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Berry Vegetable Times

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Summer 2015

SOLUTIONS

Contents

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.

2015 Strawberry Agritech Tradeshow and Educational Sessions. Aug. 5 and 6 at the Trinkle building at HCC in Plant City. For more information and to register, contact the Florida Strawberry Growers Association.

2015 Florida Ag Expo November 4, at the Gulf Coast Research and Education Center. More information to come.

Gulf Coast Research and Education Center Welcomes Dr. Justin Renkema, Strawberry Entomologist

GCREC is pleased to announce that Dr. Justin Renkema, the newest GCREC faculty member, will be on board June 2015. Dr. Renkema's research will focus on strawberry entomology. He obtained his PhD from the Department of Biology at Dalhousie University and was recently a Post-Doctoral Research Associate in the School of Environmental Sciences at the University of Guelph. The center looks forward to his contributions and expertise in integrated and sustainable pest management to the strawberry and small fruit industries in central Florida. Like his predecessor, Dr. James Price, Renkema will initiate a research program developing IPM strategies for berry pests with a focus on biological control. With over a dozen refereed publications, numerous awards and recognitions, the current GCREC faculty are confident that Renkema will be a great asset to the center and be a good fit with local county extension offices and area growers.

90 Years of Service and Support to Florida Agriculture

This year marks the 90th Anniversary of Gulf Coast Research and Education Center. From humble beginnings in Bradenton and Dover to state-of-the-art in Balm/Wimauma. Celebrate with us at our 10th Florida Ag Expo November 4th.

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90TH ANNIVERSARY
Gulf Coast Research & Education Center
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Totally Impermeable Film – Potential Benefits for Soil Fumigation

Josh Freeman, Assistant Professor of Horticultural Sciences, North Florida REC, Quincy, FL

In many plasticulture vegetable crops in Florida, growers still rely on soil fumigation as their primary means of soil-borne pest management. At this time the transition to methyl bromide alternatives is complete. As most know, these alternatives are not as efficacious or forgiving in their application methodologies as methyl bromide but for the foreseeable future they are the only available fumigant tools. These tools often result in sporadic or incomplete control of weeds and soil-borne diseases and pests. Most producers have familiarity with virtually impermeable film (VIF) which has been widely used for years. This film was developed to be more retentive to fumigants and keep them in the soil longer. With VIF less fumigant could be used while achieving equivalent or greater pest control. The next generation of highly retentive plasticulture films has been developed know as totally impermeable film (TIF). TIF uses a different polymer from VIF, ethylene vinyl alcohol, to further increase the retentive properties of the film. TIF has been shown to keep fumigant in the ground longer than VIF, which keeps the fumigant in contact with pests longer. The idea is that fumigant use rate could be further reduced while maintaining pest control efficacy. Because TIF is more retentive than VIF, it allows for a 20% decrease in buffer zone distances of VIF films with Pic-Clor 60. This helps growers maximize the amount of land that is used to farm and not occupied by buffer zones.

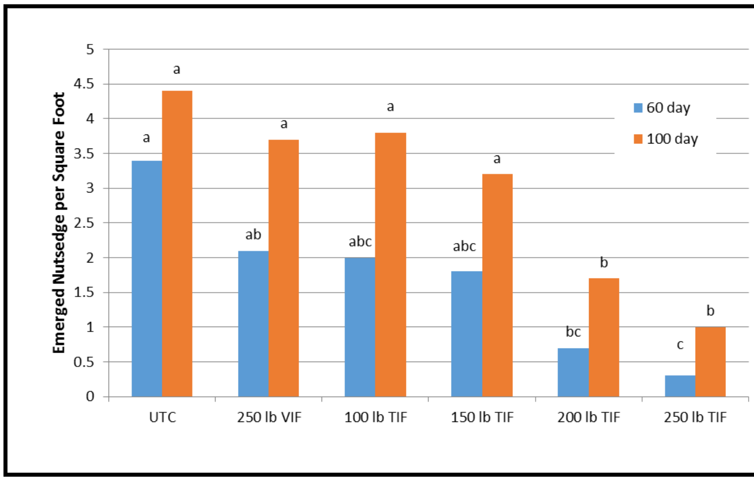

Figure 1. Effect of totally impermeable film (TIF) and virtually impermeable film (VIF) in combination with standard and reduced rates of Pic-Clor 60 on nutsedge population. Experiments were performed in Quincy, FL during fall 2014.

The first TIF produced for plasticulture in the U.S.A. was used for experimentation in 2009. It had many of the same problems as the first VIF films such as ripping and tearing. Since that time several manufacturers have begun producing TIF and the quality of the current films is very good. In most cases, the handling properties are similar to VIF.

Research has been conducted by many institutions around the country to investigate the potential of TIF with different fumigant systems. These data have illustrated that fumigant use rates of Pic-Clor 60 and Paladin can be reduced by 20-30% when used with TIF while maintaining efficacy. Though there are potential benefits to TIF there are also drawbacks, the primary being extended planting interval, the time needed from fumigation until planting for crop safety. Research has indicated that an extension in planting interval of 4-10 days may be needed compared to fumigant use with VIF. This extended planting interval may need to be increased further if cool, wet conditions persist between fumigation and planting. Another drawback of TIF is cost. Costs associated with plasticulture film change frequently but TIF is generally 10-15% more than VIF. Even though TIF costs more than VIF, if used in conjunction with reduced fumigant use rates, overall input costs for fumigation decrease compared to standard use rates with VIF.

Figure 2. Field experiments with Paladin:Pic in combination with TIF. Foreground from left to right. Untreated VIF, untreated TIF, 20 Gal/acre Paladin:Pic under TIF, 30 Gal/acre Paladin:Pic under TIF.

Like alternative fumigants, TIF is merely a tool to be used in a systems approach to soil-borne pest management. And like other fumigant tools, a greater level of planning and preparation will be required to use alternative fumigants with TIF because of the issues with lengthy planting interval. For many growers TIF could improve their soil-borne pest management while reducing input costs associated with fumigation. Further information can be found at http://swfrec.ifas.ufl.edu/docs/pdf/veg-hort/tomato-institute/proceedings/ti14_proceedings.pdf. *(Table 1 on Page 3)*

Table 1. Effect of totally impermeable film (TIF) and virtually impermeable film (VIF) in combination with standard and reduced rates of Paladin:Pic (79:21 w/w) on yellow nutsedge population and tomato yield. Experiments were performed in Painter, VA during fall 2010 and 2011. Data presented are pooled over both seasons.

		Yields (lb/acre)[a]			
Treatment	Emerged nutsedge ft^2	Medium	Large	Extra-large	Total marketable
Untreated VIF	22.5 a[b]	4,199 b	5,922 c	8,786 d	18,908 c
Untreated TIF	7.4 b	5,336 b	11,367 b	20,332 c	37,037 b
20 gal/acre TIF	0.2 c	7,745 a	15,143 a	25,479 abc	48,368 a
30 gal/acre TIF	0.1 c	7,345 a	13,870 ab	22,144 bc	43,360 ab
40 gal/acre TIF	0.0 c	7,716 a	14,609 a	26,299 abc	48,625 a
50 gal/acre TIF	0.0 c	7,462 a	15,664 a	26,914 ab	50,042 a
50 gal/acre VIF	0.2 c	7,375 a	13,964 a	28,730 a	50,069 a
60 gal/acre VIF	0.3 c	6,941 a	13,234 ab	26,643 ab	46,818 a

[a] Yield estimates are based on two harvests from ten plants per plot.
[b] Values followed by the same letter do not differ at the 5% significance level by Duncan's multiple range test. Means are to be compared within columns.
ns = not significant

Blackberry: Selecting Suitable Cultivars and Improving Management Practices for the Florida Environment

Shinsuke Agehara, Assistant Professor of Horticultural Sciences, Gulf Coast REC, Balm, FL

Blackberry is an attractive specialty crop with extremely high nutritional value and antioxidants. Blackberry production in the U.S. has rapidly increased in recent years because of consumer-driven demand and the release of new cultivars with superior fruit quality and adaptability to diverse climates. From 2009 to 2014, the blackberry grower price in the U.S. increased from $0.56 to $0.97 per pound, and the production value increased from $30.8 million to $43.2 million. However, current blackberry production in Florida is limited primarily to home gardens and small commercial U-pick operations.

To evaluate the potential of blackberry as a new alternative specialty crop in Florida, we initiated blackberry trials in 2013. There are two types of blackberry based on fruiting characteristics of their canes. Primocane-fruiting cultivars produce berries on first-year canes in late summer, and the same canes produce berries again in spring of the second year. By contrast, floricane-fruiting cultivars produce berries only from buds on second-year canes in spring. Most commercial blackberry cultivars are currently floricane-fruiting cultivars. In the first season (2013-2014), we tested three floricane-fruiting cultivars ('Natchez', 'Navaho', and 'Ouachita') that require relatively low chill hours, which is an important trait to grow in Florida. Plants were grown on a standard trellis system for blackberry production constructed under the shading net. We identified 'Natchez', 'Ouachita', and 'Navaho' as high, medium, and low yielding cultivars, respectively (Table 1). In particular, 'Natchez' grown under the optimal cultural practices yielded more than 9,000 lb/acre, which was about 20% higher than the average blackberry yield in the U.S. Fruit Brix was higher for 'Natchez' and 'Ouachita' than 'Navaho', although all cultivars had good sweetness overall .

Table 1. Blackberry yield and quality of three floricane-fruiting cultivars grown at the Gulf Coast Research and Education Center in Balm.

	Fruit set	Fruit wt		Brix
Cultivar	(#/plant)	(lb/plant)	(lb/acre)	(%)
Natchez	227	2.60	9,145	10.52
Navaho	28	0.24	862	9.23
Ouachita	62	0.50	1,701	10.54

All canes were pruned at the base immediately after the last harvest (July 7, 2014). We are currently collecting the second-season yield data, which appear to be similar to the first season (Figure 1). In this season, we are also growing the same blackberry cultivars in a high tunnel to determine the optimal production system in Florida. Despite high temperature in the high tunnel, we are observing excellent fruit set for 'Natchez' (Figure 2). We will continue the trial to fill a gap in our current knowledge and to develop recommendations of blackberry production for Florida growers.

Figure 1. Three floricane-fruiting blackberry cultivars grown under the shade net at the Gulf Coast Research and Education Center in Balm (from left: 'Natchez', 'Navaho', and 'Ouachita'). Photos were taken on May 13, 2015.

Figure 2. Fruit set of floricane-fruiting 'Natchez' blackberry grown in a high tunnel at the Gulf Coast Research and Education Center in Balm. Photos were taken on May 13, 2015.

When Your Herbicides Don't Work

Nathan Boyd, Assistant Professor of Horticultural Science, Gulf Coast REC, Balm, FL

It is extremely frustrating to spend the time and money to apply an herbicide and then not obtain adequate weed control. I have never met a grower yet that liked to spend money on nothing. There are many reasons an herbicide may not work. Following is a list of techniques you can use to help ensure successful herbicide applications.

Know your weeds: Selective herbicides will only control specific species. Common errors I have seen include misidentification of a sedge as a grass and applying a grass herbicide. Herbicides with active ingredients such as sethoxydim and clethodim do not have activity on sedges. Other herbicide groups such as sulfonylureas (example: Sandea, Envoke, Matrix) control very specific broadleaf weed species and not others. Read the label and use the right product for the right weed species.

Use the correct application rate: I know it is tempting to use low rates to save money or high rates because 'if a little works then a lot should work better', but don't. Agrochemical companies spend a lot of money on research to determine the proper application rate. The use of low rates may reduce control and some products do not work as well when excessively high rates are applied. Read the label and apply the recommended rate.

Hit your target: I'm sure this seems obvious that an herbicide must reach the targeted weed if it is going to work. However, there are a few things that are often overlooked. First, application of a soil active herbicide to a field with a dense weed population will reduce how well it works if the leaves intercept the herbicide before it reaches the soil. Also, keep in mind that even if the herbicide reaches the soil and is washed below the seed germination zone (2-3 inches deep for many species) it will not work as well. Second, herbicide drift may damage neighboring fields but it also reduces the amount of herbicide where you need it. Third and final point, if the weeds are below the crop canopy the herbicide can be intercepted by your crop and the overall effectiveness reduced.

Ensure adequate coverage: There are two main types of herbicides. Contact herbicides commonly called burn-down products kill the part of the plant they touch. Systemic herbicides move in the plant and can kill part of the plant where the herbicides did not touch. Adequate coverage is important for all herbicides but especially important for contact products. To achieve proper coverage: (a) use an adequate application volume, (b) use the proper pressure to achieve acceptable droplet sizes, (c) add a surfactant to help spread the herbicide on the leaf surface, and (d) apply herbicides to annual weeds when they are small.

Apply at the right time: As a general rule herbicides work best on annual weeds when the plants are small. For biennual weeds (weeds that tend to form a rosette and then flower after a period of dormancy) apply the herbicides when the rosettes are actively growing and before the plant flowers. For perennial weeds apply the herbicide before they flower when they have reached 1/3 to 2/3 of their maximum height. For perennial weeds, the goal is to ensure that the herbicide moves down and kills the roots. This is generally achieved when the plant is large enough to produce sugars in the leaves to send down to the root system.

Apply in the right environment: Herbicides such as glyphosate work best if the weeds are actively growing. Do not apply during excessively hot or dry periods when plants may be dormant.

Check your water pH: As a general rule pesticides work best if the pH is between 4 and 7. In Florida, water tends to be alkaline (pH greater than 7) which can lead to alkaline hydrolysis or the breakdown of herbicides in water with a pH greater than 7. Sulfonylurea herbicides (example: Sandea, Envoke, Matrix) tend to work best in slightly alkaline conditions whereas herbicides such as 2,4-D, glyphosate, and flumioxazin break down more rapidly when the pH is greater than 7. For example, one report found that the flumioxazin half-life in a tank of water at a pH of 5 should be measured in days whereas the half-life at pH 9 was 15 minutes. In other words, mixing herbicides susceptible to alkaline hydrolysis in high pH water can rapidly degrade them and as a result reduce their efficacy. To combat this problem add a buffer or acidifier when needed. Also note that water pH is especially important if the herbicide is stored in a tank for an extended period of time. The longer the herbicide remains in the tank, the greater the importance of proper pH.

Check water hardness: Positively charged ions in your water (aluminum, iron, magnesium, calcium, sodium) can bind with negatively charged herbicides (example: 2,4-D, dicamba, glyphosate) and reduce effectiveness. To address this problem reduce the time between applications and mixing, add a surfactant, and add ammonium sulfate to glyphosate applications.

Management of Pickleworm and Melonworm

Phil Stansly, Professor of Entomology, Southwest REC, Immokalee, FL; Hugh Smith, Assistant Professor of Entomology, Gulf Coast REC; and Susan Webb, Associate Professor of Entomology, Gainesville, FL

Pickleworm (*Diaphania nitidalis*) and melonworm (*Diaphania hyalinata*) can damage squash, cantaloupe, cucumbers and other cucurbit crops. Melonworm feed primarily on foliage (Figure 1) while pickleworm burrow directly into flower buds, fruit and stems (Figure 2). Pickleworm and melonworm moths are active at night and so are rarely seen in the field during the day. Pickleworm adults have dark brown purplish iridescent wings with yellow portions in the center (Figure 3). The wings of melonworm have a dark brown border and a white area in the center (Figure 4). Each species has hair pencils protruding from the tip of the abdomen which are involved in pheromone release. Female moths lay eggs in small groups on host plants, and eggs hatch in 3-4 days. Each species passes through five larval instars and requires about fourteen days to complete larval development under typical growing conditions. Pickleworm larvae are whitish yellow with characteristic black spots on the back when they are young (Figure 5). Older pickleworm larvae lose their spots (Figure 6). Pickleworm larvae can turn a coppery color when they are ready to pupate (Figure 7). Melonworm larvae are green, and develop two white stripes along the length of their body when they are older (Figure 8). Pickleworm and melonworm typically pupate in a leaf-fold on plant; melonworm prefers green leaves for pupation while pickleworm often pupates in dry leaf material. The pupal stage usually lasts 9-10 days.

Pickleworm and melonworm feed exclusively on cucurbits. *Cucurbita* species, especially summer and winter squash, are preferred hosts. Crops in the genus *Cucumis* - cucumbers, gherkins and cantaloupe – are also attacked, while watermelon is seldom attacked. Creeping cucumber (*Melothria pendula*) may be an important wild host of pickleworm; other wild cucurbits in Florida including wild balsam apple (*Mormordica chorantia*) have not been identified as important hosts. Although primarily a foliage feeder, melonworm can attack the fruit of certain cultivars , especially when caterpillar numbers are high (Figure 9). Melonworm form a light silken structure around themselves on the underside of leaves, possibly to protect themselves from natural enemies. However they are attacked by several types of predatory and parasitic insects. Pickleworm passes most of the larval stage of its life cycle concealed in buds and fruit, protecting it from natural enemies and insecticides.

Good pest management begins with a sampling plan and these pests are no exception. Melonworm is easier to detect and control because the larvae spend most or all of their time on foliage where they are susceptible to insecticides. Pickleworm are harder to scout for and control because they move rapidly into flowers or fruit. The best way to scout for pickleworm in squash is by inspection of staminate buds or blooms. There is no set threshold but the presence of one worm in 50 buds or blooms would be cause for concern and 1 worm in 25 buds is sufficient reason to spray. In cucumbers and melons young fruit must be inspected.

Table 1 lists some of the insecticides labeled for use on cucurbits in Florida to manage pickleworm and melonworm. Coragen and Verimark are systemic insecticides that can be applied as a drench or through drip irrigation to provide long-term protection against both pests. Both are group 28 insecticides and one or the other should only be used once in a crop. Other effective insecticides must be applied as foliar sprays so care must be taken to protect bees that are critical for pollination of cucurbit crops. Always consult the label for specific indications. Broad spectrum insecticides (Groups 1 and 3) are especially incompatible with bees and other beneficial insects as well. Therefore, selective insecticides targeting Lepidoptera are generally preferred (Table 1). These include the group 5 spinosyns (Entrust and Radiant), Intrepid (group 18), Avaunt (group 22) and the group 28 insecticides which include Belt and Exirel in addition to the two products mentioned above. It is best not to repeat any mode of action (group number) in a single crop to avoid selection for resistance. Bt (*Bacillus thuringiensis*) products can be used to fill in if necessary. Bts and Entrust are the only products listed in Table 1 that are approved for organic production. More information on melonworm and pickleworm can be found at http://entnemdept.ufl.edu/creatures/veg/melonworm.htm and http://entnemdept.ufl.edu/creatures/veg/pickleworm.htm respectively.

(Continued on Page 7)

Table 1. Some insecticides for control of melonworm, pickleworm and other pests on cucurbit crops*				
MOA	Active Ingredient	Example Trade Name	Rating G = Good E = Excellent	Other pests controlled
1A	carbaryl	Sevin XLR	G	Cucumber beetles,
1A	methomyl	Lannate	E	Squash bugs, stink bugs
1B	malathion	Malathion 5EC	G	Squash bugs, stink bugs
3A	beta-cyfluthrin	Baythroid XL	G	Cucumber beetles
3A	bifenthrin	Brigade 2EC	G	Cucumber beetles, squash bugs, stink bugs
3A	esfenvalerate	Asana	G	Cucumber beetles
3A	fenpropathrin	Danitol 2.4 EC	G	Cucumber beetles
3A	lambda cyhalothrin	Warrior	G	Cucumber beetles
3A	permethrin	Ambush 25 W	G	Cucumber beetles
3A	pyrethrins	Pyganic	G	Cucumber beetles
3A	zeta-cypermethrin	Mustang	G	Cucumber beetles
5	spinetoram	Radiant SC	E	Armyworms, leafminers, thrips
5	spinosad	Entrust	E	Armyworms, leafminers, thrips
11	*Bacillus thuringiensis* kurstaki	Dipel	G	Melonworm
11	*Bacillus thuringiensis* aizawai	XenTari	G	Armyworms
15	novaluron	Rimon 0.83EC	G	Armyworms, cucumber beetles
18	methoxyfenozide	Intrepid 2F	E	Armyworms
22	indoxacarb	Avaunt	E	Armyworms
28	chlorantraniliprole	Coragen	E	Armyworms, leafminers
28	cyantraniliprole	Exirel, Verimark	E	Armyworms, leafminers, whiteflies, aphids
28	flubendiamide	Belt SC	E	Armyworms
*Check labels for restrictions				


Figure 1. Damage to squash leaves caused by melonworm. Photo credit Lyle Buss


Figure 2. Damage to squash caused by pickleworm. Photo credit John Capinera


Figure 3. Pickleworm adult. Photo credit Lyle Buss


Figure 4. Melonworm adult. Photo credit Lyle Buss


Figure 5. Mid instar pickleworm larva. Photo credit Lyle Buss


Figure 6. Late instar pickleworm larva. Photo credit Lyle Buss


Figure 7. Pickleworm prepupa. Photo credit John Capinera


Figure 8. Melonworm larva. Photo credit Lyle Buss


Figure 9. Melonworm feeding directly on fruit. Photo credit Jim Castner

New Ilarvirus Species Identified in South Florida Tomatoes

Scott Adkins, USDA-ARS, Fort Pierce; Carlye A. Baker, FDACS-DPI, Gainesville; Ismael E. Badillo-Vargas, North Florida REC, Quincy; Galen Frantz and H. Charles Mellinger, Glades Crop Care, Inc., Jupiter; William W. Turechek, USDA-ARS, Fort Pierce; and Joe Funderburk, Professor of Entomology, North Florida REC, Quincy

Solanaceous crops in the southern half of the Florida peninsula have been extensively surveyed for the emerging thrips-transmitted tospoviruses, *Tomato chlorotic spot virus* (TCSV) and *Groundnut ringspot virus* (GRSV), over the past four years as part of several research projects. Field collection of symptomatic tomato samples has been coordinated and implemented by Glades Crop Care, Inc., with the cooperation of many growers, other scouting organizations, University of Florida/IFAS Extension and researchers, and USDA-ARS scientists in Fort Pierce. Results of sample testing by USDA-ARS scientists have shown that TCSV and GRSV are both currently present in south Florida, along with the well-known *Tomato spotted wilt virus* (TSWV). An outbreak of TCSV has been plaguing Miami-Dade County tomato production in this spring season.

During these surveys for TCSV, GRSV and TSWV in the fall season of 2013, symptomatic tomato plant and fruit samples were collected in Miami-Dade County by Glades Crop Care, Inc. and in Palm Beach County by growers and USDA-ARS scientists that did not test positive for any of these emerging tospoviruses. This was surprising because the symptoms of virus-like necrosis on leaves, petioles and stems, and necrotic rings or spots on fruits were similar to those induced by TCSV and GRSV. Further testing by scientists at FDACS-DPI and USDA-ARS eliminated all of the usual tomato virus suspects known in Florida. Eventually, a new ilarvirus species was identified for which the name *Tomato necrotic streak virus* (TomNSV) is proposed. Symptoms of TomNSV in the field have been reproduced by inoculation of greenhouse tomato plants with symptomatic field samples. TomNSV is a distant relative of *Tobacco streak virus* (TSV), which is the cause of bean red node disease in south Florida. TSV and other ilarviruses are reported to be transmitted by thrips but in a manner quite different from the tospoviruses like TCSV, GRSV and TSWV.

Now that TomNSV has been identified, scientists have been able to test other previously collected samples for this new virus. TomNSV has subsequently been detected in similarly symptomatic tomato samples collected from the spring and fall seasons of 2014 in Palm Beach County. No detections have been made in 2015. During the initial TomNSV findings in fall 2013, incidence of symptoms was generally low (<3%), although >1000 plants were rogued from a single Miami-Dade County farm. The lack of TomNSV detection so far in 2015 may be due to TCSV or *Tomato yellow leaf curl virus* (TYLCV) outbreaks in Miami-Dade and Palm Beach County locations (from where TomNSV was originally detected) that are obscuring symptoms. No natural hosts for TomNSV other than tomato have been identified to date. An FDACS-DPI Specialty Crop Block Grant is funding current studies to examine other hosts for both TomNSV and TSV, and to determine the mode of transmission of these viruses in Florida. No matter what the ultimate economic cost of TomNSV to the Florida tomato industry, its detection through pest surveys and definitive identification as a new virus highlights the importance of vigilant crop scouting.

Figure 1. Necrotic streaks alongside veins of leaflets on tomato plant infected with *Tomato necrotic streak virus*. Photo credit Scott Adkins

Figure 2. Necrotic rings on immature fruits on tomato plant infected with *Tomato necrotic streak virus*. Photo credit Scott Adkins