

# Pest Management in Hydroponics Horticulture

B. Sujatha, A. Himabindu and K. Geethanjali

College of Horticulture,  
Dr YSR Horticultural University,  
Parvathipuram-535502, Andhra Pradesh

bsujatha47@gmail.com

Hydroponics refers to the cultivation of plants without soil, either in aerated nutrient solution (water culture) or based on various soil-less media (substrate culture) like gravel, vermiculite, rock wool, peat moss, sawdust, coir dust, coconut fibre, etc.

## Hydroponics in horticulture

Horticultural crops viz., vegetables like tomato, capsicum, cucumber and melons, and flowers like Rose, gerbera, chrysanthemum, and Liliium may be grown inside grow bags, pots, trays and pipes through the usage of growing media that help the plants with proper support, nutrients, air and water.

### Advantages

- Reduces the soil-borne diseases, and nematodes through which soil treatments with fungicides, bactericides and nematocides may be reduced which ultimately leads to less soil residues.
- Better yield and quality of produce may be obtained even in poor-quality soils.
- Found all around the year with higher water and nutrient efficiency through maintenance of optimal ecological circumstances.

### Disadvantages

- Requires more technical assistance with huge investment while setting up.

## Pests in Hydroponics Horticulture

As the land is a limited resource there is a high demand for hydroponics horticulture. To draw high yields within limited sources, hence the constraints observed like pests and diseases need to be managed effectively with the following IPM practices.

Major pests attacking vegetables like tomato, capsicum, cucumber and melons, flowers like Rose, gerbera, chrysanthemum, liliium are Greenhouse Whitefly, *Trialeurodes vaporariorum* Westwood (Aleyrodidae, Hemiptera); Two-spotted / Red Spider mite, *Tetranychus urticae* Koch (Tetranychidae, Acarina); Western flower thrips *Frankliniella occidentalis* (Pergande) (Thripidae, Thysanoptera); Aphids - Green peach aphid, *Myzus persicae* (Sulzer), Cotton or melon aphid, *Aphis gossypii* Glover, Potato aphid, *Macrosiphum euphorbiae*, Foxglove or glasshouse aphid, *Aulacorthum solani*, Chrysanthemum aphid, *Aphis craccivora* (Aphididae, Hemiptera); Fungus gnats- *Lycoriella* spp., *Bradysia* spp. (Sciaridae, Diptera)

### 1. Greenhouse whitefly



Adults are about 1.5 mm long, white, resemble tiny moths possess pale yellow wings that are held relatively flat when in repose and are coated with a pure white waxy bloom. Whitefly adults and nymphs damage plants directly by sucking sap from leaves and indirectly by transmitting viruses and producing a sticky secretion known as honeydew, which prevents crops from functioning normally, as well as acting as a substrate for fungal growth (black sooty moulds) that blocks block out sunlight, inhibits photosynthesis.

Feeding damage results in stunting, poor growth, defoliation, reduced yields and even death in extreme cases and in certain plants, stunting or abnormal colouration can be caused due to the physiological stress of the feeding.

### 2. Two-spotted/ Red spider mite



The two-spotted spider mite is oval, about 1/50 inch long and may be brown or orange-red, but a green, greenish-yellow or an almost translucent colour is the most common. The female is about 0.4 mm in length with an elliptical body that bears 12 pairs of dorsal setae. Overwintering females are orange to orange-red. The body contents (large dark spots representing the accumulation of body wastes, newly molted mites may lack the spots) are often visible through the transparent body wall and hence, the name given as two-spotted mites. The male is elliptical with the caudal end tapering and smaller than the female. All mites have needle-like piercing-sucking mouthparts. Spider mites feed by penetrating the plant tissue with their mouthparts and are found primarily on the underside of the leaf. All spider mites spin fine strands of webbing on the host plant — hence their name. The mites feeding causes greying or yellowing of the leaves, necrotic spots, browning, bronzing and withering of the petals

### 3. Thrips

Adults are small, slim insects, with narrow wings fringed with hairs. Thrips feed by using their mouthparts to pierce plant cells and suck out their contents. Damaged plant cells collapse, resulting in deformed plant growth, flower deformation, or silvered patches and flecking on

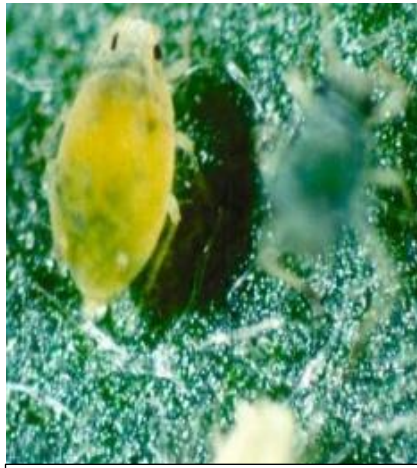
expanded leaves. If thrips feed on the surface of expanded leaves or petals, damage appears as small scars or silvered patches.



Greenish-black faecal specks are left by the thrips on plant surfaces as thrips feed. If thrips feed within developing buds, the damaged cells fail to grow as the leaf or flower expands, resulting in deformed leaves or flowers. Flower buds may abort in heavy infestations. In chrysanthemum and gerbera flowers, feeding results in distorted petals, discolouration, and extensive streaking. In geranium, feeding causes young leaves to grow in a deformed manner, curling upwards, and to have whitish bumps on the upper leaf surface. Western flower thrips is a vector of tomato spotted wilt virus (TSWV).

#### 4. Aphids

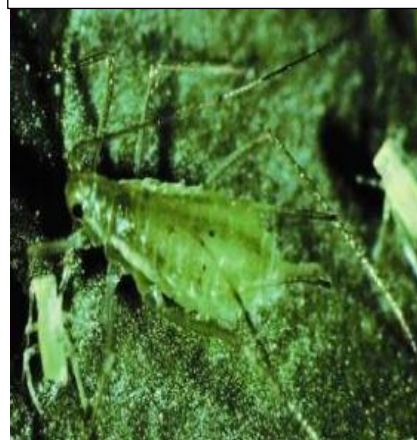
Aphids are small (less than 1/8-inch long), soft-bodied, pear-shaped insects with long legs and antennae. The green peach aphid is a light greenish-yellow, but it can be a darker green or sometimes a pink/rose colour with cornicles of the same colour as the body, slightly flared and darker at the tip. Melon aphids are a smaller species, dark green with cornicles shorter, and dark throughout their length. The potato aphid is large, and green, but can be variable in colour and often has a darker stripe down the middle of its back. The foxglove aphid is green, and shiny with two darker patches on its abdomen at the base of the cornicles. The cornicles are long and thin, the same colour as the body and may be curved outward at the tips. Chrysanthemum aphid is



Green peach aphid



Cotton/ melon aphid



Potato aphid



Chrysanthemum aphid

shiny and dark brown. Aphids feed by inserting their stylet-like, sucking

mouthparts directly into the phloem and removing plant sap. Young leaves may become stunted, curled and twisted when populations are high. Aphids excrete a sugary plant substance (called honeydew) as they feed. Black, soot-like fungi (called sooty molds) can grow on the honeydew, often resulting in a reduction of photosynthesis. Aphids can transmit plant virus diseases (e.g. cucumber mosaic virus)

#### 5. Fungus Gnats

Adult fungus gnats are delicate, dark brown or black flies that are approximately 1/8 inch long. Fungus gnat maggots are slender, 1/4 inch long, whitish or translucent with a black head. Maggots feed on the roots resulting in rotting and tilting or toppling down the plants with stunted growth.

#### Integrated Pest Management used in Hydroponics Horticulture

**Whitefly:** Good hygiene before transplantation and general sanitation during the crop. Keep the greenhouse doors closed; ventilators and all other openings should be secured with a quality insect-proof net. Install yellow sticky traps @ 12 /ha to attract the adult. The usage of UV-absorbent plastic films reduces *T. vaporariorum* infestations on protected crops. Uproot and destroy the diseased leaf curl plants. Use nitrogen and irrigation judiciously. *Bacillus thuringiensis* (Bt), *Beauveria bassiana* (white muscardine fungus), *Chrysoperla carnea*, *Coccinella septempunctata*, *Encarsia formosa*, *Encarsia guadeloupe* reduces the infestation by nymphs and adults. Apply carbofuran 3% G @ 40 kg/ha or spray dimethoate 30 % EC @ 1.0 mL/lit or malathion 50 % EC @ 1.5 mL/lit. or methyl demeton 25 EC @ 1.0 mL/lit. or cyantraniliprole 10.26 OD @ 1.8mL/ lit. or imidacloprid 17.8 SL @ 3.0 mL/10lit. or Spiromesifen 22.9 SC @ 1.25mL/lit.

**Two-spotted/ Red spider mites:** For detection of spider mites, a 10X to 15X magnifying glass undersides of

the leaves closely for mites, cast skins and webbing. Proper ventilation and water - prevent pest attacks in the greenhouse. Predatory mites, *Amblyseius swirskii* and *Phytoseiulus persimilis*; the minute pirate bugs, *Orius insidiosus*; the thrips, *Leptothrips*; and the lacewing larvae, *Chrysopa* are significant predators. Insecticidal soaps and oils should be carefully considered when a pesticide is required. Spray any one of the following Insecticides: Azadirachtin 5 W/W 200 ml/ha, Bifenthrin 8 SC 500 ml/ha, Dicofol 18.5 EC 1250 ml/ha, Ethion 50 EC 500 ml/ha, Etoxazole 10 SC 400 ml/ha, Fenazaquin 10 EC 1000 ml/ha, Fenpyroximate 5 EC 300 - 600 ml/ha, Propargite 57 EC 750 – 1250 ml/ha, Spiromesifen 22.9 SC 400 ml/ha

**Thrips:** Use insect proof net. Both yellow and blue sticky traps of which blue traps are somewhat more efficient. Release of predatory bug, *Orius laevigatus*, phytoseiid mites such as *Amblyseius andersoni* (Chant), *Amblyseius* (*Neoseiulus*) *cucumeris* (Oudemans) reduces thrips population. Botanicals or biorationals like azadirachtin or neem oil, paraffin oil, insecticidal soaps. Spray fenpropathrin 30EC @ 100-120 ml/ac in 200-250 L water or pyriproxyfen 10EC @ 200 ml or spinosad 45SC @ 75 g/ac in 200 lit water or fipronil 5SC @ 400 ml/ac in 200 L water. Other chemicals such as chlorfenapyr are good for thrips management

**Aphids:** Monitor aphids using yellow sticky cards. Parasitic wasps *Aphidius* spp., *Aphelinus abdominalis*, predatory midge *Aphidoletes aphidimyza*, ladybeetles (*Hippodamia convergens*, *Harmonia axyridis*), lacewings and praying mantids are common predators. Spray acetamiprid 20 SP 1.5g/10l. or malathion 50EC 1.25 ml /l. or tolfenpyrad 15EC 2.0/l. or imidacloprid 200 SL at 100 ml/ha or dimethoate 30 EC 2.0 ml/l. or

phosphamidon 40 SL 600 ml/ha.or thiamethoxam 25 % WG @ 40 g/ac or imidacloprid 17.80 % SL @ 40 ml/ac. **Fungus gnat:** Monitor for fungus gnat adults using yellow sticky traps placed just above the crop canopy. Use ten potato disks per 10,000 square feet of production area, and replace the disks every two weeks. Eliminate breeding areas such as infested growth media and plant debris. Avoid overwatering, and overfertilization of plants to reduce the amount of fungi and algae growing in containers. *Bacillus thuringiensis subsp. israeliensis* (Bti), that can be used to control fungus gnats without disrupting any natural enemies that may be present in a greenhouse. Cyromazine, diflubenzuron controls fungus gnats.