis* develops disease in many lepidopterous pests.

Virus: Though there are many reports of entomopathogenic viruses Nuclear Polyhedrosis Virus (NPV) and Granulosis Virus (GV) are commonly used in insect pest control.

Fungus*: Beauveria bassiana* is used for control of lepidopterous pests.

Chemical control: Chemical measures are the most common method of pest management. Hence their judicious use is advocated which includes avoiding prophylactic sprays, adopting strip treatment, spot application to only those areas with heavy incidence of pests, applying to the soil to avoid direct contact with natural enemies and using selective or non-persistent pesticides. In vegetables skip row treatment with pesticides is given. Safer pesticides have been identified for use inconjunction with natural enemies-among chlorinated hydrocarbons, endosulfan, among organophosphates-phosalone, monocrotophos, oxydemeton methyl and dichlorvos and among carbamates, carbaryl, have been found to be relatively safer to many commonly used natural enemies.

Botanical pesticides: Indian farmers used a variety of plant products and extracts for pest control. The most commonly used botanicals are neem (*Azadirachta indica*), pongamia (*Pongamia glabra*) and manhua (*Madhuca indica*). Neem seed kernel extract (2 to 5%) has been found effective against several pests including cutworm, plant hopper, leafhoppers, tobacco caterpillar, several species of aphids and mites. Mahua seed kernel extract (5%) is effective against sawfly (Athalia lugnes proxima) and others. Root extracts of Targets or Asparagus work as a nematicide for plant parasitic nematodes. Similarly, leaft extracts of many higher plants can inhibit a number of fungal pathogens.

Neem seed extract was used for management of root-knot nematode in tomato.

Biological suppression of crop pest - tomato: For the control of tomato fruit borer, *T. brasilience* or *T. pretisoum* or *T. chilonis* (strain BioH1) are released 6 times at 50,000 per hectare starting the first release 30 days after transplanting.

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