



### Major Emerging Pests of Tomato and Its Eco-Friendly Management Tactics

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Tomato (*Lycopersicon esculentum* Linn.) becomes a major demanding vegetable crop. The crop is commercially cultivated almost all parts of the globe. However, numerous pests attack on different levels of tomato growth. Farmers rely on heavy pesticides which lead to resistance against numerous pesticides, flare back and environmental hazards. Eco-friendly management tactics is the way towards bringing sustainable agricultural productivity management.

#### Introduction

Tomato is the most popular garden vegetable nowadays, grown both under greenhouse and open-field conditions. It thrives best with ample of sunshine and moderate day temperature of 20–28°C. The crop is extremely susceptible to environmental stress caused by high temperature and low soil moisture. Unusual rising of temperature during growing season leads to reduction in fruit set and hamper the fruit quality. The complexity of insect pests and diseases greatly depend on prevailing weather. In spite of all these, the presence of pests and diseases are a fact of crop production and growers must use all available eco-friendly management options and strategies to avoid serious pest and disease problems.

#### Emerging Pests of Tomato

**Tomato fruit borer** [*Helicoverpa armigera* (Hubner)] is a polyphagous pest. The damaging stage, larvae attack almost all the aerial parts of the tomato plant from the early growth upto the fruit maturation stage. The larvae usually attack on reproductive parts of hosts like flowers and fruits by boring holes and thrust only their heads inside the fruits which make the crop unfit for consumption. The larvae have a spotted look due to sclerotized setae, tubercle bases, and spiracles. The matured larvae are long and ventrally flattened but convex dorsally; and they are brownish or pale green with brown lateral stripes with a distinct dorsal stripe (Bhatt and Patel 2001).

**Tomato leaf miner** [*Tuta absoluta* (Meyrick)] is a recent invasive pest of India. Immature larvae are whitish-gray with a black head. As it matures, they turned greenish to pink with a brown head (Sridhar *et al.* 2014). They are also found on flowers, apical buds, or new fruits with black frass. Under severe infestation, the leaves will appear distinct mines.

**Leaf eating caterpillar** [*Spodoptera litura* (Fabricius)] prefer tomato among solanaceous crops. Larvae are defoliators; they start infesting from the upper tender portions of plant like terminal bud, and can consume 90% foliage, flowers and green fruits.

**Foliage feeding beetles:** The striped blister beetle, *Epicauta vittata* (Fabricius) is highlighted by black and yellow with two black spots occur on the dorsal surface of the head and on the thorax, two to three black stripes on elytra. They are heavy foliage feeder but relatively feed on fruits of the plant. The flea beetles (*Phyllotreta* spp.) are also defoliator by making small round holes in

the leaves but in larger groups, they may destroy entire foliage. They are blackish small; oval-shaped with bright blue lustrous elytra, tendency to hop quickly when disturbed.

**Stink bug:** Different kinds of stink bug attack on tomato viz. consperse stink bug (*Euschistus conspersus*), red shoulder stink bug (*Thyanta pallidovirens* or *T. accerra*), green stink bug (*Nezara viridula*), the bagrada bug (*Bagrada hilaris*), brown marmorated stink bug (*Halyomorpha halys*), etc. They feed on green fruit with the appearance of cloudy spot; irregular-shaped white or yellow blotches under the skin of the fruit. They preferably attack on developing seed and causes abortive seed formation.

**Two-spotted spider mites** [*Tetranychus urticae* (Koch)] cause infestation on leaves by producing tiny white or yellow spots "stippling". With advance infestation, the leaf loses chlorophyll content, appearance of chlorotic spot and leaves finally shed off. They are yellow-orange in color with two dark spots on each side of the dorsal abdominal surface. Under severe infestation webbing occurs.

**Aphids** - Different species of aphids like melon aphid, *Aphis gossypii* (Glover), potato aphid, *Macrosiphum euphorbiae* (Thomas) and green peach aphid, *Myzus persicae* (Sulzer) harbour tomato crop. They are soft-bodied pear-shaped insects with long legs and antennae with a pair of cornicles on the abdomen, color vary from pale yellow to green or black, depending on the species, host plant, and season. The infestation causes shedding of blossom or curling or stunting of new growth by sucking cell-sap. They may cause *Cucumber mosaic virus* on tomato.

**Thrips** - *Thrips tabaci* (Lindeman) primarily attack on flowers, apical buds. Feeding in flowers may cause blossom drop, or fruit abortion. Adult thrips are small-slender insects, yellowish head and darker abdomen with two pairs of wings.

**Whiteflies** - Sweetpotato whitefly, *Bemisia tabaci* (Gennadius) and greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood) are polyphagous and cosmopolitan species. Adults are tiny, yellowish insects with white waxy powder wing. When disturbed, they readily tend to fly. Both the species cause damage by feeding on leaves under surface, which leads the leaves chlorotic and curls. *B. tabaci* transmit tomato yellow leaf curl virus. Premature leaves shed, stunted growth and un-uniform ripening of fruit are the main problem.

**Root knot nematode** - *Meloidogyne* spp. are pear-shaped, looks like white pearls. About 50-100 eggs are produced per female. Damage involves formation of galls on roots; plants get weak, leaf chlorosis and are prone to wilt in hot weather. Under severe attack, crop seedlings or transplants may fail to develop, stunted growth, or die, causing poor or irregular stand appearance.

## Eco-friendly Management Practices

### Seedling management

- i. Select the location free from solanaceous crops
- ii. Keep the seedbed free of weeds and crop residues
- iii. Seedbed solarisation
- iv. Prepare the seedbed properly
- v. Apply well decomposed farm yard manure @ 20 litre-container/m<sup>2</sup>
- vi. Select healthy seeds and planting material
- vii. Thick-skinned cultivars may provide some resistance
- viii. Avoid dense seeds sowing (5 x 5 cm spacing)
- ix. Protect seedlings with insect-proof netting in areas where virus diseases are endemic
- x. Inspect the nursery regularly for pests and diseases
- xi. Rogue out the weak and unhealthy seedlings

### Main field management

- i) Avoid transplanting on previously grown solanaceous crops
- ii) Apply adequate amount of organic or farm yard manure
- iii) Keep proper plant spacing
- iv) Tilling disrupts overwintering sites and killing pupae by sun-exposure

- v) Grow border crops as coriander, fenugreek, maize, marigold, millet, cowpea, sunnhemp, pigeonpea or sorghum. Coriander and fenugreek are repellent to whitefly. Marigold, millet, pigeonpea and sorghum are suitable host for *H. armigera*. Cowpea, sunnhemp, sorghum, marigold can manage root-knot nematode.
- vi) Growing 8 rows of sorghum as a border crop around the field at 30 x 10 cm spacing promotes natural predators like *Chrysoperla* and Coccinellids
- vii) Grow row covers like alfalfa during flowering for *H. Armigera*
- viii) Reducing the number of flowering weeds in and around the field and cutting before flowering stage
- ix) Intercropping of cucumber with alternate rows of 30 days before tomato for whitefly-vectored tomato yellow leaf curl virus
- x) Rogue out weak and unhealthy plants
- xi) Give proper irrigation; over-head irrigation washed off soft-bodied insect pests like mites, thrips, aphids, etc.
- xii) Regular monitoring of fields for pests, diseases, weeds, nutritional disorders, soil moisture and general plant health
- xiii) Application of 1.25t/ha of vermicompost decreased damage hornworms to tomato foliage significantly
- xiv) Use of pheromone traps (@ 4 traps/acre) for monitoring of larva
- xv) Setting of light trap and bird perches (@ 10/acre)
- xvi) Place white and yellow sticky traps for every 15 to 30 feet of row
- xvii) Handpicking and crushing of egg masses and bugs
- xviii) Soil mulching with yellow polyethylene sheets delayed the spread of tomato yellow leaf curl virus
- xix) Spray 5% neem seed kernel extract, *Andrographis kashayam* or five leaf extract to kill *H. armigera* larvae at their early stages
- xx) Use of biocontrol agents like *HaNPV* (@ 250 LE/ha), *Bacillus thuringiensis* (@ 1 g/litre of water), *Trichogramma chilonis* (@ 50,000 eggs/ha, six times at weekly intervals) and *Bracon hebetor* (larval parasite)
- xxi) Introduce the predatory bugs, *Nesidiocoris tenuis* and *Macrolophus caliginosus* several times during the first weeks of cultivation in a total dose of 1-2 bugs/m<sup>2</sup>. Delayed defoliation helps to boost the development of both *Nesidiocoris* and *Macrolophus* in the crop.

### Conclusion

Due to increasing environmental problems with the application of heavy chemical pesticides, the feeding for a healthy nation becomes a serious concern. Crop management with the eco-friendly methods has to look forward for overcoming the existing environmental issues. The directly consumable vegetables have to be given the first priority to tackle organic pest management.

### References

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