

Management of Whiteflies, TYLCV and Insecticide Resistance:



Economic importance:

The sweetpotato whitefly is **the** key pest of tomato, primarily as a vector of the geminivirus, Tomato yellow leaf curl virus, TYLCV. Pepper may act as an asymptomatic host of the virus.

INTRODUCTION:

Tomato yellow leaf curl virus (TYLCV) threatens commercial tomato production fields was identified in 1997 in south Florida. The disease spread north rapidly and TYLCV was first identified in north Florida and south Georgia in the Fall of 1998. TYLCV is transmitted by adult silverleaf whiteflies (*Bemisia tabaci* Biotype B = *Bemisia argentifolii*). TYLCV is not transmitted through seed or by mechanical transmission. The presence of other cultivated or wild hosts of silverleaf whitefly (i.e., cotton) during summer may lead to additional whitefly migration to tomato. During late spring, summer, and early fall, growers need to monitor whitefly populations very closely and follow recommendations in this Fact Sheet. TYLCV has a broad host range from several plant families including Solanaceae (tomato, tobacco), Malvaceae (cheeseweed), and Fabaceae (common bean, lentil).

Symptoms of TYLCV include:

- If plants are infected at an early stage, they won't bear fruit and their growth will be severely stunted.
- Other symptoms that are typical for this disease are: yellow (chlorotic) leaf edges, upward leaf cupping, leaf mottling, reduced leaf size (**Figure 3**) and flower drop.
- Identification based only on symptomatology is unreliable, because similar symptoms can be caused by other viruses or various growing conditions.
- Proper identification of TYLCV is available at Plant Disease Clinics in Florida.

Figure 3. Note yellowing of edges, cupping and distortion of leaflets. Photograph by: Tim Momol.



CROP HYGIENE:

Field hygiene should be a high priority and should be included as an integral part of the overall strategy for managing whitefly populations, TYLCV incidence and insecticide resistance. These practices will help reduce the onset of the initial infestation of whitefly, **both biotype B and biotype Q (if present)**, and lower the initial infestation level during the cropping period.

1. Establish a minimum two-month crop free period during the summer, preferably from at least mid-June to mid-August.

2. Use a correct crop destruction technique, which includes destruction of existing whitefly populations in addition to the physical destruction of the crop.

- a. Promptly and efficiently destroy all vegetable crops **within 5 days of final harvest** to maximally decrease whitefly numbers and sources of plant begomoviruses like TYLCV.
- b. Use a contact desiccant ("burn down") herbicide in conjunction with a heavy application of oil (not less than 3 % emulsion) and a non-ionic adjuvant to destroy crop plants and to quickly kill whiteflies.
- c. Time burn down sprays to avoid crop destruction during windy periods, especially when prevailing winds are blowing whiteflies toward adjacent plantings.
- d. Destroy crops block by block as harvest is completed rather than waiting and destroying the entire field at one time.



Figure 4. TYLCV infected regrowth of fall tomatoes after doublecropped cucumbers. Photograph by: Phyllis Gilreath.



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Reduce overall whitefly populations, both biotype B and biotype Q (if present), by strictly adhering to cultural practices.



Figure 5. Use resistant cultivars if possible. Photograph by: Charlie Vavrina.

OTHER CULTURAL CONTROL PRACTICES:

Use proper pre-planting practices:

- a. Plant whitefly and virus-free transplants.
 - Do not grow vegetable transplants and vegetatively propagated ornamental plants (i.e. hibiscus, poinsettia, etc.) at the same location, especially if bringing in plant materials from other areas of the US or outside the US.
 - Isolate vegetable transplants and ornamental plants if both are produced in the same location.
 - Do not work with or manipulate vegetable transplants and ornamental plants at the same time.
 - Practice worker isolation between vegetable transplants and ornamental crops.
 - Avoid yellow clothing or utensils as these attract whitefly adults.
 - Cover all vents and other openings with whitefly resistant screening. Use double doors with positive pressure. Cover roofs with UV absorbing films.
- b. Delay planting new fall crops as long as possible.
- c. Do not plant new crops near or adjacent to old, infested crops.
- d. Use determinant varieties of grape tomatoes to avoid extended crop season.
- e. Use TYLCV resistant tomato cultivars (see additional information below for list) where possible and appropriate, especially during historically critical periods of virus pressure. Whitefly control must continue even with use of TYLCV resistant cultivars because these cultivars are able to carry the virus.
- f. Use TYLCV resistant pepper cultivars (see additional information below for list) when growing pepper and tomato in close proximity.
- g. Use ultraviolet light reflective (aluminum) mulch on plantings that are historically most susceptible to whitefly infestation and TYLCV infection.



Figure 6. Destroy old crops within 5 days after harvest. Photograph by: Phyllis Gilreath.

Use proper post-planting practices:

- a. Apply an effective insecticide to kill whitefly adults prior to cultural manipulations such as pruning, tying, etc.
- b. Rogue tomato plants with symptoms of TYLCV at least until second tie. Plants should be treated for whitefly adults prior to roguing and, if nymphs are present, should be removed from the field, preferably in plastic bags, and disposed of as far from production fields as possible.
- c. Manage weeds within crops to minimize interference with spraying and to eliminate alternative whitefly and virus host plants.
- d. Dispose of cull tomatoes as far from production fields as possible. If dumped in pastures for cattle feeding, the fruit should be spread instead of dumped in a large pile to encourage consumption by cattle. The fields should then be monitored for germination of tomato seedlings and, if present, they should be controlled by mowing or with herbicides.
- e. Avoid u-pick or pin-hooking operations unless effective whitefly control measures are continued.
- f. Destroy old crops within 5 days after harvest, destroy whitefly infested abandoned crops and control volunteer plants with a desiccant herbicide and oil.

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INSECTICIDAL CONTROL PRACTICES:

1. Use a proper whitefly insecticide program.

Follow the label!

- On transplants in the production facility, do not use a neonicotinoid insecticide if biotype Q is present. If biotype B is present, apply a neonicotinoid **one time** 7-10 days before shipping. Use products in other chemical classes, including Fulfill®, soap, etc. before this time.
- Use neonicotinoids in the field **only during the first six weeks of the crop**, thus leaving a neonicotinoid-free period at the end of the crop.
- As control of whitefly nymphs diminishes following soil drenches of the neonicotinoid insecticide or after more than six weeks following transplanting, use rotations of insecticides of other chemical classes including insecticides effective against biotype Q. Consult the Cooperative Extension Service for the latest recommendations.
- Use selective rather than broad-spectrum control products where possible to conserve natural enemies and enhance biological control.
- Do not apply insecticides on weeds on field perimeters because this can kill natural enemies, thus interfering with biological control, and because this can select for biotype Q, if present, which is more resistant to many insecticides than biotype B.



Figure 7. Pesticide application on tomato. Photograph by: Fred Fishel.

2. Soil applications of neonicotinoid insecticides for whitefly control:

- For best control, use a neonicotinoid as a soil drench at transplanting, preferably in the transplant water.
- Soil applications of neonicotinoids through the drip irrigation system are not recommended.
- Do not use split applications of soil drenches of neonicotinoid insecticides (i.e. do not apply at transplanting and then again later).

3. Foliar applications of neonicotinoid insecticides for whitefly control:

- If foliar applications of a neonicotinoid insecticide are used instead of or in addition to soil drenches at transplanting, **foliar applications should be restricted to the first six weeks after transplanting**. Do not exceed the maximum active ingredient per season according to the label.
- Follow scouting recommendations when using a foliar neonicotinoid insecticide program. Rotate to non-neonicotinoid insecticide classes after the first six weeks and do not use any neonicotinoid class insecticides for the remaining cropping period.

Additional Information:

Breaking the whitefly/TYLCV cycle: http://swfrec.ifas.ufl.edu/veghort/docs/tom_inst_2002_091202.pdf

TYLCV resistant pepper cultivars: <http://grec.ifas.ufl.edu/TOMATO%202003.pdf>

TYLCV resistant tomato cultivars: <http://grec.ifas.ufl.edu/TomatoOptimized.pdf>

CONTACT INFORMATION:

Dr. David Schuster
Gulf Coast Research & Education Center- Balm
dschust@ufl.edu
813-633-4124



NEIGHBORS:

1. Look out for your neighbor's welfare.

This may be a strange or unwelcome concept in the highly competitive vegetable industry but it is in your best interest to do just that. Growers need to remember that should the whiteflies develop full-blown resistance to insecticides, especially the neonicotinoids, it's not just the other guy that will be hurt—everybody will feel the pain! This is why the Resistance Management Working Group has focused on *encouraging region-wide cooperation in this effort*.

2. Know what is going on in the neighbor's fields.

Growers should try to keep abreast of operations in upwind fields, especially harvesting and crop destruction, which both disturb the foliage and cause whitefly adults to fly. Now that peppers have been added to the list of TYLCV hosts, tomato growers will need to keep in touch with events in that crop as well.