Integrated pest management on vegetables for insect pests and vectors in South Texas

**Adrian Silva** and Ismael E. Badillo-Vargas

Texas A&M AgriLife Research

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Insect pests of vegetables in the Lower Rio Grande Valley

- whiteflies
- thrips
- psyllids
- aphids
- leafminers
- loopers
- fruit flies

All these insect pests are very small.
Whiteflies

• Eggs are laid on leaves in different arrangements (e.g. spiral).

• Some nymphs have very ornate bodies that vary from species to species. This morphological feature is used to identify these insects to the species level.

• In some situations whiteflies can go from the egg stage to adult in 16 days. The adults can move readily and will fly if disturbed.

• Whiteflies feed on multiple plant species (polyphagous) and can cause extensive feeding damage when present in high numbers.
Thrips

• Eggs are laid inside the leaves.

• There are two larval stages, a prepupal and pupal stage that do not feed and mostly occur in the soil, and then adult males (smaller) and females (larger) emerge and disperse using their fringed wings.

• Thrips feed on multiple plant species (polyphagous) and can cause extensive feeding damage when present in high numbers.
Psyllids

• The main concern in vegetable production is the tomato/potato psyllid.

• The yellow football-shaped eggs are usually laid on the undersides and edges of leaves on very fine stalks.

• There are 5 nymphal stages differing only on their body size.

• The adults have white markings and roof-like wings to disperse to other fields and throughout very long distances.

• Tomato/potato psyllids feed on multiple solanaceous species, including weedy ones (polyphagous) and can cause extensive feeding damage when present in high numbers. Nymphs cause “psyllid yellows” by feeding.
Aphids

• Aphids come in various colors and sizes.
• Common aphids in vegetable crops are the green peach aphid, melon/cotton aphid, and potato aphid.
• Aphids give birth to live young or and can lay eggs.
• Most adults do not have wings but in overpopulated situations they may develop wings to disperse and colonize other fields.
• Aphids feed on multiple vegetable species (polyphagous) and can cause extensive feeding damage when present in high numbers.
Leafminers

- Eggs are laid on leaves.

- When the larvae hatches it eats its way inside the leaf tissue where it creates “mines”.

- It makes a cocoon outside of the leaves where it pupates until the adult emerges and flies to other plants.

- Leafminers feed on multiple vegetable species (polyphagous) and can cause extensive feeding damage when they are larvae.

- The adult looks completely different to the immature stage (larvae) as it is a moth that could fly to other plants.
Loopers

• There are several different species of loopers that can infest vegetable crops.

• Eggs are laid in groups on the underside of the leaves.

• When the larvae emerges it feeds on leaves and fruits using its chewing mouthparts.

• Loopers feed on multiple vegetable and fruit plant species (polyphagous) and can cause extensive feeding damage.
Fruit flies

- Fruit flies lay their eggs inside fruits. Thus, they are not a problem before fruit production.

- When the larvae hatches it feeds on the interior of the fruit causing extensive damage.

- It pupates inside the fruit and eventually emerges as an adult.

- Fruit flies feed in various fruits and other plant species (polyphagous) and can cause severe damage in the field and during storage when they are larvae.

- The Mediterranean fruit fly is currently a quarantine pest not present in the US.
Some insect pests are also vectors of plant pathogens. They carry these plant pathogens within them and transmit them to plants. Once these plant pathogens are delivered into the host plant, they cause plant diseases. These plant pathogens can also cause tremendous yield losses in vegetable crops.
Insect pests as trojan horses (cont’d)

• Whiteflies transmit begomoviruses such as *Tomato yellow leaf curl virus* (TYLCV).

• This virus infects vegetables, many weedy hosts, and has recently been shown to infect papaya (Olufemi Alabi, personal communication).

• Plants can be severely stunted, and leaves curl up, and become bright yellow and can eventually die.

• If fruits are produced they might have necrotic spots and are unmarketable.
Insect pests as trojan horses (cont’d)

• Western flower thrips transmit tospoviruses such as *Tomato spotted wilt virus* (TSWV).

• This virus infects vegetables, ornamentals, and many weedy plants.

• Plants can be severely stunted, become chlorotic, necrotic and eventually die.

• If fruit are produced they might have concentric rings and are unmarketable.
Insect pests as trojan horses (cont’d)

• Onion thrips also transmit tospoviruses such as *Iris yellow spot virus* (IYSV).

• This virus infects onion, garlic, leek and Iris plants.

• Plants develop oval-shaped or diamond-shaped lesions.

• Ultimately plants can collapse and die bearing small fruit or none at all.
Insect pests as trojan horses (cont’d)

• Tomato/potato psyllid transmit the Lso bacterium that causes vein-clearing disease in tomato and Zebra chip in potato.

• This bacterium infects potato, tomato, pepper and several solanaceous weeds.

• Potato plants can be stunted and developed purple leaves that roll up and eventually die.

• Infected tubers have dark strips that intensified when fried.
How to control these insects and diseases?

• Chemical control – insecticides

• Cultural control – modifying planting date, rotating different crops

• Physical control – using plastic mulches, growing plants inside protected structures (e.g. greenhouses)

• Biological control – using insects (predators or parasitoids), fungi and bacteria that kill the insect pests

• Genetic control – resistant varieties generated by plant breeding
Integrated Pest Management (IPM)

- IPM is an ecosystem-based strategy that focuses on long-term prevention of insect pests/pathogens or their damage through a combination of techniques such as chemical control, modification of cultural practices, biological control, and use of resistant varieties.
Chemical control - Insecticides

- In many cases insecticides are the most effective and only method available for controlling insect pests and insect-transmitted pathogens to plants.

- It is important to use these insecticides correctly and do not abuse them.

- Alternating insecticides with different modes of action is important to avoid insects developing insecticide resistance to these chemicals.
Cultural control

• Modifying the planting date could be an easy strategy to escape the arrival of insect pests.

• Rotating different crops could be used to break the insects life cycle with a crop that is not suitable for them to live on.

Physical control

• Using plastic mulches could help to confuse insect pests in locating their host plant by reflective light.

• Protected structures such as greenhouses, net-houses, and high tunnels exclude insect pests but represent an additional cost of production.
Biological control

- Using insects (predators or parasitoids), fungi, bacteria, and nematodes that kill the insect pests but do not harm the plants is an environmental friendly strategy.

Genetic control

- Using resistant varieties naturally occurring or generated by plant breeding is the best practice. However, resistant varieties are not always available.