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Berry Vegetable Times
Fall 2014

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See Christine Cooley at the Front Desk during the show.

2014 Calendar of Events

Hillsborough County Extension Office Pesticide License Testing. Third Tuesday of each Month- Starts at 9:00am. 5339 CR 579, Seffner. Bring a photo ID.

Nov. 5, 2014. 9th Ag Expo, GCREC. More information in newsletter.

Dec. 2, 2014. Strawberry grower meeting: Update on SWD, thrips and spider mite management. Trinkle Building, HCC, Plant City. 12:30- 3:30. Sponsored by DOW Chemical. Contact Alicia Whidden for info: (813) 744-5519

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Control Water Runoff At Transplant Time

Alicia Whidden and Jemy Hinton, Hillsborough County Extension and IFAS BMP Implementation

During the transplant time the Southwest Florida Water Management District (SWFWMD) usually receives about 100+ complaints of water running off the strawberry farms due to the overhead sprinklers we use to establish our strawberry plants. Members of SWFWMD asked us to remind growers to be very aware of this issue and take precautions to keep the water from the overhead sprinklers from leaving the field. As strawberry growers, you do have the right from the Water District to use 12-14 inches of water for plant establishment but that does not allow you to impact property downstream from you. All the rain we have had right before transplanting is going to give us problems as the ground is saturated and many ditches still have water in them. Neighbors will be extra sensitive about our running sprinklers to establish the plants. Controlling excess water will pose a challenge this year. Control sediment movement into ditches so that sediment does not get into waterways. Please pay close attention to turn on and off times so that we only run when necessary and shut off as soon as the sun starts going down. If temperatures turn cool again then water may not be needed as early or late in the day so that you can decrease the volume of water you are using. Also GCREC research showed that spraying transplants with kaolin clay solutions after the seventh day after transplanting allowed you not to need more overhead irrigation unless the weather turned very hot and then it was only needed for a short time at mid-day. This could be used on the higher parts of your fields where you can get a tractor in on wet ground. Newer farms may have a tail water recovery pond that catches and recycles the water to help avoid this problem. If your farm has an on-going problem every year with water leaving the field you may want to take advantage of the cost share programs the Water District has to construct a tail water recovery pond to conserve water and help deal with water movement off-site. These type of projects are handled by the SWFWMD FARMS group. The manager is Ed Craig and he can be reached at 1-800-320-3503 ext. 6556. FARMS will cost share on pumps, filters, etc. but not the excavation of the pond but that can be considered part of the growers cost share portion. Also Jessica Stempien of FDACS, Office of Ag Water Policy, has new cost share money. This can also be used for tail water recovery ponds as well as many other projects for your farm. The number to reach Jessica is 813-985-7481, ext. 2125.

Monitoring for Spotted Winged Drosophila in Florida Strawberry Fields

Oscar Liburd, Rebecca Barocco, Teresia Nyoike—UF/IFAS Gainesville and Alicia Whidden, Hillsborough Co. Extension

The Spotted wing drosophila (SWD), *Drosophila suzukii* (Matsumura), is a fairly new invasive insect pest in North America causing damage to a wide range of fruit crops, including but not limited to blueberries, strawberries, blackberries, raspberries, cherries, plums, peaches, and grapes. This pest belongs to the same family of drosophilids as the common vinegar, pomace, and fruit flies and is normally attracted to decaying or rotten fruits. However unlike other drosophilids, SWD lays an egg into the ripening fruit and the larva develops inside the fruit preventing it from being marketable.

The first discovery of SWD in the continental U.S. was during 2008 in California and since that time the insect has spread rapidly throughout North America. SWD was first recorded in Florida during August 2009 in the northeast corner of Hillsborough County and has spread to over 28 Florida counties. Although fairly high levels of SWD have been recorded in other small fruit crops in Florida including blueberries and blackberries a formal survey for SWD has not been conducted in strawberries. During the 2013/2014 strawberry season, we surveyed strawberry fields in central (Plant City) and North-Central Florida (Alachua and Bradford Counties).

Fig. 1

The SWD was monitored in the field using apple cider vinegar (ACV) and yeast sugar water baited traps. These traps were deployed on 16 farms in Plant City (Hillsborough County), 6 farms in Bradford County, and 4 farms in the Alachua County, Florida. The sampling in the Plant City area was conducted between January 22 and March 24, 2014. Sampling dates were February 9-10, February 23-24, March 9-10, and March 23-24. The farm size ranged from 0.5 to 100 acres. Depending on field size, each site had from 3 to 5 traps. Traps were set up in the field (within or near strawberry plants) and others were set up on the perimeter of the fields (Fig. 1). In Bradford and Alachua Counties, sampling was conducted every two weeks between February 25th and May 6th 2014.

We captured SWD on 50% (8 of the 16) farms sampled in Plant City (Table 1). On the 3rd sampling date (March 9-10) no SWD was caught in the traps which was likely due to growers applying insecticides to their crops. After discussing our initial findings (from trap counts 1 & 2) with Plant City growers many of them embarked on a spraying program. In Bradford and Alachua counties at least one SWD adult (either a male or a female) was recorded on each farm during each sampling period (Fig. 2). We randomly collected berries from strawberry fields in Bradford and Alachua Counties and found that approximately 30% of the berries were infested with SWD. Our results indicated higher captures of SWD in perimeter traps at the end of the season. This may suggest that SWD flies might be moving into adjacent woodlands to find other hosts at the end of the season.

Table 1: Mean number of spotted wing drosophila (SWD) collected per strawberry farm (A-P) on each sampling time noted as collection 1-4 alongside the means for the entire season. All the farms were within Plant City, Florida principal strawberry growing area.

Farms	Number of SWD per trap				
	Feb 9-10	Feb 23-24	Mar 9-10	Mar23-24	Average over season
A	0	0	0	0	0
B	1. 7	0	0	0.5	0.6
C	0	0	0	0.5	0.1
D	10	0.7	0	0.8	2.9
E	0	0.3	0	4.4	1.2
F	0	0	0	0	0
G	0	0	0	0	0
H	0	0.7	0	0	0.2
I	0	0	0	0	0
J	0	0	0	0	0
K	0	0	0	0	0
L	0.3	0	0	0	0.1
M	2.3	0.3	0	0.4	0.8
N	0.3	0	0	1.8	0.5
O	0	0	0	0.5	0.1
P	1.5	0	0	0.2	0.4

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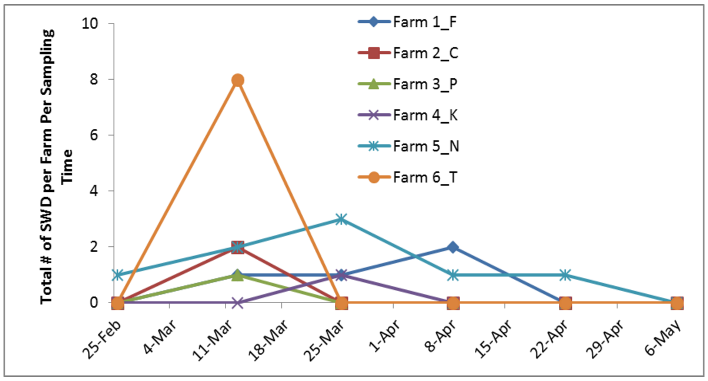

Fig. 2: Total number of SWD adults captured in each of the six farms in Bradford County

The SWD is best controlled using integrated pest management (IPM) techniques. This includes effective monitoring, using cultural techniques, and the use of selective pesticides. The use of cultural techniques involves frequent harvesting and the removal of susceptible hosts that are adjacent to strawberry fields. Spotted wing drosophila is very susceptible to insecticides from the following classes; organophosphates, pyrethriods, and Naturalytes (Spinosad and Spinetoram). Pesticides should not be sprayed before detecting SWD in monitoring traps and should be rotated with pesticides from other classes to prevent resistance build-up.

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Potential Water Savings Using Sprinkler Irrigation for Cold Protection of Strawberries

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Strawberries are a very important crop for the U.S., which is the largest producer in the world, and furthermore for Florida, which ranks second after California (FAOSTAT 2013). Sprinkler irrigation is commonly used to establish the strawberries after planting and during the winter to protect them from cold damage. In 2010, extreme cold events occurred in the Dover/Plant City area, where the main strawberry industry is located, causing the aquifer to drop 60 ft in certain locations, impacting about 750 residential wells. Approximately 140 sinkholes were reported (SWFWMD 2012).

During a cold night, when temperature starts to drop below freezing, cold damage mainly occurs due to intracellular freezing in the plants, i.e. when ice crystals form inside the protoplasm of cells (Westwood 1978). Therefore, sprinkler irrigation is used for protection under the principle of "latent heat of fusion." This refers to the heat that is released as water freezes on plant surfaces, increasing the surrounding temperature (Snyder and de Melo Abreu 2005a). This release of heat must be constant in order to keep the temperature above the plant's critical temperature, which is the point cold damage occurs.

Fig. 1. Strawberry blossom protected using sprinkler irrigation. PSREU, Citra, 2013. Photo credit: M. Gutiérrez.

The application rate (AR), or the amount of water needed for cold protection should provide enough heat to compensate as much as is lost through evaporation and other losses (Snyder and de Melo Abreu 2005b). Many models have been developed in order to determine the sufficient AR to protect the crops. This rate depends on plant's critical temperature, crop and stage of bud development (Boyce and Strater 1984) and is influenced by minimum temperature, wind speed (Gerber and Martsolf 1965; Gerber and Harrison 1964), and relative humidity (RH) (Barfield et al. 1981) as well as the sprinkler rotation speed (Wheaton and Kidder 1965). A table of recommended ARs was established by Gerber and Martsolf (1965) based on a previous citrus model developed by Gerber and Harrison (1964). The recommended AR for cold protection (0.25 in hr^{-1}) is based on the citrus modeling and has been used

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successfully. However, it has not been verified whether lower rates are effective. Lower rates require less water.

The objective of this project was to evaluate a range of ARs for cold protection on water savings and strawberry yield. An alternate objective was to evaluate temperature and RH technologies to control irrigation for cold protection.

A field experiment was conducted during two seasons: 2011-12 and 2012-13 at the University of Florida/Institute of Food and Agricultural Sciences (UF/IFAS) Plant Science Research and Education Unit (PSREU), near Citra, FL. "Strawberry Festival" bare-root transplants were planted in staggered rows during early October in both seasons. Beds were previously fumigated; pesticides and fertilizer applications were performed according to existing recommendations (Peres et al. 2010). Sprinkler irrigation was used for crop establishment and cold protection was provided using Wade Rain WR-32 impact sprinklers with 9/64 in nozzles for low volume applications(Wade Rain Inc. 2007).

Testing areas consisted of five rows planted with strawberries at each plot, where the three middle rows constituted the harvest areas used for data analysis. USDA (2006) guidelines were followed to classify and weigh yield from biweekly harvests (Fig. 2).

Fig. 2. Yield weighing process. PSREU, Citra 2013. Photo credit: M. Gutiérrez.

Five treatments were developed to assess the effectiveness of sprinkler irrigation ARs for cold protection varying the system pressure, sprinkler spacing and irrigation controllers: (i) GROW: used 50 psi, 48 ft. sprinkler spacing and thermostat or resistive thermo devices (RTDs) to control irrigation, mimicking grower's cold protection practices ("grower practice"); (ii) AC: evaluated an automated irrigation system triggered by temperature and RH wireless sensors using 50 psi and 48 ft. spacing (iii) LOW: tested 30 psi at 48 ft. sprinkler spacing, representing a low pressure/AR scenario, (iv) SPC: evaluated a 50 psi and 40 ft. spacing between sprinklers, this being close to the manufacturer data for ideal overlap at low pressures, and (v) NO/ control treatment: the non-irrigated plots used for comparison against irrigated treatments.

Temperature was monitored at each plot using cooper-constantan thermocouples (Fig. 3). Irrigation on the GROW, LOW and SPC treatments was controlled by a thermostat (2011-12) and resistive thermo devices (2012-13), mimicking grower's practices. This was referred to as "grower practice irrigation". Irrigation on the AC treatment was controlled by temperature and RH wireless sensors based on calculated dew point temperature (DP) and critical strawberry blossom temperature (31°F) (Fig. 3).

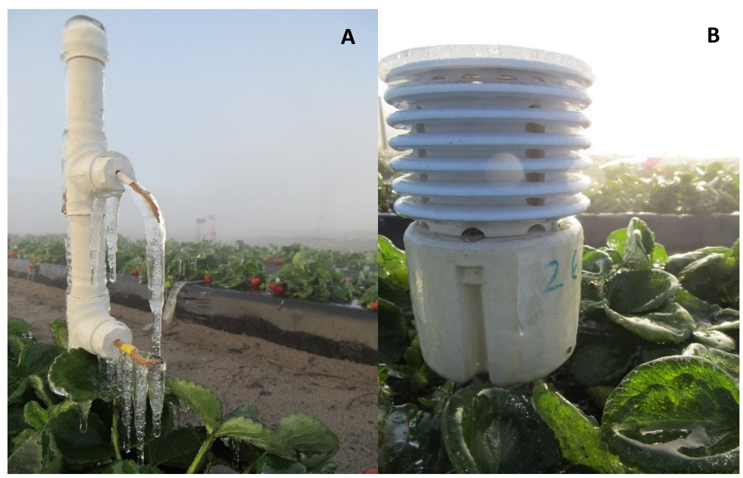

Fig. 3. Thermo-couples (A) and temperature and RH wireless sensors (B). PSREU, Citra 2013.

2011-12 Season

During the first season, a total of 23 harvests were performed (Dec. 2011 – March 2012). The first extreme cold events took place on 2 – 5 January 2012, reaching a minimum leaf and DP temperatures of 16.7°F and 8.8°F. A total of 33.5 hours occurred below strawberry blossom critical temperature; therefore, grower practice irrigation ran during 29.2 hours and AC irrigation for 33.7 hours in order to protect the crop. These extreme

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cold events impacted all treatment yields negatively; however, only the irrigated treatments recovered quickly afterwards. By contrast, the NO treatment did not show a yield recovery resulting in the lowest total treatment mean yield (0.36 ton acre^{-1}; Table 1). Table 1 shows the yield and irrigation results from 2011-12 and 2012-13 seasons. Statistical differences in yield were found only between the irrigated treatments versus the NO treatment/control, which resulted in 74%, 73%, 70% and 70% lower yield than AC (1.39 ton acre^{-1}), LOW (1.33 ton acre^{-1}), SPC (1.20 ton acre^{-1}) and GROW (1.19 ton acre^{-1}) treatments, respectively (Table 1).

On 14 - 16 January 2012, 28.8 hours reached critical levels for strawberry blossoms where leaf and DP temperatures dropped to a minimum of 23.2°F and 24.1°F respectively. An average of 27.4 hours of irrigation were applied. Later on during the season, more cold events occurred; however, yield was only slightly impacted since temperature did not reach critical levels. However, consecutive cold events occurred on 12 - 14 February 2012, reaching 20.3°F and 12.4°F as the lowest leaf and dew point temperatures. Grower practice and AC irrigation applied water during critical temperatures for 19 and 24.7 hours, respectively.

During the harvesting season, grower practice irrigation was activated on 16 cold events (98.4 h); whereas, AC irrigation on ten cold events (93.8 h). In terms of irrigation for the first season, the treatment comparison versus grower's practices (i.e. GROW treatment) shows water savings up to 22% and 5% by LOW and AC treatments, respectively. However, 44% extra water applied by SPC treatment. Nevertheless, no differences in yield were present among the treatments (Table 1).

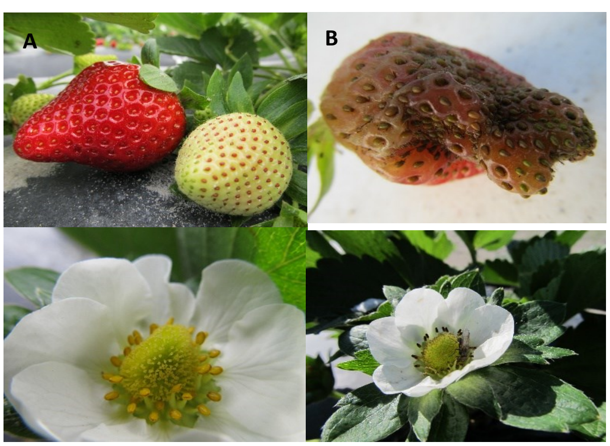

Fig. 4. Fruits and flowers effectively protected from cold damage using sprinkler irrigation (A). Non-protected

2012-13 Season

A total of 22 harvests (Jan. 2012 - March 2013) were performed during the second season. Yield production decreased as a result of damages due to cold temperatures. Particularly, the irrigated treatments showed a fast recovery in yield after the cold events. During 2012-13 season mild temperatures predominated; thus, the NO treatment yield could recover; however it decreased as soon as severe cold events happened.

During the second harvest season, the grower practice irrigation was activated during 16 cold events, whereas AC irrigation was triggered for only 12 events. Cold events occurred on 22 - 31 December 2012 where leaf and DP temperatures dropped to 24˚F and 19.8˚F; respectively (Table 2). Within this period, grower practice and AC systems irrigated 32.8 and 33.9 cumulative hours. Temperature fell below critical 20.5 hours. Mild temperatures predominated until new cold events occurred 22 - 24 January 2013. Grower practice irrigation was applied for 15.3 hours and AC irrigation for 5.7 hours. Air and DP temperatures were 28˚F and 29˚F, respectively, but only one hour of irrigation was triggered to protect the strawberries from critical damage. Afterwards, irrigated treatments presented a significant higher yield in comparison to the NO treatment. Five cold events occurred within 31 January - 5 February 2013 (Table 2). Leaf temperature reached a minimum of 28˚F. Grower practice irrigation and AC irrigation were on for 40 and 29 hours; however, only 6.8 and 3.8 hours occurred below critical temperature. The lowest temperatures reached during the 2012-13 season occurred in 17 – 18 February 2013 (Table 2). Minimum leaf and DP temperatures dropped to 21°F and 16°F. Thus, grower practice and AC irrigation ran for 19 and 22 hours; respectively and approximately 18.6 hours fell below critical temperature. The last cold events occurred within 2 -8 March 2013. Minimum air and DP temperatures fell down to 24˚F and 26˚F. Grower practice applied 38.8 hours of cumulative irrigation, while the AC only 26.4 hours, from which 16.5 and 13.3 hours were applied during critical temperatures (Table 2).

In terms of water savings during the 2012-13 season, water savings were achieved in comparison to grower's practices: AC treatment saved up to 23%, LOW treatment achieved 22% water savings and, by the contrary, SPC applied 44% excess water through irrigation. However, results showed no differences in yield on the treatments that used irrigation; differences

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in yield were found only versus the non-irrigated plots. The NO treatment/control (0.57 ton acre^{-1}) resulted in 54%, 53%, 51% and 51% lower mean yield than LOW (1.23 ton acre^{-1}), AC (1.21 ton acre^{-1}), SPC (1.17 ton acre^{-1}) and GROW (1.16 ton acre^{-1}) treatments respectively (Table 1).

Conclusions

Sprinkler irrigation was an effective method to protect strawberries during the 2011-12 and 2012-13 winter seasons in Florida. No yield differences were found between the irrigated treatments; only versus the NO/control treatment although irrigation volume differences were found among the treatments using irrigation.

An automated control irrigation system (i.e. AC treatment) can be used to measure more accurate real time leaf temperature for cold protection saving up to 23% of water through irrigation. Furthermore, reducing the irrigation system pressure from 50 to 30 psi achieved water savings up to 22% in both seasons. Thus, considering the 8,800 acres of strawberries planted in Florida in 2010 (USDA 2013), an estimated average of 5.1 billion gallons of water can be saved every strawberry season. Reducing the sprinkler spacing from 48 ft. to 40 ft. resulted in a 44% extra water applied or an average of 10 billion gallons of water per strawberry season in Florida and without differences in yield.

In comparison to the 2009-10 season with extreme low temperatures, the 2011-12 and 2012-13 seasons presented 56% and 78% less hours below freezing; considering the years under evaluation as "mild" years. Based on these temperature conditions, the LOW treatment can be considered as a high potential water saver (22% in both consecutive years) by reducing the pressure in the irrigation system; also decreasing the recommended cold protection AR by 64%. Nevertheless, if lower temperatures predominate, higher ARs might be needed in order to provide more heat to keep temperature above critical levels and avoid cold damage. Hence, SPC treatment may be considered for further research under severe cold conditions.

Table 1. Summary water applied and water savings per treatment during two years of field results. PSREU, Citra, FL.

Treat.	Press. (psi)	Irrigation Mgal acre^{-1}		Mean yield (ton acre^{-1})		Water Savings (%)	
		*Yr. 1	Yr. 2	Yr. 1	Yr. 2	Yr. 1	Yr. 2
AC	50	1.87	2.48	1.39 a	1.21 a	5	23
GROW	50	1.96	3.21	1.19 a	1.16 a	0	-
LOW	30	1.52	2.49	1.33 a	1.23 a	22	22
NO	-	-	-	0.36 b	0.57 b	100	100
SPC	50	2.82	4.63	1.20 a	1.17 a	-44	-44

Ton (short, U.S.) = 2000 lbs.
* Yr. 1 and Yr. 2 corresponds to the 2011-12 and 2012-13 seasons, respectively.
Different letters within a column correspond to statistical differences between treatments.

Table 2. Minimum temperature, weather data recorded and hours of irrigation during severe cold events occurred during 2011-12 and 2012-13 seasons.

Season	Dates	Minimum Temp. (°F) *Air	*DP	**Leaf	Avg. wind speed (mph)	Hrs. < TC (<-31°F)	Irrigation Hrs. GP	AC
2011-12	3-5 Jan.	19.0	8.8	16.7	3.4	33.5	29.2	33.7
	14-16 Jan	26.1	24.1	23.2	1.0	28.8	26.9	27.9
	12-14 Feb	25.5	12.4	20.3	4.3	22.0	19.0	24.7
Total						84.3	75.1	86.3
2012-13	22-31 Dec	27.0	19.8	24.1	2.9	20.5	32.8	33.9
	22-24 Jan	30.7	29.1	28.0	0.9	6.8	15.4	5.7
	31 Jan-05 Feb	30.2	28.2	27.9	0.9	12.0	39.9	28.9
	17-18 Feb	22.1	15.8	21.2	2.0	19.0	19.1	22.0
	2-8 March	26.4	26.1	24.4	1.8	16.0	38.8	26.4
Total						74.3	146.0	116.9

*Air temperature data recorded at 6.6 ft. from FAWN weather station, Citra, FL.
**Leaf temp. measured by thermocouples at the experimental field.
GP and AC= Grower practice and AC treatment irrigation systems

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Susceptibility of *Bemisia tabaci* to Group 4 Insecticides

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Tomato yellow leaf curl virus (TYLCV) is a geminivirus that is persistently vectored by the silverleaf whitefly, *Bemisia tabaci* biotype B. TYLCV can cause up to 100% loss of the crop. Growers manage TYLCV by destroying crop residues and other virus reservoirs, by using reflective mulches and virus-tolerant tomato varieties when appropriate (Schuster et al. 2008). Insecticide treatments are a key component of managing silverleaf whitefly and TYLCV. *Bemisia tabaci* has demonstrated the ability to develop resistance to many types of insecticide. Globally, the silverleaf whitefly is ranked among the top ten arthropod pests with regard to documented insecticide resistance (FAO 2012).

Since the early 1990s, when imidacloprid (Admire) first became available to Florida tomato growers, the neonicotinoid group of insecticides has played a central role in management of whitefly viruses. Schuster et al. (2009) documented widespread but uneven tolerance of the silverleaf whitefly to imidacloprid and thiamethoxam (Platinum) in Florida's tomato growing regions. Dinotefuran (Venom, Scorpion) received EPA registration in 2004. Periodic monitoring of whitefly susceptibility to neonicotinoids is necessary to inform growers and crop protection professionals regarding shifts in efficacy. Among new materials nearing registration for management of whitefly and TYLCV is flupyradifurone (Sivanto), a butenolide insecticide from Bayer Crop Science. Sivanto has a similar mode of action to neonicotinoids. It is described as comparatively safe for pollinators. Bayer expects to have Florida registrations for Sivanto in 2015. In order to monitor the efficacy of Sivanto over time, it is necessary to collect baseline susceptibility data on the insecticide before it is released.

In January 2014 the Vegetable Entomology lab at GCREC began collecting whitefly populations from commercial tomato fields in central and south Florida and testing them for susceptibility to the Group 4 insecticides dinotefuran, flupyradifurone, imidacloprid, and thiamethoxam. A standard metric for evaluating and comparing the efficacy of insecticides is the LC_{50}, which is the concentration of an insecticide needed to kill 50% of test insects. LC_{50}s are measured in milligrams active ingredient per liter, which can also be expressed as parts per million (ppm). LC_{50}s are used to calculate the resistance ratio, which is the LC_{50} of a field population divided by the LC_{50} of a laboratory colony known to be susceptible to the insecticide being tested. LC_{50}s can also be used to calculate Relative Potency Estimates, which indicate how many times more effective one active ingredient is than another. We present preliminary results here for trials that are ongoing.

Materials and Methods

Each trial consists of four pesticides at six active ingredient concentrations (0.0, 1.2, 4.7, 18.8, 75.0, and 300 ppm) derived by serial dilution. All treatments are replicated four times. Populations of whitefly are

(Continued on page 8)

collected from end of season commercial tomato fields. Lanai tomatoes on which field populations are established are confined in cages in growth rooms at GCREC with cotton plants. Mortality is tested at 24, 48, and 72 hrs and analyzed using Probit on IBM/SPSS version 22 software. We present results for select trials at 72 hrs.

Results

Population testing began in January 2014 and as of October 2014 ten populations have been tested. Populations have been tested from as far north as the Balm area in west central Florida to Homestead in the southern portion of the state. Analysis of four field colonies and the susceptible colony are presented to illustrate the range of tolerance levels observed in the field in Tables 1-3. LC_{50}s are listed in Table 1. The highest LC_{50}s measured were for Admire (imidacloprid) and ranged from 7.84 to 23.56. The lowest LC_{50}s measured for a registered insecticide were for Venom (dinotefuran), ranging from 0.18 to 1.05. LC_{50}s for Platinum (thiamethoxam) ranged from 3.31 to 11.80. LC_{50}s for Sivanto (flupyradifurone) ranged from 0.12 to 0.48. The expected registration date for Sivanto is 2015.

Resistance ratios are presented in Table 2. Resistance ratios for Admire ranged from 8.0 for a Balm population to 24.3 for a population near Vero Beach. Resistance ratios for Platinum ranged from 13.8 for a Balm population to 49 for a population from Homestead. Resistance ratios for Venom ranged from 1.2 to 7.5. There is considerable variability among populations tested with regard to susceptibility to Admire, Platinum, Venom and Sivanto. Resistance ratios calculated for Admire and Platinum are within the range of values calculated by Schuster et al. (2009), who presented results based on 24 hours after treatment. Data for Sivanto are provided for comparative purposes. The relative potencies of Sivanto, Platinum and Venom compared to Admire are presented by population in Table 3. For each site, the ranking of potency from least to most potent was Admire, Platinum, Venom, Sivanto. This research was funded by the Florida Tomato Institute and Bayer Crop Science.

If you are a tomato grower and are interested in allowing us to collect whitefly from your fields for testing, please contact Hugh Smith at hughasmith@ufl.edu, tel.: 813-633-4124. Participation is anonymous, and will contribute to development of guidelines for managing whitefly, TYLCV, and the development of resistance.

Table 1. LC_{50}s (ppm of ai.) for *Bemisia tabaci* populations after 72 hours of exposure to group 4 insecticides.

B. tabaci population	Insecticide Trade Name			
	Admire	Sivanto	Platinum	Venom
	ppm of active ingredient			
Lab colony (susceptible)	0.97	0.03	0.24	0.14
Balm 1	7.84	0.21	3.31	0.61
Ruskin 1	14.86	0.34	8.62	0.51
Vero 1	23.56	0.12	3.63	0.18
Homestead 1	11.90	0.49	11.81	1.06

Table 2. Resistance ratios of *Bemisia tabaci* populations ($LC_{50\ \text{Test population}}/LC_{50\ \text{Susceptible population}}$) for group 4 insecticides after 72 hours of exposure.

B. tabaci population	Insecticide Trade Name			
	Admire	Sivanto	Platinum	Venom
Balm 1	8.0	7.0	13.8	4.4
Ruskin 1	15.3	11.3	35.9	3.6
Vero 1	24.3	4.0	15.1	1.3
Homestead 1	12.2	16.3	49.2	7.6

Table 3. Relative median potency estimates ($LC_{50\text{Insecticide B}}/LC_{50\text{ insecticide A}}$) of group 4 insecticides on *Bemisia tabaci* populations after 72 hours of exposure.

Insecticide A	Sivanto	Platinum	Venom	Sivanto	Venom	Sivanto
Insecticide B	Admire	Admire	Admire	Platinum	Platinum	Venom
B. tabaci population	No. of times more potent insecticide A is than insecticide B.					
Lab colony (susceptible)	38.4	4.0	7.1	9.5	1.8	5.4
Balm 1	36.8	2.4	12.9	15.5	5.5	2.9
Ruskin 1	43.9	1.7	29.1	25.5	16.9	1.5
Vero 1	198.7	6.5	134.4	30.6	20.7	1.5
Homestead 1	24.5	1.0	11.2	24.3	11.2	2.2

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Sensation™ Brand 'Florida127' Strawberry

Vance M. Whitaker and Natalia A. Peres, UF/IFAS
Gulf Coast Research

'Florida127' (U.S. PPAF) is a new strawberry cultivar released from the University of Florida in 2013, the fruit of which are eligible for marketing under the Sensation™ brand. This cultivar was originally trialed as breeding selection FL 09-127. 'Florida127' originated from a 2009 cross between WinterStar™ 'FL 05-107' (female parent) and unreleased breeding selection FL 02-58 (male parent). It has been tested over several years in field plots at the University of Florida Gulf Coast Research and Education Center (GCREC, Balm, FL), at the Florida Strawberry Growers Association (FSGA) headquarters in Dover, FL and on several commercial farms. Data from these trials have been used to generate the following information and recommendations to help growers obtain optimum performance of this cultivar in west-central Florida. Comparisons are made to the current industry standard cultivar 'Florida Radiance' (Chandler et al., 2009) and also to 'Strawberry Festival' (Chandler et al., 2000) for some disease resistance comparisons.

Fig.1. 'Florida 127' growing in Dover, FL.

Fruit and Plant Characteristics

'Florida127' is a short-day plant adapted to annual, winter plasticulture growing systems. The plant is moderately compact, robust and upright with long pedicels, making the fruit easy to harvest (Fig. 1). It produces conic to broad-conic fruit that are uniform in shape throughout the season, resulting in few non-marketable fruit. A small internal cavity has been observed in some primary fruits, but rarely in secondary or tertiary fruits.

Fruit size is very large, exceeding that of 'Florida Radiance' on average over the course of the season. Fruit firmness is slightly greater than that of 'Florida Radiance', with excellent shelf life. The resistance of 'Florida127' to water damage is less than 'Florida Radiance', with some cracking of ripe fruit observed and/or a pale, water-soaked spot when standing in water on top of the plastic mulch. While cull fruit due to water damage have been greater for 'Florida127' than for 'Florida Radiance', cull fruit due to small size have been lower, resulting in overall lower cull rates for 'Florida127'.

The external color of the fruit is bright red that appears lighter than 'Florida Radiance' and does not darken overly late in the season (Fig. 2). Since the fruit is firm and develops external color gradually, growers should adjust picking schedules to allow optimum external color development. We estimate that the picking interval should be one day longer for 'Florida127' than for 'Florida Radiance' at most points during the season.

Fig. 2. 'Florida127' has larger size and lighter color than other Florida varieties, and growers are encouraged to adjust picking schedules to obtain optimum color.

The ripe fruit of 'Florida127' have excellent flavor and aroma. Soluble solids contents of 'Florida127' fruit were significantly higher than that of 'Florida Radiance' on six out of seven harvest dates tested. Titratable acidity was not significantly different from 'Florida Radiance'.

Field Performance

Early and total season yields of 'Florida127' have been very similar to 'Florida Radiance' in multiple years of testing, both in experimental and on-farm trials. When planted early in the planting period, no overly-elongated fruit have been observed, in contrast to 'Florida Radiance' which can produce elongated fruit when planted early in west-central Florida and exposed to hot weather in October and early November. 'Florida127' planted between September 25 and October 1 has performed very well in GCREC field plots. Growers are encouraged to experiment with planting dates between September 25 and October 10. Because this variety is more vigorous than 'Florida Radiance' in-row spacing of 15-16 inches is recommended, especially at early planting dates.

Fertilization

Field studies and observations suggest that 'Florida127' does not require as much nitrogen (N) fertilization during the first few weeks of establishment and growth as 'Florida Radiance' in order to produce high early and total yields. This variety also appears to respond more strongly to N application in terms of vegetative growth compared to 'Florida Radiance.' Growers should therefore carefully monitor N fertilization to prevent excess growth, particularly early in the season. For this reason, pre-plant N fertilization is not recommended. Previous research has indicated that other Florida cultivars do not require pre-plant N fertilization (see http://edis.ifas.ufl.edu/pdffiles/HS/HS37000.pdf), and it is expected that 'Florida127' will follow the same pattern. In mid- to late-season, 'Florida127' should be able to tolerate higher N rates than 'Florida Radiance' due to its higher fruit firmness, and rates of 1 lb N/acre/day should usually be possible without negatively impacting fruit quality.

Disease Management

'Florida127' is considered highly resistant to *Colletotrichum acutatum* (causal agent of anthracnose fruit rot), similar to 'Florida Radiance' (Seijo et al., 2011). More information about anthracnose can be found at: http://edis.ifas.ufl.edu/pdffiles/PP/PP13000.pdf. 'Florida127' may be more susceptible to Botrytis fruit rot than 'Florida Radiance' based on observations of grower trials, though in GCREC trials the two varieties are not significantly different for Botrytis incidence (see http://edis.ifas.ufl.edu/pdffiles/PP/PP15200.pdf for more information on Botrytis). Plant size management is a key for Botrytis resistance, with overgrown plants trapping moisture and humidity that promotes epidemics. Therefore careful monitoring of N fertilization, particularly early in the season and on soils with higher organic matter, is crucial.

Fungicide applications for the control of Botrytis fruit rot should target the peak bloom periods. As for all varieties, applications of Switch should be reserved for environmental conditions that are highly conducive for Botrytis. A web-based disease forecast system to aid growers on timing of fungicide applications for control of anthracnose and Botrytis fruit rots has been developed and is available at http://agroclimate.org/tools/strawberry/. More information on the system is available at: http://edis.ifas.ufl.edu/pdffiles/AE/AE45000.pdf.

Early indications from naturally infected trials indicate that 'Florida127' is more susceptible to *Podosphaera aphanis* (causal agent of powdery mildew disease) than other Florida varieties. Early control at the first sign of foliar signs or symptoms is recommended.

Based on inoculated trials, 'Florida127' is highly susceptible to crown and root rots caused by *Phytophthora cactorum*. Thus, fruit growers are strongly encouraged to take the same precautions against *P. cactorum* infection as they would for 'Florida Radiance'. Metalaxyl, the active ingredient in Ridomil Gold®, is highly effective and should be injected through the drip tape as soon as plants are established. Two applications may be needed to treat an infected crop. Products containing potassium phosphite or potassium salts of phosphorus acid are alternatives that should generally be applied as foliar sprays, although some are also labeled for drip application. Members of this group are not curative and multiple applications may be needed beginning immediately after plant establishment. Early season plant collapse can also be caused by *Colletotrichum gloeosporioides* (causal agent of Colletotrichum crown rot) and *Macrophomina phaseolina* (causal agent of charcoal rot) and symptoms are virtually indistinguishable to those of Phytophthora crown rot. Inoculated trials indicate that 'Florida127' is more resistant to Colletotrichum crown rot than 'Florida Radiance' (Seijo et al., 2014) and has similar resistance to charcoal rot. To identify the causal agent of plant wilt and collapse, growers are encouraged to submit a sample to the UF Plant Diagnostic Lab at GCREC where the pathogen will be isolated and identified, and control recommendations will be provided.

Summary

'Florida127' is a promising new cultivar for west-central Florida growers due to its early yield, robust plant habit, and its excellent fruit size and eating quality. Based on research trials at the GCREC and in commercial fields, the following main recommendations can be made:

Growers can experiment with early planting dates for this variety to maximize early profits.

Due to the lighter external color of the fruit compared to current cultivars, picking schedules must be adjusted accordingly.

Priorities for disease management for this variety are Botrytis fruit rot, Phytophthora root rot and powdery mildew. Resistance to other fungal diseases is considered moderate to high.

Careful management of N fertilization is recommended to achieve optimum plant size and density (which is key in managing Botrytis fruit rot) and high fruit quality.

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Biology and Management of Green Kyllinga (*Kyllinga brevifolia*)

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Species Description

Green kyllinga (*Kyllinga brevifolia*) is a perennial sedge that likely originated in Asia. It is a common weed of turf and in recent years has become problematic in strawberry fields in Florida. Within plasticulture production systems, its occurrence is limited to row middles (Fig. 1) and planting holes because unlike purple and yellow nutsedge it cannot penetrate the plastic mulch. Stem height is highly variable but the culm or stem is typically triangular with two to five grass-like leaves near the base of the shoot that fold tightly around the stem. The inflorescence (group of flowers) occurs at the end of the stem, is green, and generally cylindrical or dome-shaped (Fig.2). There are two to four leaf-like bracts at the base of the inflorescence that spread out perpendicular to the stem. Each inflorescence, typically called a spike, is composed of multiple spikelets with an average seed production of 100 seeds per spike. There are other kyllinga species that occur in Florida that are largely differentiated by the floral structure. Only green kyllinga and false green kyllinga (*Kyllinga gracillima*) spread via rhizomes. The inflorescence of green kyllinga tends to be smaller than false green kyllinga with toothed scale keels and 1-2 stamens per flower versus the smooth scale keels and 2-3 stamens per flower observed in false green kylinga (Bryson et al. 1997).

Fig. 1. Green Kyllinga in the row middle in a strawberry field (L) and up close (R).

Green kyllinga spreads via seeds and rhizomes. It tends to become established in wet conditions with full sun but once established can spread to drier areas and areas with limited shade. Shoots are closely spaced on the rhizome (Figure 3) and as a result the plant tends to appear in dense clumps. The plant also produces prolific numbers of small seeds that disperse over very

(Continued on page 13)

short distances when unassisted by other mechanisms. There is currently no information on seed bank longevity in commercial fields in Florida but we do know that viability is typically high. Seeds only germinate when they are very near the soil surface and prefer temperatures between 68 and 75 F (Molin et al. 1997) which means germination is likely to be greater during the fall and winter months.

Fig. 2. Green kyllinga spikes. Note the cylindrical shape of the spikes and leaf-like bracts at the base.

Fig. 3. Green kyllinga rhizomes with closely spaced shoots.

Management

The first step in any management program should be prevention which includes removal of problem areas. For example, field leveling and drainage can minimize the number of localized wet areas where this species tends to become established. Steps should also be taken to minimize spread on equipment. This may include washing equipment after working in fields where green kyllinga occurs as it reproduces and spreads readily via seeds and rhizomes which can move on farm implements. New patches should be eliminated as quickly as possible before the species becomes established.

There are a range of management options once green kyllinga becomes established in a field. Hand removal may be an option if the population is localized. Fumigants may control green kyllinga rhizomes and seeds but efficacy will depend on the fumigant selected and injection method. Pre-emergence applications of s-metolachlor (Dual Magnum) provide excellent control of germinating seedlings but will not control established plants. Post emergence applications of glyphosate tend not to provide adequate levels of control. Halosulfuron (Sandea) suppresses green kyllinga but sequential applications 4-7 weeks apart are needed to achieve 50-80% suppression. Trifloxysulfuron (Envoke) provides good control of green kyllinga especially when the herbicide is absorbed by the roots and the leaves. Control will be reduced when the stand is dense and the foliage intercepts all of the applied herbicide (Gannon et al. 2012). None of the above listed herbicides except glyphosate are currently registered for use in strawberry where this weed has most frequently been observed. Management options are limited to herbicide applications during fallow periods, maximum label rates of glyphosate applied to row middles only, and hand pulling.

Please note that the herbicide recommendations listed above are general in nature and the listed active ingredients are not registered on many vegetable crops. The use of trade names 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 other suitable products. Be sure to read and follow all herbicide labels prior to application.

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Bryson, C. T., R. Carter, L. B. McCary, and F. H. Yelverton. Kyllinga, a genus of neglected weeds in the continental United States. Weed Tech. 11:838-842.

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Molin, W. T., R. A. Khan, R. B. Barinbaum and D. M. Kopec. 1997. Green kylling (*Kyllinga brevifolia*): Germination and Herbicidal Control. Weed Sci. 45:546-550.

FLORIDA AG EXPO

2014 Florida Ag Expo Program & Speakers

Wednesday, November 5

7:30 am Registration and Breakfast/Vendor Booths Open

8:30 am Welcome and Overview - Jack Rechcigl, Center Director, UF/IFAS, GCREC

8:35 am Special Sponsor Welcome: Clayton Norman, DuPont Crop Protection

8:40 am Grower Panel: Finding Fixes on the Farm
Moderator: Sonia Tighe, Florida Specialty Crop Foundation
Dudley Calfee – Ferris Farms
Danny Johns – Blue Sky Farms
Michael Hill – Southern Hill Farms
Todd McClure -- West Coast Tomatoes

9:40 am Refreshments/Vendor Booths Open

10:30 am Final Rule Update and Water Testing and Quality Requirements under the Food Safety Modernization Act (FSMA)

Moderator – Keith Schneider, UF/IFAS

10:30 am Answering Questions About FSMA Water Regulations
Dr. Marianne Fatica, produce food safety staff, FDA

11:00 am Microbial Sampling: Is It Necessary? Michelle Danyluk, UF/IFAS

11:30 am Lunch/Vendor Booths Open

Moderator -- Crystal Snodgrass, County Agent, Manatee County Extension

1:00 pm Fresh from Florida: It's Effective, Inexpensive and Taps into Buy Local Susan Nardizzi, Florida Department of Agriculture

1:30 pm Getting the Most Out of Social Media University of Florida Ag Economics Students

1:50 pm Refreshments/Vendor Booths Open

Moderator—Alicia Whidden, County Agent, Hillsborough County Extension

2:30 pm Emerging Cucurbit Pests and Diseases Dr. Gary Vallad, UF/IFAS

2:50 pm Pollinator Health and Best Practices Dr. Dan Schmehl, UF/IFAS

3:10 pm Nematode Management And Control Dr. Joe Noling, UF/IFAS

3:30 pm Peach Variety Selection For Successful Orchard Establishment Dr. Mercy Olmstead, UF/IFAS

3:50 pm Low-Chill Blueberry Variety Update Dr. Jim Olmstead, UF/IFAS

Field Tours—10:30 a.m. and 1:00 p.m.