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UNIVERSITY of FLORIDA

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SOLUTIONS

Berry Vegetable Times
Winter 2015

2015 Calendar of Events

Hillsborough County Extension Office Pesticide License Testing. Third Friday of each Month. 5339 CR 579, Seffner. Bring a photo id and voucher paperwork. See article in newsletter for more information.

May 31- June 2 Florida State Horticulture Society Annual Meeting in St. Augustine. For more information and to register go to http://fshs.org/.

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Pesticide testing is now computerized at the Hillsborough Extension Office

Starting in January the pesticide testing is going from a paper test to one done on the computer. FDACS is wanting all the pesticide tests for both Bureaus in every county to now be given on the computer so they can be instantly graded and to reduce the paperwork. When the test was paper it had a set group of questions. Now that it is computerized, there is a pool of 200 questions and each person will receive a random selection of 50 questions from the pool. This means if you take a test for the same license more than once you will not have exactly the same questions again.

Also this change has led to a date change for when the tests will be given. From now on the tests will be held at the office in Seffner on the second Friday of each month. Another change is that there is a new procedure for signing up to take the test. You can no longer just walk in to take the test- you must sign up on-line first! This is not our choice but the way FDACS has set it up. We are limited in the number of computers we have for testing so you may not get the date you want if you wait till the last minute to sign up.

Here is the new procedure:

You go to the website: https://pesticideexam.ifas.ufl.edu/

Select "Apply for Examination." You will be sent to the FDACS Environmental Services Licensing Web Site where you will enter your e-mail address and PIN. If you do not have a PIN then select "Sign up". Next select "Login."

On the middle of the page select- "Apply for Restricted Use Pesticide New License."

Then select "Exam Application: Apply to Obtain Exam Voucher" and then select the license type. Enter all the required information and select the exams you need- you are allowed 2 exams per test session. Select "Review" and then "Acknowledge" if all the information is correct or "Edit" if you need to change anything.

Click "Submit" when finished. You can either e-mail the confirmation to yourself or print it but you must have the voucher number when you schedule the exams.

Now that you have your voucher number you can schedule to take the tests. You go to the first website- https://pesticideexam.ifas.ufl.edu/

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Select “Schedule Examination”, then enter your voucher number and last name.

Then select “Schedule examination” next to exam and chose the county where you want to take the tests. Select “View Test Schedule” next to the county. Register for a time slot and print and bring your form to the exam session. You must bring this with you to be able to take the test!!!!

Arrive 15 minutes before your session.

I want to thank Susan Haddock, Commercial Horticulture agent, at Hillsborough Extension for the information for this article. For the document this article is taken from go to the Hillsborough County Extension Website- http://hillsborough.ifas.ufl.edu/. Go to the events calendar and click on the pesticide testing dates and all the information will be there.

I would recommend if you or your employee is going to need to take the tests that you be familiar with using a computer before you come in for testing. If you do not want to take the test again be sure you keep up your CEUs! For a Private Applicator license, you need 4 Private Applicator CEUs and 4 CORE CEUs every 4 years. Don’t wait till the last couple of months before renewal to try to find enough CEUs.

If you have any questions or need help registering give me a call.

Alicia Whidden

Hillsborough County Vegetables/Small Fruits Agent

Is the weather getting hotter?

Alicia Whidden, Hillsborough County Vegetables/Small Fruits Agent

In 2014 if you were thinking it was hotter than usual, you were right. Last year turned out to be the warmest year since they started keeping records in 1880. Both NASA and the NOAA (National Oceanic and Atmospheric Administration) have agreed on this ranking. I know we all keep saying it is getting hotter every year and that is true too. The 10 warmest years have occurred since 2000 with the exception being 1998. We have warmed up 1.4°F across the earth since 1880.

This information was in an article from Growing Produce.com and has an interesting video in it. For all the information, check it out at http://www.growingproduce.com/vegetables/scientists-say-2014-warmest-year-since-1880/?

Pomegranate disease survey update: Applying what is currently known to improve disease management in the upcoming season

Achala Nepal KC and Gary E. Vallad,
Gulf Coast Research and Education Center, Wimauma, FL

During the summer of 2014, surveys were conducted to identify fungal diseases of pomegranate in Florida. Many fungal species were isolated and at least six of them were determined to be pathogenic on pomegranate fruits and foliage after re-inoculation. Two different *Colletotrichum* species, *Neofusicoccum parvum*, *Lasiodiplodia* sp., *Amphilogia* sp., and *Pilidiella granati* were very aggressive on fruits and leaves. These pathogens were commonly isolated from leaves, fruits, and stems suggesting possible habitats and inoculum sources of these pathogens for the coming season.

Species of *Colletotrichum*, two species in Botryosphaeriaceae family, and *Pilidiella granati* have been previously reported as pathogenic on pomegranate, however *Amphilogia* sp. is new for this host and confirmation of the species is in progress. *Amphilogia* belongs to Cryphonectriaceae family and is closely related to *Cryphonectria parasitica,* the cause of chestnut blight that nearly eradicated the American chestnut in North America in the early 1900s. The pathogenic species in this family typically cause stem canker and die-back symptoms in woody plants. The cankers often girdle the branches or main trunk of the infected tree and can kill the tree in one to four years depending on its age. *Amphilogia* have been reported to reside on roots and bark of *Elaeocarpus* species and cause stem and root cankers. These species produce both sexual and asexual spores at the site of infection and reside on these tissues until favorable conditions for infection occur. The sexual spores are mostly dispersed with wind and play a role in long distance spread. The asexual spores are dispersed with rain or irrigation water and also on the bodies of insects and mites, birds and mammals, and equipment used for cutting or pruning that come in contact with spore masses on cankers.

Two different species of *Colletotrichum* were also identified and both were very aggressive on pomegranate fruits causing fruit decay. Exact species identification is still in progress. In most other studies, *Colletotrichum gloeosporiodes* has been reported to cause leaf and fruit spots and pre and/or post-harvest

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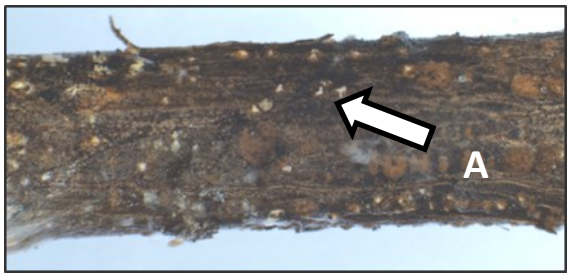
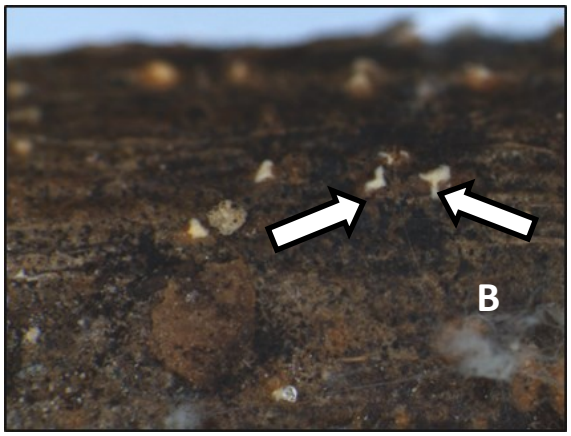
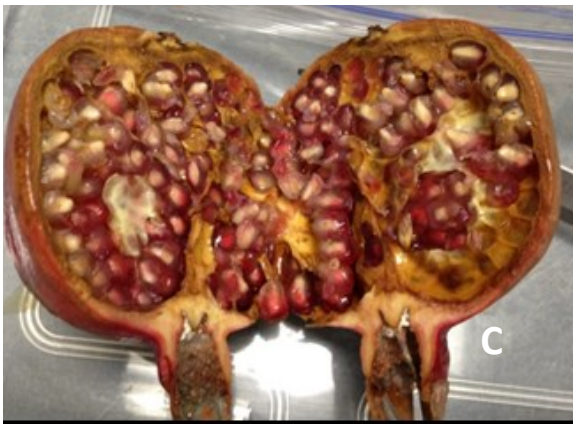
fruit decay in pomegranate. This is one of the most important pathogens that infects at least 1000 plant species, including avocado, citrus, coffee, guava, mango, passion fruit, papaya, rose apple and strawberry. *Colletotrichum gloeosporiodes* colonizes plant tissues forming abundant spores on the surface. The asexual spores are readily dispersed by rain splash and/or overhead irrigation. Sexual spores are airborne and disperse long distances by wind . These spores germinate on the surface of leaves or fruits producing symptomatic lesions.







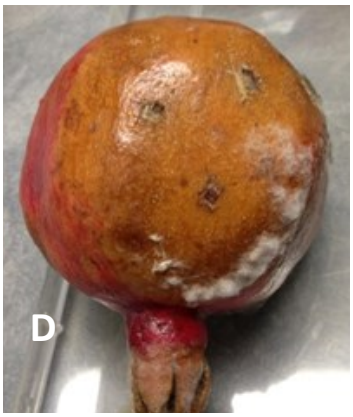


Figure 1. A) and B), stem samples from which *Amphilogia* sp. was isolated. The white arrows show the overwintering structure (pycnidia) of the fungus. C) and D), fruits infected with *Amphilogia* sp.

Figure 2. A) Fruits infected with *Colletotrichum* sp.1 and, B) Fruits infected with *Colletotrichum* sp.2. The yellow structures on (B) are the conidiospores (asexual spores) produced on the surface of infected fruit.

They either develop further producing more symptoms or remain dormant until conditions favor further infection. Dead leaves, wood and plant debris are primary sources of inoculum.

Two species, *Neofusicoccum parvum*, and *Lasiodiplodia* sp., belong to Botryosphaeriaceae family. In our survey, they were mostly isolated from rotten fruits, stems with small black dot like lesions (Figure 3a and 3b) and pedicels (part of branch attached to fruit). These pathogens have been previously reported to cause stem scab, stem canker, fruit rot, and tree decline in pomegranate. Members of Botryosphaeriaceae family are also pathogenic to many other fruit trees like pistachio, almond, blackberries, blueberries, walnut etc. causing a range of symptoms like leaf spots, die-back, gummosis, fruit rot, and cankers. The fungi overwinter on dead and diseased tissues. Both sexual and asexual spores are produced depending on the host and are spread through either air movement or splash dispersal and also through the use of contaminated cutting and pruning tools.

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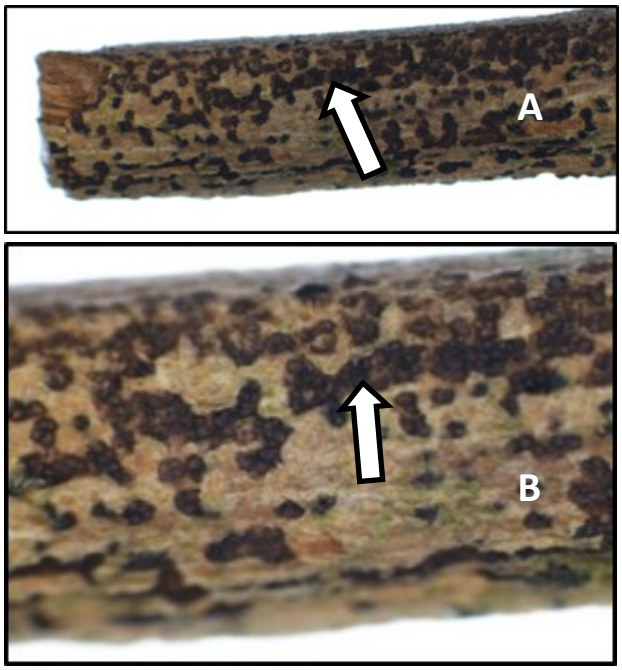
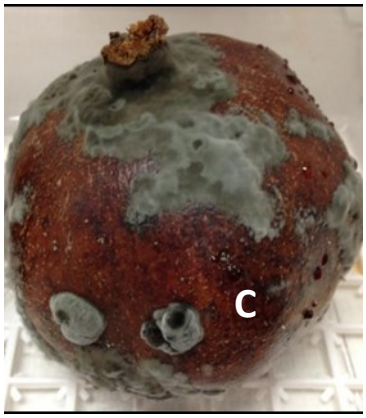
Pilidiella granati was also identified in the survey and was very aggressive on inoculated fruits. This has also been reported in pomegranate in California causing stem and crown canker and fruit decay. The pathogen overwinters as pycnidia (asexual spores) and mycelia in stem cankers, and in plant debris like rotten fruit, tree cuttings and detached leaves. Once environmental conditions become favorable, they infect through wounds and can also spread to healthy plants through contact from infected fruit and from contaminated equipment.





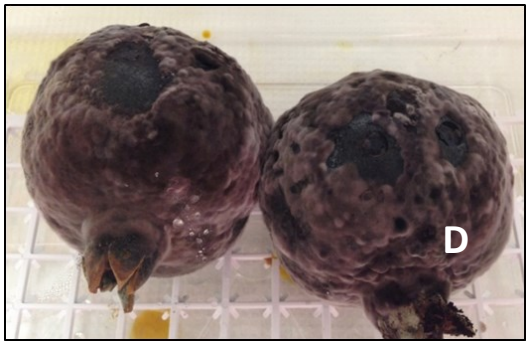


Figure 3. A) and B), stem samples from which *Neofusicoccum parvum*, and *Lasiodiplodia* sp.were isolated. The white arrows show the overwintering structure of the fungi. C) fruits infected with *Neofusicoccum parvum* and, D) fruits infected with *Lasiodiplodia* sp.

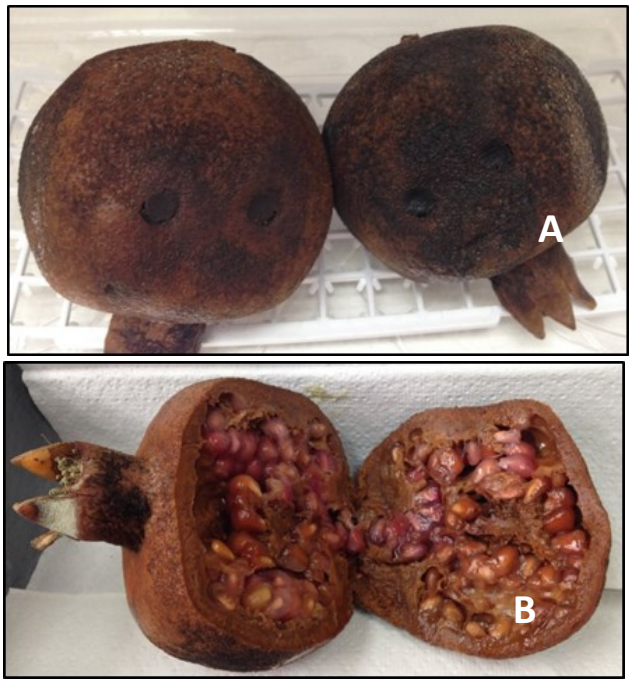


Figure 4. A) and B), fruits infected with *Pilidiella granati*. The black structures on the surface of fruit are **overwintering structures of the fungi (pycnidia).**

One interesting finding of this research was that *Alternaria* was only recovered once from fruit samples, but was not pathogenic when further tested on fruits. This is one of the major problems in California causing "black heart" or fruit rot disease in pomegranate. However, additional field samples will need to be collected and results with the current isolate confirmed under field conditions.

Most plant pathogens wait for favorable conditions to initiate disease. If there is an aggressive pathogen, a susceptible host, and favorable environmental conditions for the pathogen to grow then disease will develop. Disease management relies on manipulating any of these three factors. Field sanitation is an integral part of any disease management strategy, since it helps reduce the level of the pathogen present in the field, which in turn can delay disease development. As research progresses, resulting in pomegranate varieties with improved resistance and fungicide recommendations, lowering pathogen levels through field sanitation helps enhance fungicide performance and may even help lower the risk of fungicide resistance developing in pathogen populations. Although our knowledge about some of these pathogens is limited, it

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is clear from other crops that growers will benefit from implementing sanitation practices to minimize the presence of the pathogen in the field for the upcoming season. This can be best achieved by clearing leaf litter, fruit, and diseased stems from orchards. Especially during this time of year when many trees go dormant and lose their leaves, it is very important to clear leaf debris from around trees that may harbor the pathogen from the previous season. This is also an ideal time to inspect trees for diseased branches. We recovered pathogens belonging to the Botryosphaeriaceae family from most of the pedicel (part of branch attached to fruit) samples. So, pruning diseased branches and pedicels should help minimize carryover of the pathogen. All the infected leaves, stems, and fruits should be removed from the orchard to a safe distance and burnt as permitted by local ordinances. Similarly, equipment that comes into contact with diseased tissues should be sanitized using either a 75% alcohol, a 10% sodium hypochlorite solution (Regular Clorox® bleach), or other approved disinfectant. Growers are encouraged to refer to the article "Disinfection of Horticultural Tools" that is available on EDIS (http://edis.ifas.ufl.edu/ep380) for additional information.

Nutsedge management with pre- and post emergence herbicides in tomato

Nathan S. Boyd, Weed Science, Gulf Coast Research and Education Center

Purple (*Cyperus rotundus*) and yellow nutsedge (*Cyperus esculentus*) are two of the most invasive weed species that occur in agriculture. They are common weeds of fruit and vegetable production in temperate and tropical regions around the world. Both species are rapidly spreading perennial sedges with leaves that emerge in threes. Yellow nutsedge has yellow to light brown flowers. It produces tubers at the end of whitish rhizomes that can remain viable in the soil for over 10 years. In contrast, purple nutsedge has purplish colored flowers that are produced in chains. Yellow nutsedge has a narrow leaf tip whereas purple nutsedge has a thicker leaf tip. Both species produce seeds but reproduce and spread primarily by tubers. Both nutsedge species are especially problematic in crops grown under plastic mulch due to their ability to penetrate the mulch and compete with the crop. Research conducted by Dr. Ted Webster, a scientist with the USDA in Georgia, found that purple nutsedge growth is promoted by black plastic mulch and within sixty weeks a single shoot under mulch can reproduce to form 3,440 shoots. Due to this reproductive potential, it is important to manage nutsedge populations even if the initial density is low.

Yellow and purple nutsedge compete effectively with most vegetable crops. Their presence can reduce crop yield and quality, and increase production costs. Previous research conducted at the Gulf Coast Research and Education Center (GCREC) in Balm, Florida, confirmed that dense nutsedge populations reduce tomato yields. The impact on yield depends on a wide variety of factors including how dense the nutsedge population is in the field, how close the nutsedge is growing to the vegetable crop, when the shoots emerge, and soil fertility. Management options include fumigation, preemergence herbicides and post emergence herbicides. In plasticulture production, preemergence herbicides are applied to the surface of the bed just prior to laying the plastic. Post emergence herbicides are applied after the weeds emerge. Preemergence herbicides are desirable because they provide another application timing and facilitate rotation of herbicide products to reduce the potential for the development of herbicide resistance. They also reduce the number passes required to manage weeds as they can be applied during the fumigation operation and they prevent puncture of the plastic mulch.

Research conducted by Dr. Peter Dittmar at the University of Florida found that preemergence applications of Reflex and Dual Magnum provided short-term suppression of nutsedge for 11-25 days but no control was observed 60 days after application. Research conducted by my program at the GCREC found that Reflex and Dual Magnum applied preemergence can reduce purple nutsedge density by up to 70%. A variety of post emergence herbicides were also evaluated and products with the active ingredient halosulfuron (Sandea) were the most effective option. In fields with high nutsedge density both pre- and post emergence herbicides may be required to reduce populations to satisfactory levels and sustain season long control. Satisfactory control over the long-term will require an integrated approach that includes effective fallow management programs, fumigation, and herbicides.

African fig fly, a potential threat to late maturing strawberries and other small fruit crops in Florida

Oscar E. Liburd, Professor of Entomology and Nematology, University of Florida
Lindsy E. Iglesias, graduate student Entomology and Nematology Department

The African fig fly (*Zaprionus indianus* Gupta), is a relatively new invasive pest of small fruit crops in Florida. It is native to Africa, the Middle East, and Eurasia and was introduced into the western hemisphere (Brazil) in 1998 and has since spread rapidly throughout South and Central America. It was first recorded in the United States in 2005 in St. Lucie County, Florida in various infested fruits, and has since has been captured throughout north and south Florida in several small fruit crops including strawberries, blueberries, grapes and blackberries. The African fig fly is yellow in color and can be easily identified by an even number of silvery-white "racing stripes" with black borders that extend along the head and thorax.

Adult African fig fly. Photo courtesy of Lyle Buss, UF.

The African fig fly is a generalist feeder and has been found in various temperate and tropical fruits. In Brazil, it has become a destructive pest of orange, peach, and fig, which is where it got its name. In Florida, it has been found in strawberries, blueberries, wild and cultivated blackberries, guava, longan, sweet and sour orange, kumquat, and loquat. The female fly lays her eggs inside the fruit where the larva develops, resulting in unmarketable fruit. Although the African fig fly is able to lay eggs in fruit while they are still on the plant, most egg-laying occurs in damaged or fallen rotting fruit. An exception is in blackberries, where adult flies have been found in undamaged fruit, and figs. This behavior is unlike the significant fruit pest, the spotted wing drosophila (*Drosophila suzukii*), which can puncture the surface of ripe, undamaged fruit to lay its eggs.

The African fig fly adults have been captured with baits used for the spotted wing drosophila, including apple cider vinegar, red wine and rice vinegar mixture, and a yeast sugar mixture. Using the yeast sugar mixture, this fly has been captured in strawberries, blueberries, and wild and cultivated blackberries. In strawberries the fly appears to be more prevalent later in the season (March and April) when the days are warmer and longer. Interestingly, as African fig fly numbers begin to increase, the spotted wing drosophila populations begin to decline. Due to its ability to spread rapidly and its wide host range, the African fig fly has a high potential to become a major pest in Florida and other areas of southeastern United States.

Thrips-vectored tospoviruses in south Florida

Scott Adkins, USDA ARS Fort Pierce, FL; Joe Funderburk. UF/IFAS NFREC and Hugh Smith, UF/IFAS GCREC

Tospoviruses cause economically significant crop losses worldwide. *Tomato spotted wilt virus* (TSWV) is the original tospovirus discovered and it is well-known to cause vegetable, ornamental and peanut disease epidemics in the southeastern U.S. including north Florida (Fig. 1). In recent years, several relatives of TSWV have been detected in south Florida. *Groundnut ringspot virus* (GRSV) was first detected in tomato in late 2009 and subsequently in pepper, tomatillo and eggplant. In 2012, *Tomato chlorotic spot virus* (TCSV) was also detected in tomato and subsequently in pepper (Fig. 2). At the present time, TSWV, GRSV and TCSV are all established in south Florida and may be found in all major solanaceous vegetable crops. GRSV has also been detected in solanaceous weeds including American black nightshade and cutleaf groundcherry. TCSV has recently been detected in ornamental crops including annual vinca (also known as periwinkle), Hoya (*Hoya wayetii*, commonly known as waxflower) and false Christmas cactus (*Schlumbergera truncata*). Identification of these weed and ornamental species as GRSV or TCSV hosts demonstrates continuing host expansion for these emerging tospoviruses in Florida and has implications for management since vegetable and ornamental crops may share production space.

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Figure 1. *Tomato spotted wilt virus* symptoms on fruit. Photo: Gary Vallad.

Figure 2. *Tomato chlorotic spot virus* symptoms on foliage. Photo: Hugh Smith

All tospoviruses are transmitted by one or more species of thrips. Western flower thrips (*Frankliniella occidentalis*) is a major vector of TSWV worldwide and also in south Florida (Fig. 3). Western flower thrips has also been demonstrated to be a vector of GRSV and TCSV in Florida. Other thrips species may have more significant roles in transmission in certain geographic areas or crops. For instance, tobacco thrips (*F. fusca*) is a major TSWV vector in peanuts and also in north Florida. Common blossom thrips (*F. schultzei*) has been demonstrated to be a vector of GRSV in Florida. Further study is needed to determine if any additional thrips species may also be vectors for GRSV and/or TCSV in Florida. Vegetable fields in Florida are commonly inhabited by additional thrips species including melon thrips (*Thrips palmi*) and Florida flower thrips (*F. bispinosa*); so, understanding the role of each species in vectoring these viruses in the field is important.

Figure 3. Western flower thrips adult. Photo: Jeff Cluever.

In all known cases, thrips must acquire the tospovirus as larvae to be able to transmit as adults. This virus-vector relationship makes management difficult, as control of viruliferous adults with insecticides is not effective in preventing them from transmitting the virus to plants. Management tactics that are effective in preventing spread by adult thrips include ultraviolet-reflective barriers and mulches, systemic acquired resistance inducers, conservation of natural enemies, and optimal fertility. Additional spread of the virus can occur when larvae feed and develop on infected plants within the field. Careful monitoring and control of the larvae with insecticides is effective in reducing additional spread. Information on management in pepper and eggplant can be found at http://edis.ifas.ufl.edu/in401.

Commercially available TSWV-resistant tomato cultivars have been demonstrated to offer resistance to Florida isolates of GRSV and TCSV. These include plum, large round determinate, large round indeterminate, large round heritage, and large round grape types. These need to be evaluated for suitability to south Florida growing and pest conditions. It is very important to use an integrated pest management approach when managing tospoviruses. The thrips vectors develop resistance rapidly to insecticides and the tospoviruses also develop strains able to produce disease symptoms in the resistant tomato cultivars. This and other information concerning management of thrips and tospoviruses in tomato can be found at http://edis.ifas.ufl.edu/in895.

Sting Nematode: A reoccurring problem in Florida strawberry and a new understanding of why?

J.W. Noling, University of Florida, IFAS, Citrus Research & Education Center, Lake Alfred

ABSTRACT: In order to determine the cause for such poor and inconsistent crop performance after soil fumigation with a variety of different fumigants, a variety of strawberry field experiments were conducted to characterize the soil depths to which sting and root-knot nematodes reside and the depths to which soil fumigants diffuse. This research has demonstrated that these nematodes, for whatever reason, migrate to deeper soil during the hot summer months. What could be an apparent thermal escape mechanism appears to contribute to the nematodes survival in more ways that just heat avoidance. The presence of a subsurface traffic pan (a dense, highly compacted soil layer), was also shown to form a very effective impermeable layer to gas diffusion defining the fumigant treated zone as only the plant bed and not penetrating to the deep soil profiles below the raised bed where nematodes reside. Nematodes physically escape fumigant treatment because the fumigant never even gets close to them following treatment. Research is currently underway testing a new deep shank fumigant delivery system in which to target soil treatments to the depths where nematode occur in soil.

As everybody knows, the sting nematode is a very destructive and economically important pest of Florida strawberry. Since 1996, we have worked very hard trying to manage Sting nematode populations and the damage it causes within grower fields. I am very aware of the fact that a really good solution has eluded us. In recent years, none of the soil fumigants that we have been field evaluating at FSGA or in demonstration trials within grower fields have consistently provided season-long protection from the sting nematode. In many of these fields, the problem reoccurs even when additional fumigant treatments including spring crop termination and summer broadcast applications of 1, 3-D (Telone) have been used in hopes of preventing its reoccurrence. And need I say, the problem seems to be increasing, not only with expansion of infested acreage within fields where it has been a historic problem but also into new fields.

In order to determine the cause for such poor and inconsistent crop performance after soil fumigation with a variety of different fumigants, field surveys were conducted within these sting nematode problem fields. In these surveys, a compacted zone (traffic pan) was observed to occur just below the base of the raised bed. The presence of subsurface traffic pans (a dense, highly compacted soil layer), was shown to unavoidably cause changes in the downward percolation of water, permeability to fumigant gases, and root penetration into soil. In practical terms, the compaction zone occurs just below the depth of the deepest tillage operation or implement used in the field. Previous research has demonstrated that unless completely destroyed by deep ripping or subsoiling prior to soil fumigant injection, the presence of an undisturbed soil compaction layer almost completely restricts downward diffusion in soil of Telone when it is applied above the restrictive layer.

This past spring we introduced some new equipment into the research program. We commissioned Hartline Fabrication to build the *Probinator*. The Probinator is best described as a deep coring, soil sampling system (**Figure 1**) capable of removing a 4 inch diameter by 40 inch deep soil core using a specialized probe and hydraulic ram system. The Probinator is tractor mounted as a 3 point attachment. The Probinator (Figure 1A) is allowing us to study, without back-breaking effort, the depth distribution of nematodes, spatial movement of soil fumigants from their points of emission, causes of fumigant treatment inconsistency and origins of bed recolonizing populations of nematodes. We have been using the Probinator system to collect

Figure 1. The Probinator (A), a hydraulically operated deep soil probe (B) used to study the depth distribution of nematodes, spatial movement of soil fumigants (C), and to identify causes of fumigant treatment inconsistency and origins of bed recolonizing populations of nematodes.

monthly census samples to determine the depths to which Sting nematode occurs in soil. We subdivide the core into 1 foot soil increments, and then process and count nematodes within each of the increments from samples taken at the Florida Strawberry Growers Research and Education Foundation Farm (FSREF) in Dover, FL. The June 2014 data reported here derive from soil samples procured from an overall depth of 3 feet, from uncovered fallow, stale beds. Additional soil samples to assess

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depths and nematode population levels were collected from another farm, the DB Farm, in Barberville, FL. At this farm a drip fumigation treatment with Telone EC (18 gpa) was applied as a crop termination treatment to the previous strawberry crop, the plastic pulled and field disked, and then laid bare fallow for 2 months to reduce Sting and Root-knot nematode populations which had severely damaged the crop in this field.

The nematode assay results from soil census sampling at FSGREF from the fallow, stale (uncovered) beds showed that Sting nematodes could be detected at low levels to a depth of 36 inches from the soil surface (**Figure 2**). Highest nematode population densities were observed immediately below the traffic pan in the 13 to 24 inch soil depth category. Soil population density and depth distribution of the Root-knot nematode *Meloidogyne hapla* within the same 12 inch soil increments at the DB Farm in Barberville is illustrated in **Figure 3**. The results from these samples show the absence of nematode in the surface 12 inches of soil following the Telone EC crop termination treatment and 2 month bare fallow period (**Figure 3**). Surprisingly, highest populations of root-knot nematode were observed at the deepest soil depth of 25 to 36 inch soil depth. It would appear that the fumigant treatment and the summer fallow period were very effective in reducing nematode populations in surface soil horizons, and that *M. hapla* migrates to deeper soil during the hot summer months. It seems that this apparent thermal escape mechanism contributes to the nematodes survival in more ways that just heat avoidance.

The Probinator was also trialed in spring experiments during 2014 to evaluate the diffusion of Telone EC gases throughout the surface to 36 inch soil depth. In the first experiment, Telone EC (12 gpa) was applied at the MB farm on April 2, 2014 as a drip fumigant to terminate the strawberry crop which had been severely damaged by the sting nematode. In the second fumigation experiment, Telone II (18 gpa) was custom applied at the DB farm using deep ripper shanks spaced on 12 inch spacing to a depth of 15 inches. Following shank application, the soil was simply rolled to establish a soil seal over the shank trace to minimize premature escape of fumigant gases. After drip and or deep shank fumigant application, distribution of 1, 3-dichloropropene gases within our soil probe were incrementally measured using a MiniRae® 2000 PID VOC meter. Our intent was to characterize soil air concentrations, retention characteristics of Telone II (1,3-D) over time, as well as relative differences in vertical, gas phase movement of the fumigant with time.

Comparison of Telone gas concentrations in soil strata above and below the 14 inch traffic pan at the MB farm is illustrated in **Figure 4**. At 3 days post application, highest 1,3-D concentrations were contained within the covered plant bed, with concentration diminishing toward the plant holes within the plastic at the surface. Very low soil air concentrations were observed below the traffic pan positioned at a 14 inch soil depth below the top

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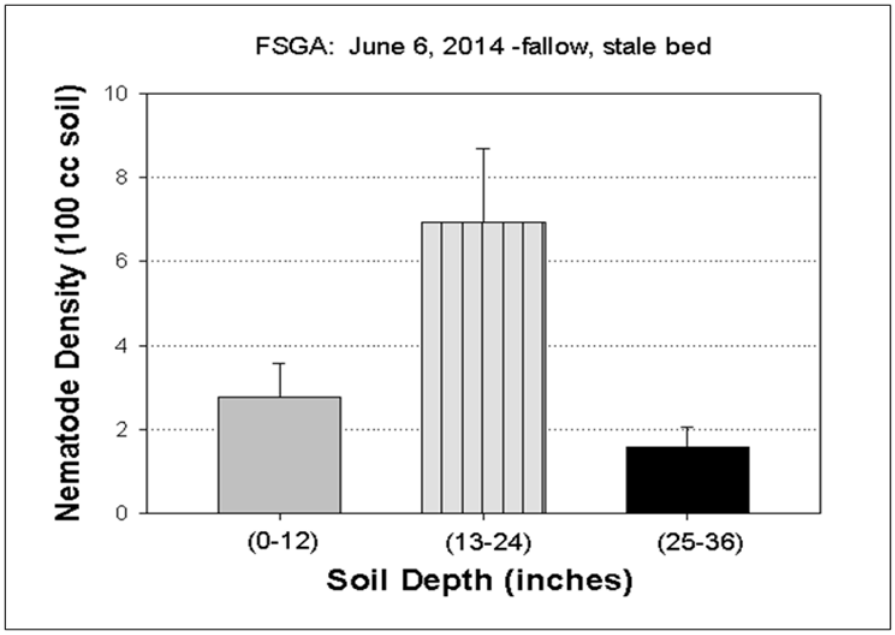
Figure 2. Soil population density and depth distribution of the Sting nematode, *Belonolaimus longicaudatus,* observed within 1 foot soil increments at the Florida Strawberry Growers Research and Education Foundation Farm Dover, FL. Soil samples procured from an overall depth of 3 feet, from uncovered fallow, stale beds. Data represent the means and standard error of 8 replicate samples.

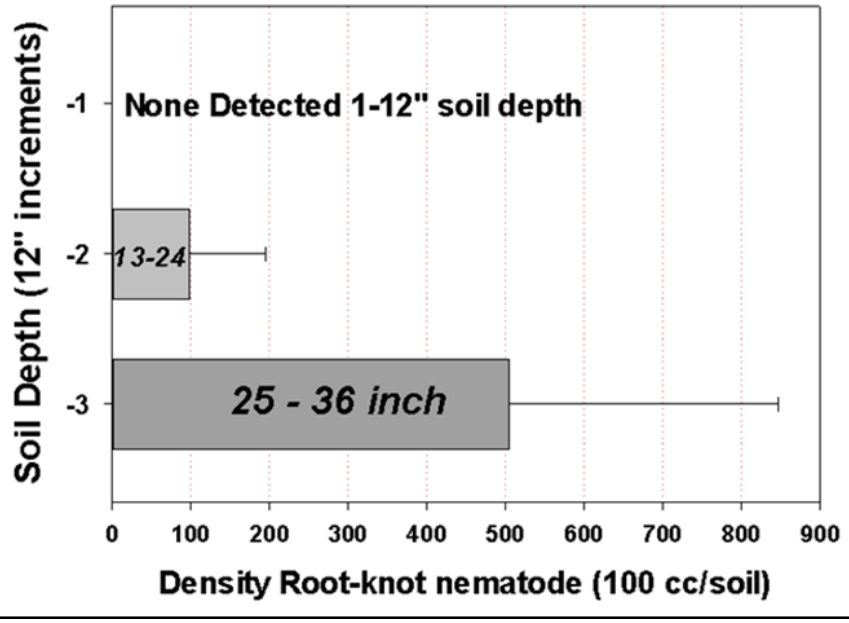


crown of the 12.5 inch raised plant bed. These data would strongly suggest only very limited movement Telone EC in the water phase or as gas diffusion through the highly impermeable traffic pan. An example of typical fumigant concentrations in soil air observed above and below a compacted strawberry traffic pan shortly after drip or shank application of the bed to a soil depth of 8 to 12 inches is illustrated in **Figure 5**. The 14 inch traffic pan forms a very effective impermeable layer to gas diffusion defining the fumigant treated zone as only the plant bed and not penetrating to the deep soil profiles where nematodes reside. Nematodes physically escape fumigant treatment because the fumigant never even gets close to them following treatment.

Similar results were obtained at the DB farm site. At this site, 1,3-D concentrations within the shank trace and midway between ripper shanks to a depth of 36 inches is presented in **Figure 6**. These data show that highest 1.3-D soil air concentrations occur at or near the 15 inch depth of application. However, very little of the gases diffuse either laterally or into deep soil below the injection depth and that the majority of soil gases move up and out of the bed via the poorly sealed shank trace. These results appear to demonstrate that not all growers may benefit from deep shank, broadcast application methods that destroy the gas impermeable traffic pan because of the rapid escape of gases back up the roller sealed shank trace. These results would suggest that new, even deeper application and sealing methods will be required to force fumigant movement deeper in soil to improve overall nematode control, particularly into deeper soil horizons where they are being observed to reside, and also improve crop yield response consistency.

Let me conclude by saying that I think things are looking up. For reasons unknown, we have learned that the sting nematode takes the plunge into deeper soil at the end of the strawberry crop. It could be a simple escape mechanism on the part of the nematode to avoid large swings in temperature and moisture. Who really knows but it sounds good to me. The amazing thing is that it now also escapes the fumigant which it could not have done as easily with methyl bromide which didn't care if there was a traffic pan or not as it raced into deep soil. If you think about the time table of events, we fumigate and then plant 30 days later. We irrigate heavily during the '*living-in period'*, leaching all of those scents and bouquets of food above, and then what happens 30 days later, the reported interval required to move 3 feet in soil, the nematode reappears. Now, in a very hungry state. What we need now is a new system in which to target treatments to the subterranean hideouts of the nematode. We have been testing said equipment, we like what we are seeing, and it will form the subject of my next newsletter article.

Figure 3. Soil population density and depth distribution of the root-knot nematode, *Meloidogyne hapla,* within 1 foot soil increments at the DB Farm, Plant City, FL. Soil samples procured to an overall soil depth of 3 feet following crop termination-drip fumigation treatment (April) and two month period of bare summer fallow. Data represent the means and standard error of 8 replicate samples.



(Continued on page 11)

Fig. 4. Concentration Isobutylene in soil strata above and below a 14 inch traffic pan. Soil air measurement obtained thru center of a 12½ " raised, mulch covered bed 3 days post application Telone EC (12 gpa). Data points are means & S.E. 8 reps MB farm, Dover, FL

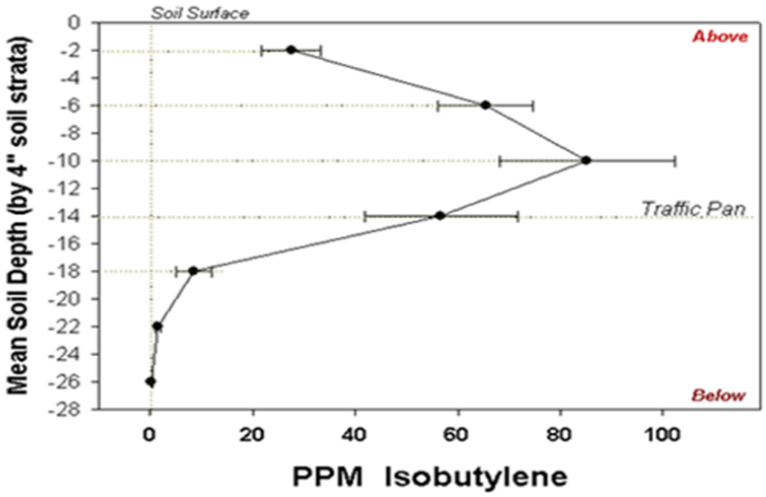


Figure 5. Illustrated example of typical fumigant concentrations in soil air observed above and below a compacted strawberry traffic pan shortly after drip fumigation or shank injection to a soil depth of 8-12 inches. Thecompacted traffic pan acts as a very effective impermeable layer to fumigant gas diffusion into deep soil profile.

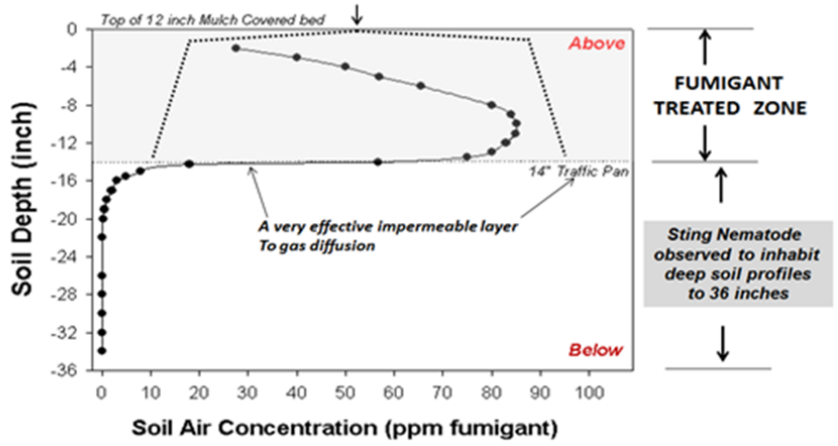
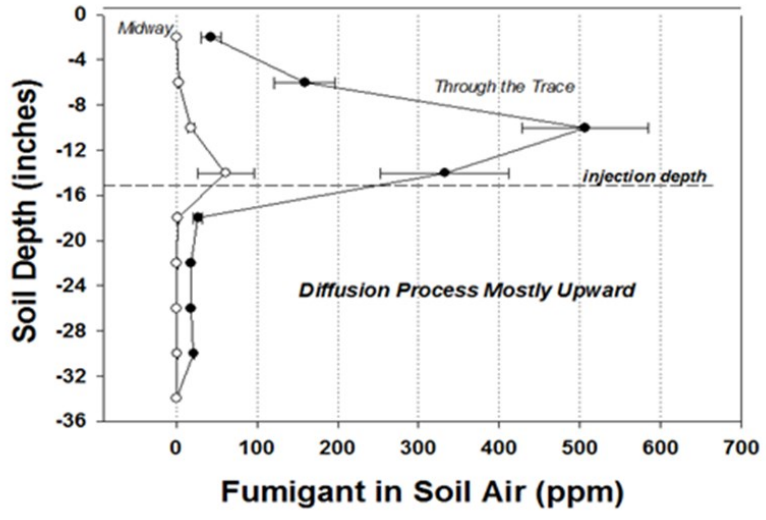


Figure 6. Fumigant Gas Concentration within the Shank Trace and midway between ripper shanks to a soil depth of 36 inches. Telone II fumigant broadcast and deep ripper shank applied (18 gpa) to a 15 inch soil depth. Datapoints are means and standard errors of 4 replicate observations. Plant City, FL. 1 DAA - July 12, 2014



Fungicide efficacy summary guide

By Natalia Peres, Jim Mertely and Achour Amiri

Every strawberry season, experimental trials are conducted at the UF Gulf Coast Research and Education Center to evaluate the efficacy of products on controlling the most important strawberry diseases in Florida. The trials are conducted for each disease separately and cultivars that are more susceptible for each of the diseases are used and/or inoculations with the target pathogen are conducted. The list below has been assembled from our results over the years and is sorted by fungicide group. It also includes a summary of the recent fungicide resistance monitoring of Botrytis populations collected from Florida strawberry fields.

We also have results with some biorational products that have not been included in this list because data might be limited or not conclusive. We hope this information will be useful. Please feel free to call us to inquiry whether we have tested a product you are planning to use in your operations.

SUMMARY EFFICACY GUIDE FOR STRAWBERRY FUNGICIDES

			Target disease						
Fungicide	**Active ingredient**	**Fungicide group**	**AFR**	**BFR**	**PM**	**ALS**	**CCR**	**PCR**	**Resistance status**
Topsin	thiophanate-methyl	1	-	-	-	-	++	-	***
Rovral	iprodione	2	-	++	-	-	-	-	*
Orbit	propiconazole	3	++	-	+	-	?	-	nd
Mettle	tetraconazole	3	+	-	+	-	?	-	nd
Rally	myclobutanil	3	-	-	+	-	-	-	nd
Procure	triflumizole	3	-	-	+	-	-	-	nd
Ridomil	mefenoxam	4	-	-	-	-	-	+++	nd
Fontelis	penthiopyrad	7	++	++	++	-	?	-	**
Scala	pyrimethanil	9	-	+	-	-	-	-	***
Abound	azoxystrobin	11	++	+	+	-	++	-	***
Cabrio	pyraclostrobin	11	++	+	+	-	++	-	***
Flint	trifloxystrobin	11	++	+	+	-	++	-	nd
Evito	fluoxastrobin	11	++	+	+	-	++	-	nd
Quintec	quinoxyfen	13	-	-	+++	-	-	-	nd
Elevate	fenhexamid	17	-	++	-	-	-	-	**
Aliette	fosetyl-Al	33	-	-	-	-	-	+	nd
many brands	phosphites	33	-	-	-	-	-	++	nd
Quilt Xcel	azoxystrobin + propiconazole	3 + 11	++	-	++	-	?	-	nd
Merivon	fluxapyroxad + pyraclostrobin	7 + 11	++	++	+++	-	?	-	**
Pristine	boscalid + pyraclostrobin	7 + 11	++	+	+	-	?	-	***
Switch	cyprodinil + fludioxonil	9 + 12	++	+++	-	-	++	-	*
many brands	copper	M1	-	-	-	+	-	-	nd
many brands	sulfur	M2	-	-	+	-	-	-	nd
Thiram	thiram	M3	++	++	-	-	+	-	nd
Captan	captan	M4	++	+	-	-	++	-	nd
Captevate	captan + fenhexamid	M4 + 17	+	++	-	-	+	-	**
Actigard	acibenzolar-s-methyl	P1	-	-	-	++	?	-	nd
Torino	cyflufenamid	U6	-	-	+++	-	-	-	nd

Fungicide group = Numbers and letters are used to distinguish the fungicide mode of action groups. All fungicides within the same group (with same number or letter) indicate same active ingredient or similar mode of action. This information must be considered for the fungicide resistance management decisions.
M = multi-site inhibitors; U = unknown, or a mode of action that has not been classified yet; P = host plant defense inducers.
Source: FRAC Code List 2013; http://www.frac.info/ (FRAC = Fungicide Resistance Action Committee).
AFR = Anthracnose Fruit Rot; **BFR** = Botrytis Fruit Rot; **PM** = Powdery Mildew; **ALS** = Angular Leaf Spot; **CCR** = Colletotrichum Crown Rot; **PCR** = Phytophthora Crown Rot
(+++) = good efficacy; (++) = moderate efficacy; (+) = low efficacy; (-) = no efficacy or not registered
Resistance status = Fungicide resistance of Botrytis populations from Florida strawberry fields
(***) = widespread; (**) = moderate frequency; (*) = low or absent; (nd) = not determined

DIAGNOSTIC CLINIC SAMPLES SUMMARY 2014-15 STRAWBERRY SEASON

Jim Mertely and Natalia Peres

In addition to Botrytis, this strawberry season has definitely been very favorable for Phytophthora crown rot. Among the 126 samples with definite diagnosis submitted so far during this season to our clinic at the UF GCREC, 53 (44%) have been diagnosed as Phytophthora crown rot. Another 22% of the samples have been confirmed as Colletotrichum crown rot. Usually, these crown rot diseases are more problematic early in the season, October-November, and tend to slow down as the weather gets cooler. This season, however, the warmer temperatures and the heavy rains around Thanksgiving weekend and other rain events throughout the season have kept these diseases going. In addition, we have also received a few samples (7%) that were diagnosed as charcoal rot caused by Macrophomina phaseolina. Symptoms for these crown rot diseases are very similar and a definite diagnosis can only be given after isolation and growth of the pathogen on culture media which usually takes 5 to 7 days. A definite diagnosis is, however, very important since control methods are different for each of them. Applications of Ridomil and phosphite products are usually effective against Phytophthora whereas captan and strobirulin fungicides such as Cabrio and Abound are the most effective against Colletotrichum.

Instructions on how to submit samples as well as the diagnostic results can be found at http://gcrec.ifas.ufl.edu/plant-clinic.shtml.

Date	Disease	Pathogen
10/6/2014	Root rot	Pestalotiopsis
10/20/2014	Pythium crown rot	Pythium sp.
10/20/2014	Phytophthora crown rot	Phytophthora cactorum
10/20/2014	Phytophthora crown rot	Phytophthora cactorum
10/22/2014	Root rot	Colletotrichum acutatum
10/22/2014	Root rot	Pestalotiopsis sp.
10/22/2014	Root necrosis	Colletotrichum acutatum
10/23/2014	Rhizoctonia root rot	Rhizoctonia sp.
10/23/2014	Anthracnose root necrosis	Colletotrichum acutatum
10/24/2014	Anthracnose root necrosis	Colletotrichum acutatum
10/24/2014	Anthracnose root necrosis	Colletotrichum acutatum
10/24/2014	Root rot	Pestalotiopsis sp.
10/30/2014	Powdery mildew	Podosphaera aphanis
10/30/2014	Anthracnose root necrosis/crown rot	Colletotrichum acutatum
10/30/2014	Charcoal rot	Macrophomina phaseolina
10/30/2014	Root and crown rot	Pestalotiopsis sp.
10/31/2014	Phytophthora crown rot	Phytophthora cactorum
10/31/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/4/2014	Charcoal rot	Macrophomina phaseolina
11/5/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/6/2014	Charcoal rot	Macrophomina phaseolina
11/6/2014	Charcoal rot	Macrophomina phaseolina
11/6/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/6/2014	Crown borer damage	
11/10/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/10/2014	Phytophthora crown rot	Phytophthora cactorum

(continued on page 14)

Date	Disease	Pathogen
11/10/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/12/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/12/2014	Colletotrichum crown rot	Colletotrichum fragariae
11/12/2014	Charcoal rot	Macrophomina phaseolina
11/12/2014	Phytophthora crown rot	Phytophthora cactorum
11/12/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/12/2014	Anthracnose crown rot	Colletotrichum acutatum
11/12/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/12/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/19/2014	Sting nematode damage	Belonolaimus sp.
10/19/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
11/20/2014	Root and crown rot	Pestalotiopsis sp.
11/24/2014	Phytophthora crown rot	Phytophthora cactorum
12/1/2014	Phytophthora crown rot	Phytophthora cactorum
12/1/2014	Charcoal rot	Macrophomina phaseolina
12/2/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/2/2014	Anthracnose crown rot	Colletotrichum acutatum
12/2/2014	Crown rot	Pythium sp.
12/2/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/2/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/2/2014	Phytophthora crown rot	Phytophthora cactorum
12/2/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/2/2014	Phytophthora crown rot	Phytophthora cactorum
12/2/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/2/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/2/2014	Leather rot	Phytophthora cactorum
12/3/2014	Sting nematode damage suspected	Belonolaimus longicaudatus
12/3/2014	Root necrosis	Colletotrichum acutatum
12/3/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/3/2014	Phytophthora crown rot	Phytophthora cactorum
12/4/2014	Leather rot	Phytophthora cactorum
12/4/2014	Phytophthora crown rot	Phytophthora cactorum
12/5/2014	Phytophthora crown rot	Phytophthora cactorum
12/5/2014	Phytophthora crown rot	Phytophthora cactorum
12/9/2014	Colletotrichum fruit rot	Colletotrichum acutatum
12/8/2014	Sting nematode damage	Belonolaimus longicaudatus
12/8/2014	Sting nematode damage	Belonolaimus longicaudatus
12/10/2014	Phytophthora crown rot	Phytophthora cactorum
12/10/2014	Phytophthora crown rot	Phytophthora cactorum

(Continued on page 15)

Date	Disease	Pathogen
12/10/2014	Colletotrichum crown rot	Colletotrichum gloeosporioides
12/10/2014	Phytophthora crown rot	Phytophthora cactorum
12/10/2014	Phytophthora crown rot	Phytophthora cactorum
12/10/2014	Colletotrichum crown rot	Colletotrichum fragariae
12/11/2014	Phytophthora crown rot	Phytophthora cactorum
12/11/2014	Phytophthora crown rot	Phytophthora cactorum
12/11/2014	Colletotrichum crown rot	Colletotrichum acutatum
12/12/2014	Anthracnose crown rot	Colletotrichum gloeosporioides
12/12/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Anthracnose crown rot	Colletotrichum acutatum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum
12/15/2014	Phytophthora crown rot	Phytophthora cactorum

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Alicia Whidden, Editor Hillsborough County Extension Service
5339 CR 579, Seffner, FL 33584
(813) 744-5519

Jack Rechcigl, Center Director
Hugh A. Smith, Co-Editor
Christine Cooley, Layout and Design
Gulf Coast Research & Education Center
14625 County Road 672, Wimauma, FL 33598
(813) 634-0000
http://gcrec.ifas.ufl.edu