Berry/Vegetable Times

April 2008

Calendar of Events

May 13 Pesticide License Testing. Hillsborough County Extension Office, Seffner. 9 am. For more information call Mary Beth Henry, 813-744-5519, ext 103.

June 1-4 Florida State Horticultural Society Meeting, Ft. Lauderdale Marriott North. For more information check the website, www.fshs.org.

June 10 Pesticide License Testing. Hillsborough County Extension Office, Seffner. 9 am. For more information call Mary Beth Henry, 813-744-5519, ext 103.

July 21-24 American Society for Horticultural Science Meeting. Rosen Plaza, Orlando Fl. For more information check the website, www.ashs.org.

EARTH DAY April 22nd

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From Your Extension Agent— Web Soil Survey and Soil Maps

A good way to manage our farms is to know what soil types you have on your property and the characteristics of those soil types. By knowing the soil types you can better manage your irrigation and fertigation which is very important in this BMP era. Most farms in this area have at least 2 different soil types and many have more. Also knowing the soil types of a property is valuable information to have when considering leasing or purchasing new land.

The USDA Natural Resources Conservation Service (NRCS) historically has had soil maps of the county available in their office. Once the existing printed maps are gone, no more will be printed. You will need to go on-line and print your own. If you are looking at property anywhere in the country you can go on-line to the Web Soil Survey and find out information on the property. This website also gives you access to full soil survey report content. The information can help with land-use and management decisions.

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Drip Fumigation and Crop Termination

Joseph W. Noling, Citrus REC Entomology & Nematology

Easter has come and gone and the strawberry season is over. Minus the Colletotrichum crown rot, I thought it was a good season. California was late, no December glut in production, very few freeze events, and relatively good production and pricing through the season. If growers didn't suffer greatly from plant and yield losses due to crown rot or nematodes, they probably did alright. Crown rot was clearly a devastating problem in some fields where I don't doubt that complete losses were incurred. The death and destruction of plants over the season just never seemed to stop, if it wasn't

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To begin go to the NRCS Web Soil Survey site at http://websoilsurvey.nrcs.usda.gov. You will go to the tab that is "Area of Interest"- you can use an address or county. Click the view button and there are tools to zoom in on a specific area. To view and print your soil map click on the tab labeled "Soil Map". To print click on "Create a Printable Document" button, then the "View" button and then the File menu and where it says Print.

The last tab on the top is the "Soil Data Explorer" and this tab gives you access to other tabs. These other tabs provide a wealth of information. They are Intro to Soils, Suitabilities and Limitations for Use, Soil Properties and Qualities, Soil Reports.

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2007 Strawberry Symposium Proceedings

are now available for purchase from the North American Strawberry Growers Association for $45 (includes shipping). Highlights include publications from leading researchers on Global and North American Overviews, Strawberry Breeding in North America, Innovations in Production Technology and Off-Season Marketing, Disease and Pest Management, Breeding and Genetics, just to name a few. Email your request to info@nasga.org or fax your request with complete credit card information to NASGA at 613-258-9129 (Canada). You can also mail your check or money order to NASGA, 30 Harmony Way, Kemptville, Ontario, Canada K0G 1J0.

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crown rot it was citrus weevils killing plants late season in many different fields.

This past season, a number of methyl bromide alternative fumigants and gas impermeable mulch films were evaluated in grower demonstration trials. Hopefully you were able to view and compare treatments in some of the trials we put out this past fall. The fumigant treatments evaluated included Telone C35 (35 gpa); Midas 98/2 (80 lb/a); Midas 50/50 (125 lb/a); Dimethyl Disulfide with Chloropicrin (Paladin) (65-75 gpa); Telone InLine (35 gpa); Chloropicrin EC (200 lb/a); and Midas Bronze 50/50 EC (125 lb/a). All rates being expressed as per treated acre while use rates per acre are computed as 62.5% of treated acre rates. This year we expanded research focus to include drip formulations of some of the alternatives fumigants to address (minimize) anticipated personal protective equipment (PPE) and buffer zones requirements which are likely to be added as new application requirements when EPA publishes its fumigant reregistrations this coming fall. With these new changes, even methyl bromide is expected to impose respirator requirements (and possibly other PPE) for every worker in the field. As part of a larger USDA Areawide project, final end of season surveys are still being conducted in some of these trials, so a discussion of the results will have to wait till a subsequent newsletter or extension meeting. Stay tuned, there are some shining stars in the alternatives mix.

Now that the season is over, much of grower focus is on the double crop. In sting nematode infested fields where double cropping is not planned, this is not the time to abandon the field or forget about integrated nematode and crop management practices. At this point, I am very fond of reminding growers farming nematode infested land to implement rapid destruction of the strawberry crop so as to withdraw further nourishment

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from a reproducing and increasing population of nematodes in the soil. Soil populations which are allowed to build to high levels now will be much more difficult to manage later. Remember that most nematodes are now pretty much confined within the beds (ie., 62% of the field, rather than all over (100%) after the plastic is removed and the field is disked. For crop termination, a bottom up approach with a drip applied fumigant is preferred to a tops-down approach with a herbicide or foliar defoliant. In recent years we have demonstrated the value of chemical crop termination treatments with rates per treated acre of Telone EC (10-12 gal), Vapam (75 gpa); or Kpam (60 gpa). These fumigant treatments not only kill the plant and its root system, but also many of the nematodes confined within the plant bed. Now is the time to take advantage of a vulnerable moment when nematodes are confined to the bed to reduce the population. Even with a single tape per bed, benefits from long injections of crop termination chemicals for nematode management have been expressed in improved health, vigor, size and yield of the following seasons strawberry crop.

Now after having disclosed the benefit side, I am also very quick to point out to growers some of the requirements and limitations of the crop termination approach for nematode management. Toxicologically, fumigant concentrations of Telone EC in irrigation water must exceed 500 ppm to effectively and consistently kill nematodes. Because of inconsistencies observed, current recommendations for concentrations of the active ingredients of Vapam or KPam in irrigation water is 1500 ppm or higher. It is also not the time to pump the fumigant into the irrigation system as fast as possible. Growers need to consider other factors, including fumigant concentration in irrigation water because of the possible adverse affects it can cause. For example, concentrations of Telone EC greater than 2000 ppm in irrigation water can damage PVC at the time of fumigation as well as afterwards, particularly if lines are not flushed properly and the fumigant settles to low areas in the lines or in dead heads.

The fine sandy soils of Florida, with low water holding capacity and high hydraulic conductivity make it physically very difficult (impossible might be more accurate) to laterally move fumigant solutions from the bed center with a single tape, through the root systems of the two strawberry rows, and to the shoulders of the bed. Previous research has demonstrated that long injection times are required to move fumigant through at most 50 to 60% of the bed with a single tape (Figure 1). Because of our soils, the treatment is doomed from the start to imperfection, particularly with short injection periods and a single tape. But even with its limitation, crop termination is still a very helpful nematode management treatment. To maximize lateral spread, growers should plan on a fumigant injection period to deliver 125 to 150 gal/ 100 linear feet of row. This equates to at least 13,500 gallons or about 50% (0.50) of a broadcast acre inch of water (1 acre inch is 27,154 gallons water). For most medium to high flow commercial drip tapes (0.4 to 0.6 gal/min/100 ft of row), a three to five hour injection period is the minimum required to maximize lateral spread of the fumigant in our soils. Chemical Injection is always followed by a complete flush of the lines. So when we talk about rates, the actual rates of application used for drip fumigation are thus a function of the fumigant concentration in irrigation water (ie., at least 500 ppm Telone EC; 1500 ppm KPam or Vapam) that you decide on and the overall length of the injection period. From this information it is possible to calculate overall chemical needs.

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I have always used the Berry Times Newsletter as a forum to express industry concern. For example, I am becoming very concerned with growers who, given the higher price and expected scarcity of methyl bromide this fall, now believe that drip fumigation with Vapam or Kpam will effectively and equivalently substitute for methyl bromide soil fumigation in a sting nematode infested field with a single drip tape. I get particularly concerned, when the intent is also to double crop strawberry after strawberry, reusing the same mulch and single tape drip system for fall 2008. I mean no disrespect; but we have not shown here in Florida or in California that either of the crop termination chemicals Vapam or Kpam as a consistently effective, standalone fumigant alternative to methyl bromide. Unquestionably these compounds have utility as a component of an overall IPM, methyl bromide alternative system. In my opinion, any exclusive reliance on these compounds for soilborne pest and disease control surely requires continued research before large scale grower trialing.

In this double cropping scenario, there are a number of negatives to consider which could compromise the efficacy and performance of the double crop / drip fumigation treatment. Remembering that there are already at least 18,000 holes in the plastic on a per acre basis. This can't help much with fumigant containment, and with open expressions of neighbor appreciation of agriculture if it should outgas. The longer the fumigant is contained in the soil, the better the pest control achieved and greater the improvement to crop yield response that should be expected. I suppose it is possible to glue new plastic tops to the old bed to help resolve the issue, but mulch integrity later in the season may degrade to become a significant problem. Prudence requires field trialing on a limited basis. Growers should not roll the dice on the entire farm. Killing a few nematodes at the end of the season with a crop termination chemical requires no concern, no real risk of failure. Growers should be satisfied with just knocking the population down. Relying on the single tape treatment to protect a high value crop for up to 6 months for the fall 2008 crop is quite a different story requiring a quantum leap of faith. There are other significant constraints and restrictions which must be considered before one decides to turn down this road. This will not be the last word on this subject before fall.

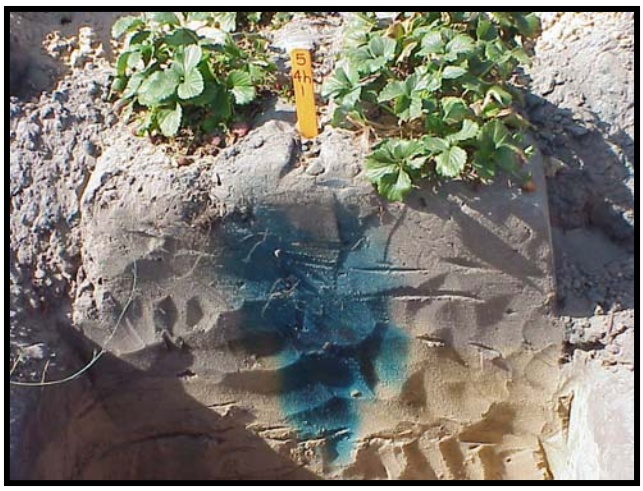

Figure 1. *Cross-sectional view of a strawberry bed using a blue dye to map movement of irrigation water in soil from a single drip tape after a four hour injection period.*

The use of trade names in this publication is solely for the purpose of providing specific information. It is not a guarantee or warranty of the products names and does not signify that they are approved to the exclusion of others of suitable composition. Use pesticides safely. Read and follow directions on the manufacturer's label..

UF to Sequence Strawberry Genome

Kevin Folta, UF/IFAS Horticultural Sciences

A joint effort between at least ten universities will generate the complete genome sequence of strawberry this year. The effort, led by Kevin Folta at the University of Florida and Vladimir Shulaev at Virginia Tech, utilizes the newest generation of high throughput sequencers to perform this monumental task. Upon completion the work will represent the largest genome (plant or animal) to be completely sequenced and assembled using this technology. The target completion date is September, 2008.

Why is a genome sequence important? There are many reasons with implications in the field and in fundamental science. The complete strawberry genome will provide a parts list, a comprehensive end-to-end arrangement of strawberry genes and their regulatory sequences. This information will be helpful to geneticists and strawberry breeders that wish to follow the inheritance of traits of interest from generation to generation, or possibly identify specific genes that confer resistance to pathogens, produce larger fruit, increase yield, require less fertilizer or better withstand environmental stress.

Once relevant gene sequences are discovered, favorable genes may be traced through generations using the fingerprints unveiled using molecular tools. The plants will not need to be modified with genetic engineering. The simple knowledge of a gene's function position, and a corresponding traceable fingerprint will guide important decisions of breeding programs. These strategies enhance the likelihood that new cultivars will contain traits of interest. The goal is even faster production of newer and better cultivars.

Surprisingly, the genome to be sequenced does not belong to one of Florida's favorite cultivars. Instead, the genome belongs to a wild strawberry that is genetically much simpler, a species called *Fragaria vesca.* Cytological evidence from as far back as the 1920's and contemporary findings from the University of Florida's strawberry genomics program predict that the *F. vesca* is a substantial part of the complex cultivated strawberry genome. Using this intermediate wild resource is a better starting point to tease apart the genome structure of the strawberry familiar to consumers. Even though this wild strawberry maintains one of the simplest higher plant genomes, it still is extremely large -- about ***200 million nucleotides*** (the A's, G's, C's and T's in DNA). That's ***two terabytes*** of computer text for those wishing to download it to your hard drive.

Genome sequencing will be performed using a rather random (and relatively cheap) process called "454 sequencing". The entire genome is broken into tiny runs of DNA and sequenced as millions of DNA pieces about 250 nucleotides long. Computational algorithms then stack the sequences together, identify overlaps, and assemble the short runs together in long contiguous sequences that will span the genome from one end to the other. After the sequence is fully assembled other computational methods predict the genes contained within.

Sequencing a genome with this method has substantial technical challenges. To give a sense of the magnitude of this work, if you were to print all of the strawberry sequence, single spaced it would take over 83,000 sheets of paper. If you were to lay the pages end to end, it would stretch about 15 miles. An important genetic regulator of fruit firmness may be present on a single page, 6 miles into the sequence. A fruit size gene might be found on two pages 100 feet into the sequence. In order to find needles in the haystack, you must first define what the haystack is!

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If you'd like to see what strawberry genetic information looks like please visit http://www.strawberrygenomics.com/berrytimes.htm . This page allows you to explore some of the strawberry sequence deposited by Tom Davis (U New Hampshire) and Kevin Folta (UF) last year. 1% of the genome was deposited by traditional (slow and expensive) sequencing means. Most importantly, the physical location of these long stretches has been determined using mapping techniques. Because we know the sequence and position of these 50 long runs, we can arrange the new genome sequence around them. By analogy, it is like knowing 15 pages of the sequence every 500 yards along that 15 mile stretch. These "anchors" will help properly arrange the new sequence information.

Sequencing of the strawberry genome will be a landmark for strawberry science, for studies in the Rosaceae (the strawberry's taxonomic family) and for plant science as a whole. The sequencing effort also reminds us of UF's commitment to leverage the strengths of traditional breeding and new genomics technologies to bring improved cultivars to the field, increase profitable production, and offer better berries to the consumer.

Late Blight Alert

Gary Vallad, GCREC Plant Pathology

Just to give all area tomato growers a reminder. Late blight was confirmed in Manatee and Hillsborough counties in late March. Additional samples continue to arrive in the diagnostic clinic. Late blight is caused by the fungal-like oomycete, *Phytophthora infestans*. Symptoms on tomato consist of light green, water-soaked lesions that can be circular or irregularly shaped. Disease development is favored by periods of high humidity or leaf wetness and cooler temperatures. The cool, damp evenings following a rain event and cool mornings that promote heavy dew are ideal for disease development. Under such conditions the disease can quickly spread to epidemic levels within a field in a matter of days. The mornings are a great time to scout for this disease, since the cooler temps and higher humidity promote sporulation on affected plant tissues. The white cottony growth, consisting of sporangiophores and sporangia, can often be seen on the underside of symptomatic leaves and on infected stems. The sporulation will be on the leading edge of the lesion as it enlarges. Eventually the lesion will turn black/brown before the leaf dies. Lesions can also develop on stems and fruit. Stem lesions have a similar appearance as leaf lesions, but can girdle the plant as they enlarge. Fruit lesions appear as large, light green to light brown colored, water-soaked blotches that are usually firm in texture and can show some zonation as the symptoms progress.

There are a number of products available for late blight control. A basic maintenance program of copper hydroxide with the multisite fungal inhibitors maneb, mancozeb or chlorothalonil does offer good protection. Commercial formulations with the following active ingredients can be added to your rotation for additional control/protection if needed: cymoxanil, cyazofamid, dimethomorph, fenamidone, famoxadone, propamocarb hydrochloride, ziram, and the strobilurin class of fungicides. Please read the labels carefully, since most of these products have specific limitations in the number of applications and must either be combined or rotated with other fungicides with a different mode of action. These rotations are important to avoid the development of fungicide resistance in the pathogen population.

Additional information can be found at http://www.imok.ufl.edu/plant/late_blight/. A list of pesticides labeled for tomato can be

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found at http://edis.ifas.ufl.edu/PG100.

I wish you a FRUITFUL growing season!

The Colletotrichum Crown Rot Situation This Season

Jim Mertely and Natalia Peres, GCREC Plant Pathology

Between October 2007 and April 2008, 87 strawberry samples were received at the GCREC Plant Diagnostic Lab. Fifty-two of these samples were diagnosed with crown rot. Since this was by far the most serious disease affecting Florida strawberries this season, the crown rot crown rot situation needs a complete explanation.

In Florida, crown rot is typically caused by *Colletotrichum gloeosporioides*, a fungus which infects numerous cultivated and non-cultivated plants in warmer areas of the world. Normally, strawberry runner plants produced in northern or high elevation nurseries are free of the disease, and plants become infected by spores from native vegetation shortly after planting. Infected plants begin to collapse and die in November and early December, but fewer than 5% of the plants are typically killed. Secondary spread is probably suppressed by the arrival of cooler weather and standard fungicide sprays.

This season was distinctly different. Colletotrichum crown rot samples began arriving shortly after planting in October and were diagnosed in increasing numbers through November. Up to 40% of the plants in some fields were ultimately killed, resulting in unavoidable production losses. Most early-season cases of crown rot (particularly those with high plant mortality) developed on runner plants from North Carolina nurseries. Over the entire season, 65% of all crown rot samples were associated with plants from that state.

Based on previous experience with this disease, we recommended starting fungicide applications as soon as possible after establishment. This recommendation is based on experiments and observations that showed that regular applications of captan or thiram were highly effective in preventing disease spread to healthy plants. Unfortunately, fungicide sprays this season did not prevent the death of plants previously infected in the nursery. Problems also occurred with replacement of dying plants with Canadian transplants. Canadian transplants are normally free of *C. gloeosporioides*, but are not immune to infection by spores or other inoculum at the planting site. Thus, some resets planted in fields damaged by crown rot eventually succumbed to the disease.

Collectotrichum crown rot has plagued southern nurseries for decades and is one of the factors that contributed to the demise of the strawberry nursery industries in Florida and Louisiana. Strawberry runner plants from high-altitude nurseries in North Carolina and Virginia have generally escaped the disease, but a similar situation developed in the late 1970s. Hopefully, with the recent establishment of a clean plant program, more stringent production practices, and additional research, the North Carolina nursery industry will overcome this disease problem and produce plants free of *C. gloeosporioides* in the future.

OPEN BURNING OF AGRICULTURAL PLASTIC

In March 1993, the Environmental Protection Commission of Hillsborough County revised Chapter 1-4, Open Burning Rule, to allow the open burning of agricultural plastic used primarily by commercial strawberry and tomato growers in mulch and string applications. There are some restrictions that apply, and some guidelines which should be followed:

The following restrictions must be observed:

- Only polyethylene plastic is authorized for burning.
- The burning must occur between 9AM and 1 hour before sunset; fires must be completely extinguished 1 hour before sunset.
- The burning must be conducted so that no nuisance, excessive smoke or odor, or excessive smoldering occurs.
- The burning must be under constant supervision.
- The burn area must be free of fire hazards, such as overhanging trees.
- The burning must occur at least 100 feet from any public road to avoid visibility problems.
- The plastic must be dry, and cleaned of dirt and other debris or contaminants prior to burning.
- The piles must be at least 30 feet away from surface waters.

The following guidelines should be observed:

- The best way to conduct this type of activity is to burn the plastic in many small piles, such as at the end of every other crop row at the farthest point from any road.
- Pile size should be limited to 10 feet in diameter and 5 feet in height.
- The number of piles should be limited to ensure proper control.
- A means of extinguishing the fire should be available on-site at all times.

THERE ARE RESTRICTIONS ON OTHER FORMS OF OPEN BURNING IN HILLSBOROUGH COUNTY. PLEASE CALL THE DIVISION OF FORESTRY AT 863-648-3160, OR THE EPC AT 813-627-2600 FOR MORE INFORMATION.