

## Impact of Tomato Leaf Miner/ American Leaf Miner on Tomato and their Management Strategy

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### INTRODUCTION

One of the most significant vegetables in the world is the tomato (*Lycopersicon esculentum* Mill. It has a short growing season, produces a lot, is economically appealing, and the area under cultivation is growing every day. A member of the Solanaceae family is the tomato. Tomatoes are a part of a balanced, healthy diet. They are abundant in dietary fibre, carbohydrates, vital amino acids, minerals, and vitamins. Iron, phosphorus, and vitamin B and C are all abundant in tomatoes. Tomato fruits can be eaten raw in salads or cooked in sauces, soups, and meals with meat or fish. They may be turned into juices, sauces, and purées. Both dry and canned tomatoes are crucial processed foods commercially. Yellow tomatoes have more vitamin A than red tomatoes do, but lycopene, an antioxidant found in red tomatoes, may help protect against cancer-causing agents.

A significant pest of field- and greenhouse-grown tomatoes is the tomato leaf miner (*Tuta absoluta*), which is a member of the Gelechiidae family. It feeds mostly on Solanaceae species and is oligophagous. The primary host plant is the tomato, although it also consumes weeds like *Datura stramonium*, *Lycium chilense*, and *Solanum nigrum* as well as other solanaceous agricultural plants including potato, eggplant, capsicum pepper, and tobacco.



Fig. 1: On a tomato leaf, *Tuta absoluta* larvae and mining damage

### Life cycle

*Tuta absoluta* may produce 10–12 generations each year and reproduces quickly. Its lifespan is between 30 and 35 days. During the course of her life cycle, a mature female can lay up to 250–260 eggs, which are laid on portions of aboveground plants. Four to six days following egg laying, the egg hatches. Larvae develop a distinctive black stripe posterior to the head capsule and a deeper shade of green as they grow older. There are four instars of the larva. Caterpillars can occasionally be seen outside the leaf mines or fruit when they are in the process of moulting. The most destructive phase of the life cycle, the larval stage, lasts 12 to 15 days. When food is readily accessible, larvae do not go into diapause. Pupation may occur on the surface of the leaf or in the soil.

### Damage-

Tomato plant infestations can happen at any time during the crop cycle. The entire plant

and all larval instars contribute to feeding harm. The larvae feed on the mesophyll tissue of leaves, creating irregular leaf mines that might eventually turn necrotic. Both the caterpillars and their dingy frass may be discovered inside these mines. In cases of severe infection, leaves entirely wither away. Fruit rot can occur before or after harvest as a result of the larvae's attacks on fruits and secondary diseases using the entryways. Only green fruit is attacked by the caterpillars. The variety influences the size of the infestation to some extent. In the case of tomatoes, there is a considerable and perhaps 100% yield loss that might occur if the insect is not controlled. Attacks on potatoes often target the aerial sections. Tubers, however, have lately been observed to have damage.



**Fig. 2: Symptoms of *Tuta absoluta* damage**

### *Tuta absoluta*-related Yield Losses-

There have been reports of yield losses of up to 50–100% as a result of the direct and indirect damage. As a result, there has been an increase in the price of tomatoes and the use of synthetic pesticides, which has raised the expense of tomato cultivation. There is every indication that *Tuta absoluta* will continue to have a significant negative impact on the livelihood of regional tomato producers and agribusinesses. The long-term health impacts of pesticide usage are expected to be felt, particularly in Africa, and research is required to offer information that might be used to

make decisions about safer approaches to control this pest.

**Management of *Tuta absoluta***-*Tuta absoluta*, like many other pests, poses a serious danger to the cultivation of tomatoes and other members of the Solanaceae family. As a result, the control of this pest depends on detection, accurate identification (of the pest and damage), and threshold levels. *Tuta absoluta* has been monitored and controlled using a variety of techniques, both in its native range and in areas where it is an alien pest.

**Biological control agents**

1. Predatory capsid bugs (*Nesidiocorus tenuis* and *Macrolophus pygmaeus*) – targets eggs of *Tuta absoluta*
2. *Bacillus thuringiensis* – mainly targets larvae

**Physical/ Mechanical tools-**

1. Remove any old fruits and plants from the area.
2. Use insect netting to cover ventilation gaps in greenhouses.
3. To monitor and catch adult moths in large numbers, use Horiver Tuta sticky traps.
4. For scouting and monitoring the adult moths, use the Delta trap along with pheromones.
5. To mass-capture adult moths, use the Tutasan water trap in conjunction with pheromones.

**Monitoring of *Tuta absoluta* using pheromones-**

Pheromone traps may accurately detect *Tuta absoluta* concentrations in low population to medium-level infestations and can provide early warning of infestation. While pheromones are utilised for monitoring, the catches indicate the existence of the pest and the beginning of its seasonal flying phase since only males are caught in pheromone traps when they are searching for females to mate with. This is crucial in establishing the threshold values, whether for timing control operations or deciding whether or not to take corrective action.

Pheromone traps typically produce high levels of capture in areas with extensive infestation, which makes data collecting challenging. Other items are intentionally

made to have a reduced capture rate to make it easier to collect data in areas with a lot of pests. The consistency of the traps (the attractant, dispenser, trap design, and trap position) is crucial when utilising pheromones for monitoring.

**By Pheromone lures-**

Sex pheromones are substances that an organism secretes to entice members of the same species of the opposing sex to mate. The male in *Tuta absoluta* is drawn to the females' pheromones, which triggers mating to take place. Insect pests like *Tuta absoluta* have been detected and monitored using sex pheromones on a large scale. Pheromones can also be used to control this pest, mostly by mass trapping (luring one or both sexes to a lure in tandem with a high capacity trap) or the attract-and-kill strategy (an additional insecticide-impregnated target). If pheromones are the sole strategy utilised, the advantage is that no pre-harvest period is necessary.

**Insecticides**

Leaf miners on tomatoes cannot be killed or controlled by chemical pesticides or oils. This is so that the larvae who are inflicting the harm are shielded from the sprays inside the leaves. Additionally, some of the leaf miner's natural predators might be harmed by pesticides. When flies become active in the spring but haven't yet produced their eggs, pesticides can be useful. Broad-spectrum insecticides are long-lasting and effective but more harmful to beneficial insects than horticultural oils.

1. *Azadiractin* - Neem seed extract acts as contact and systemic insecticide against *Tuta absoluta*
2. Apply chlorpyrifos (Lirifos 48% EC), spinosad (Tracer 24% SC) and imidacloprid (Admire 20% SC), in controlling *T. absoluta* in tomato.