Common Southwest Florida Vegetable IPM Issues

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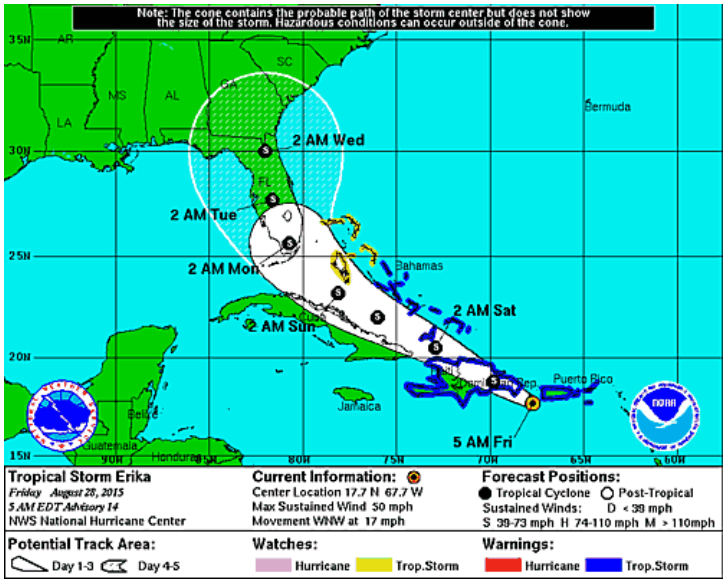
Due to our humid warm subtropical climate vegetable gardeners face unique IPM (integrated pest management) issues.

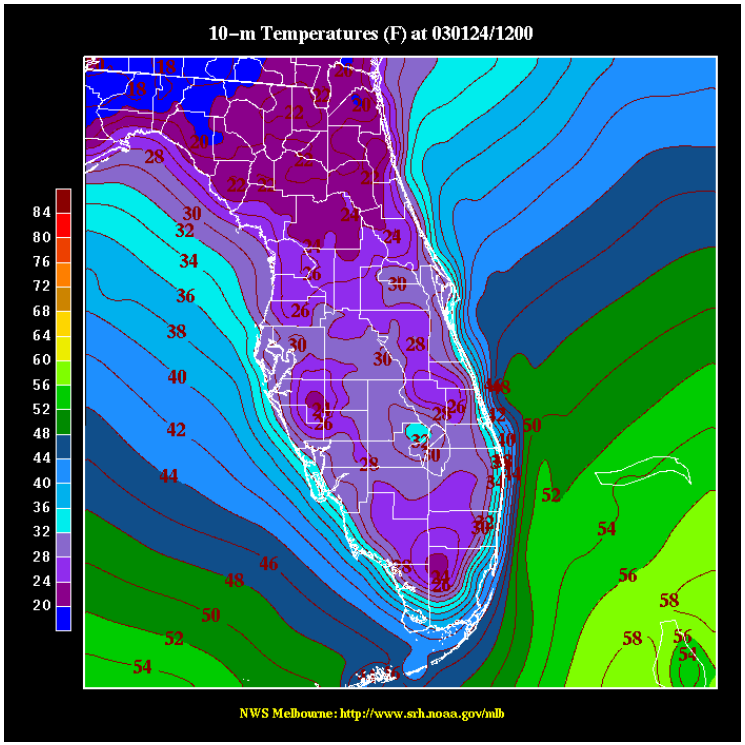
Unlike the temperate states to the north our gardening calendar is not dictated by last frost dates.

Instead it is dictated by the beginning and end of the rainy season much like other seasonally wet tropical locations.



2/3 of the Florida fall vegetable season is during hurricane season. Plants usually experience heavy rain, high humidity, and high winds all making them susceptible to disease and insect pressure.

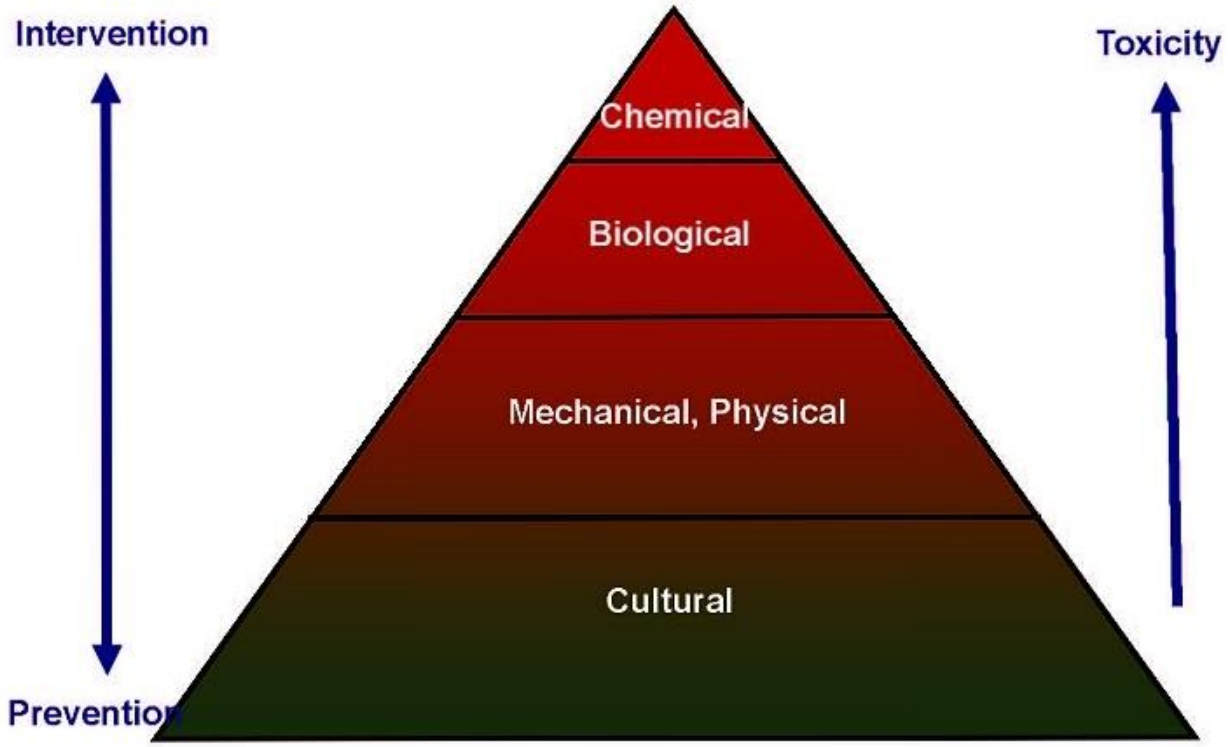
Most of Florida, even mainland South Florida, is susceptible to killing frosts and freezes. Florida vegetable gardeners are usually pushing the limits when we squeeze our fall and spring gardens in between the rainy season and continental artic blasts.



From Thanksgiving to St. Patrick's Day frequent cold fronts push south through the state bringing rain, strong winds and cold nights below 50 degrees Fahrenheit. Occasionally nights will dip into the upper 30s allowing for frost formation in calm open areas.

This too creates stress on our vegetable plants making them susceptible to certain diseases and insects.

Before we look at specific IPM (integrated pest management) issues in specific Florida fall crops, let's go through the principles of IPM as a whole.



The control of pests seldom relies on a single pest control practice. Rather, the decision to initiate control involves a combination of elements.

These elements include:

- **monitoring**
- **knowledge of the pests, plant or animal hosts**
- **beneficial organisms**
- **level of damage**
- **and selection of the pesticide with the least risk to humans and the environment.**

Together, these elements form the basis for the practice of integrated pest management, more commonly referred to as IPM. When everything is taken into consideration the decision may be to not apply chemicals.

Now let's look at some specific common fall Florida crops and their specific IPM issues

Tomatoes are one of the most popular fall Florida crops and have many IPM issues

Root Knot Nematodes are a major issue in tomatoes.

1) plant nematode resistant varieties
2) solarize
3) incorporate crab meal into soil
4) incorporate organic matter into soil
5) grow in containers with clean soilless medium
6) no labelled pesticide control

Worms and Caterpillars can be a major issue with tomatoes.

1) scout plants often
2) manually remove insects
3) generally present in low numbers with few generations so treating every 7-10 days with *Bacillus thuringiensis* (Bt) provides good control

The Sweet Potato Whitefly B Biotype aka Silverleaf Whitefly *Bemisa tabaci* is a major tomato pest because it is a virus vector.

1) use reflective plastic bed mulch
2) scout plants often
3) begin rotating organic pesticide treatments prior to populations building (Horticultural Soaps, Neem, Biologicals such as *Beauveria bassiana*)
4) usually present in large populations with multiple generations so rotating pesticides is necessary to prevent resistance

Beneficial insect controls work best in controlled greenhouse environment

Tomato Yellow Leaf Curl Virus is a major disease of tomatoes in Florida

1) grow only resistant varieties
2) if you purchase tomato plants buy only virus free plants (box store plants notorious for having this virus)
4) plant larger size sets into the garden
3) control whitefly (the vector) on all vegetable and nearby plants
4) immediately remove and dispose of symptomatic plants (also can be in cucurbits, beans, okra and eggplant)

Left: typical foliar symptoms of tomato yellow leaf curl. Upper right: new leaflets with symptoms of yellowing between veins and an upward curling of their margins. Lower right: adult and nymph of bemisia whitefly, a vector of TYLCV.

Aphids are a common insect pest of tomatoes and many other vegetables

1) scout plants often, honey dew and sooty mold may be present
2) begin rotating organic pesticide treatments prior to populations building (Horticultural Soaps, Neem, Biologicals such as *Beauveria bassiana*)
3) usually present in large populations with multiple generations so rotating pesticides is necessary to prevent resistance

Beneficial insect controls work best in controlled greenhouse environment

Bacterial leaf spot (Xanthomonas spp.) is a major disease in tomatoes especially in the beginning of the fall before Halloween (the historical end of SW FL rainy season)

Control of Bacterial Leaf Spot

1) if you start your plants from seed, purchase the seed from a reputable seed company. Grow your seedlings under plastic. Heirlooms are often the most susceptible
2) if you purchase transplants at a retail nursery outlet, be sure to inspect the plants carefully for symptoms of bacterial spot and avoid the purchase of diseased transplants.
3) always avoid overhead irrigation
4) plant later in fall after rainy season has ended (Oct 31)
5) treat with copper-containing fungicide (bactericide) plus mancozeb sprays, wettable sulfur prior to disease outbreak frequently

Sidenote- UF breeders have successfully trialed completely bacterial spot resistant GMO tomato plants that contain one pepper gene, potentially reducing pesticide treatments but unacceptable to the broader consumer market because it is GMO.

Late Blight *Phytophthora infestans* is another devastating tomato disease. The cause of the Irish Potato Famine. For this disease to occur daytime high temperatures must be in the 60s and low 70s and be damp. Conditions present during and after a usual cold front in SW Florida.

1) selection of resistant varieties is the best strategy for managing late blight, heirlooms are usually the most susceptible to this disease
2) plant disease free transplants
3) always avoid overhead irrigation
4) space plants far enough apart in the garden so that plants will dry off quickly during the day
5) treat with preventative copper-containing fungicide plus mancozeb sprays, wettable sulfur prior to disease outbreak frequently ahead of optimal conditions for disease formation and after

Bacterial Wilt *Ralstonia solanacearum* is a soil-borne disease of many crops and is associated in water accumulating in low areas. Bacterial wilt is very difficult to control after it is established in the field. No single measure totally prevents losses caused by the disease.

1) rotate plantings with non-susceptible crops
2) eliminate low areas where water will stand in your garden
3) do not over water
4) plant bacterial wilt resistant cultivars
5) plant disease free transplants
6) plant later in the season when weather is cooler

Peppers are also popular fall Florida crops and have many IPM issues

Because they are also solanaceous they share many of the same IPM issues as tomatoes. IPM measures for the following would be the same as for tomatoes

1) Nematodes
2) Worms and Caterpillars
3) Whiteflies
4) Tomato Yellow Leaf Curl Virus (reservoir host)
5) Aphids
6) Bacterial Leaf Spot
7) Bacterial Wilt

Pepper weevils *Anthonomus eugenii* are an pest issue unique to peppers

1) scouting is important, fruit and flower buds should be examined for damage and fallen fruit and buds examined for presence of larvae.
2) important to eliminate wild solanaceous host plants if pepper weevil is to be managed effectively
3) removal and destruction of fallen fruit will result in destruction of larvae and pupae
4) Chemical control is difficult because all stages except the adult are protected within the fruit, so that only the adult weevil is vulnerable to insecticides. Frequent sprays may be necessary starting in the initial stages of infestation, usually pre-bloom, in order to avoid unacceptable levels of damage

Broad Mite *Polyphagotarsonemus latus* is a damaging insect to peppers. Heavy feeding causes flower abortion and dark, smooth russetting of fruit. Populations tend to build in late fall.

1) Broad mites are extremely small and a microscope is needed to see them so check often for signs of damage
2) maintain a weed free zone around your garden, Papaya, Floss Silk, Brugmansia, Citrus, Grape, and Rainbow Eucalyptus are common hosts in this region.
3) cut or pinch off distorted leaves, buds or entire shoots as soon as you notice mite damage and promptly bag and dispose of portions you remove.
4) spray the infested and adjacent plants thoroughly several times with horticultural oil, insecticidal, miticidal soap, or wettable sulfur making sure you reach leaf undersides completely and penetrate buds where mites are feeding.

Green Beans are a favorite and easily produced fall vegetable in SW Florida.

Insects that affect damage tomatoes, peppers, and green beans include:

1) Whiteflies which are the number one pest which are the vector of Bean Golden Mosaic Virus
2) Worms and Caterpillars
3) Aphids
4) Root Knot Nematodes

Twospotted Spider Mite *Tetranychus urticae* is a pest of green beans and many other vegetables

1) frequent scouting of the undersides of leaves especially during hot and dry periods
2) maintain a weed free zone around your garden
3) spray the infested and adjacent plants thoroughly several times with horticultural oil, insecticidal, miticidal soap, or wettable sulfur making sure you reach leaf undersides completely and penetrate buds where mites are feeding.

Bean Rust *Uromyces appendiculatus* is a significant disease in green beans during the cooler months

1) plant resistant varieties, new races are always appearing so resistance varies
2) use only disease free seed
3) plant at wide spacing for air circulation
4) avoid wet foliage
5) frequent preventative treatments of copper and wettable sulfur
6) remove and dispose old plants

Bean Golden Mosaic Virus is the most damaging bean disease in South Florida

1) control whitefly populations because they are the vector
2) dispose of symptomatic plants

Sweet Corn is a popular garden crop with some specific pest and disease issues in SW Florida

Corn Earworm is the biggest pest to sweet corn. Fall army worm and cornstalk borer also damage sweet corn.

To control these pests in sweet corn:

1) scout frequently
2) frequent treatments of Bt

Cucurbits are popular plants in Florida vegetable gardens. This group includes summer and winter squash, pumpkins, cucumbers, and melons. They are also damaged by previously described pests:

1) Nematodes
2) Whiteflies
3) Aphids which are the vectors for very damaging viruses
4) many types of Lepidoptera insects (worms and caterpillars)
5) Twospotted Spider Mites

Viruses are especially damaging to cucurbits. Three viruses common in this area are Watermelon Mosaic Virus, Zucchini Yellow Mosaic Virus, Papaya Ringspot Virus. There are also many others.

1) try to eliminate any cucurbit weeds (balsam apple, creeping cucumber, citron) and papaya that could serve as a source of viruses and whiteflies for the crop.
2) grow and/or plant whitefly-free and virus-free transplants
3) control whiteflies
3) keep your garden and garden perimeter weed free
4) remove and dispose and symptomatic and adjacent plants immediately
5) clean your hands with isopropyl alcohol after touching any cucurbit plant
6) remove and dispose plants as soon as harvest is complete

Powdery Mildew is a common major disease that affects cucurbits. Without healthy foliage yields are reduced. It is caused by three fungal species.

Powdery Mildew can destroy your cucurbit plants. Temperatures between 75-85 °F and elevated levels of relative humidity (80-95%) in the absence of rainfall promote the development of this disease. Dew not rain increases disease pressure.

1) plant only disease resistant and tolerant varieties
2) plant at adequate spacing for good air flow
3) plant only in open sunny areas
4) healthy and vigorous plants grown under a good nutritional program and suitable sanitary conditions are less susceptible to powdery mildew infection than plants under nutritional stress
5) plan on having a preventative spray program in place even with resistant and tolerant varieties
a) Biorationals – neem (not when bees are present, cow milk, jojoba oil, cinnamon oil, horticultural mineral oils)
b) copper, wettable sulfur

*****Use caution with sulfur, neem, and oils. May have phytotoxic damage when applied during high temperatures**

Downy Mildew is another devastating foliar disease in cucurbits not to be confused with powdery mildew. It usually appears as water soaked spots on the leaves.

Downy Mildew *Pseudoperonospora cubensis* overwinters in Gulf Coast states so it is always present. The disease occurs with adequate leaf wetness, usually by the dew, with high or low rainfall

1) plant only resistant and tolerant varieties
2) plant at adequate spacing for good air flow
3) eliminate moisture and humidity around the impacted plants, always water from below, such as with a drip system, and improve air circulation through selective pruning
4) biorational and chemical preventative control almost same as for powdery mildew but no research was found on cow milk being effective

Crucifer crops and lettuce crops have many of the same IPM issues described in other crops. Scout often and especially look out for these issues:

1) aphids
2) worms and caterpillars
3) root knot nematodes
4) downy mildew
5) powdery mildew

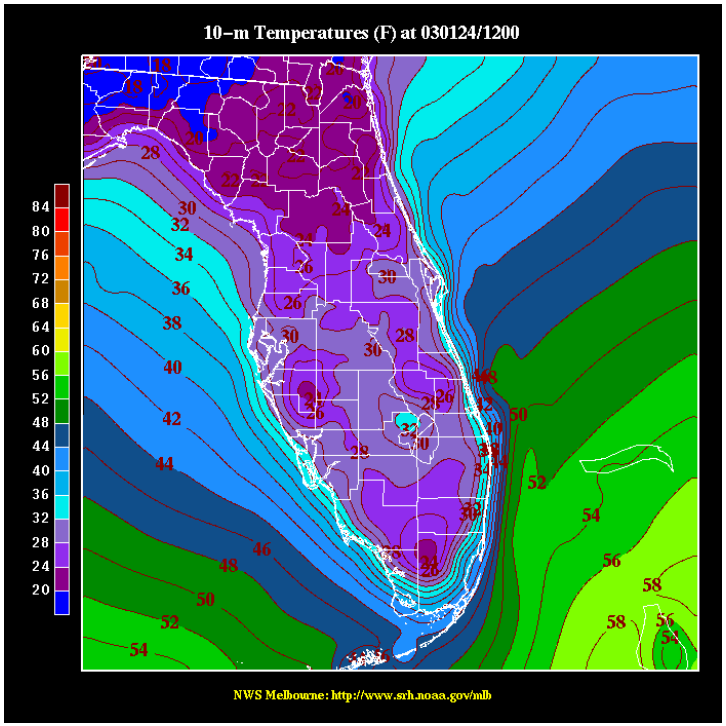
Wildlife are also common pests in the garden

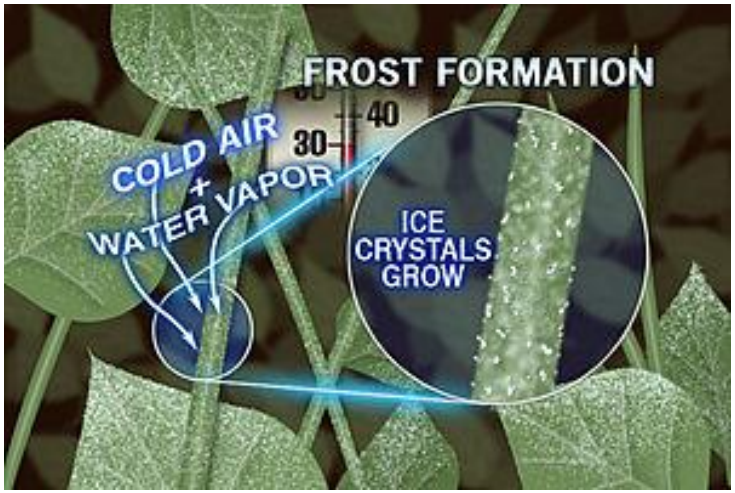
Wildlife can sometimes be very challenging to keep away from your vegetable garden. Usually a combination of controls is needed.

Some general prevention and control measures for wildlife (We could spend hours on this subject alone):

1) plant vegetables that your problem wildlife will not eat
2) fencing -7’ for deer, finer mesh for rabbit, electric for coyotes, bears, feral hogs, and raccoons
3) onsite predators- large dogs for fenced in properties, sterilized feral cats in urban setting where desired wildlife will not be affected
4) predator repellents – coyote, fox urine, blood (usually short efficacy, strong offensive odor usually, do not spray on plants)
5) heavily perfumed bar soap hung in mesh bags
6) do not have pet food, unprotected bird feeders, garbage and ripening fruit where raccoons can access, also do not have standing water nearby (raccoons are usually found in a group known as a gaze)
7) live trapping especially for nuisance raccoons, bait with marshmallows which cats usually do not seek out

Cold protection is often needed to protect your vegetable garden late November through March

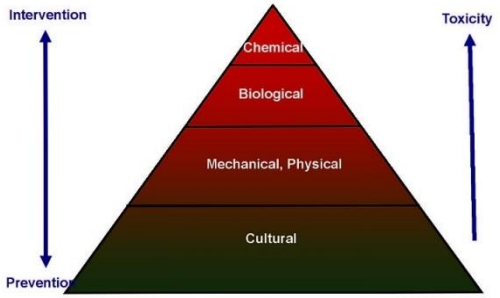




Cold protection is another subject we could spend a lot of time on. Frost can form above freezing in the upper 30s if conditions are right. Here are some key points:

1) plant cold resistant crops (most crucifers, lettuces)
2) know your micro-climate, open areas east of I-75 will get much colder than a south wall in Coastal Collier
3) purchase frost cloth ahead of time because local suppliers will sell out when a freeze is predicted (specialized woven fiberglass sheeting)
4) if you cannot get frost cloth stock pile old cloth sheets and blankets
5) water can do more damage!!! The day ahead of a frost/freeze event saturate soil and do not get foliage wet, **turn off automatic irrigation clocks**
6) Do not use plastic or tarps unless you have a support frame so plants will not come into any contact with the plastic or tarps
7) apply preventative fungicide/bactericide ahead of freeze event and then regularly after
8) if freeze/frost damage occurs to your plants leave damaged material alone until it dries and new buds emerge. Then damaged vegetation can be cut back to live buds

Integrated Pest Management when practiced through its multiple approaches can protect your crops and increase your yields. By combining its methods organic vegetable growing can be successful even here in our challenging Southwest Florida climate.



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GARDENS with LATITUDE