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EVALUATION OF FUNGICIDES FOR BACTERIAL SPOT CONTROL ON BELLPEPPER TRANSPLANTS IN THE GREENHOUSE, 2007.

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Introduction

Bell peppers (*Capsicum annuum*) are an important vegetable crop grown in Georgia with a 2007 farm gate income of $100,131,847 which accounted for 0.87% of Georgia's agriculture (2007 GA Farm Gate, 2008). Bacterial leaf spot (BLS) on pepper is one bacterial disease that infects many pepper types, which includes bell, hot, and specialty types. BLS is caused by *Xanthomonas campestris* pv. *vesicatoria* (XCV), which is also currently known as *Xanthomonas axonopodis* pv. *vesicatoria* and *Xanthomonas euvesicatoria*. XCV is a motile, aerobic, gram-negative phytopathogenic bacterium with a single polar flagellum. XCV grows most efficiently at high temperatures (24-30 °C), high humidity, and high amounts of moisture. The organism can overwinter on infected plant debris or epiphytically on host volunteers as well as seed. Bacterial dissemination occurs by wind, rain or irrigation droplets, aerosols, and during cultural practices like stringing. XCV enters the host through stomata and/or hydathodes and environmental or mechanical wounds. XCV can survive a few days to a week on bare soil or without a host plant; therefore it is important that the bacteria has live plant material or plant debris on which to survive. Studies have shown that XCV can be found on seed internally and externally. External seed infections can transmit bacteria to growing cotyledons when they contact the seed coat. In culture, XCV produces a circular, yellow, mucoid colony on nutrient agar. Copper, plant defense activators, EBDC fungicides (eg. Maneb and mancozeb), antibiotics and phages have been shown to reduce losses to BLS. This study was conducted to evaluate many of these products for relative suppression against BLS in pepper transplants.

Materials and Methods

Peppers were seeded into white Styrofoam, 200 cell trays in a Lewis Taylor Farms greenhouse in Tifton, GA on 31 Jul. Trays were organized into rows which were spaced approximately 1-ft apart. Each plot was a single tray 2.2-ft long and 1.1-ft wide. All trays were placed on a raised, metal bench. The trial was arranged in a randomized complete block with four replications per treatment. Standard practices for managing fertility and insects were used according to standard practices recommended for pepper transplant production which includes overhead irrigation. Fungicide treatments were applied with a single 8005E flat-fan nozzle, hooded CO^2 backpack sprayer. The sprayer was calibrated to deliver a rate of 80 GPA at 40psi. Sprays were applied on 21, 24, 28, 31 Aug and 4, 7, 10, 13, 17 Sep. The four center plants of each tray were inoculated with a race 1 strain of *X. c.* pv. *vesicatoria* by injecting a 1.0 X 10^{-8} cfu/ml suspension on the underside of the leaf with a needle-less syringe. Pepper transplants were inoculated on 27 Aug. Disease was assessed by counting the number of symptomatic plants per tray. Ratings were taken on Aug 28 and Sep 4, 11, and 18.

Results

Overall, bacterial spot severity increased to high levels after inoculation. Plants treated with Clorox could not be effectively evaluated due to phytotoxicity. Actigard showed good control for reducing the spread of disease early in the trial. On 4 Sep, all treatments had a lower disease severity compared to the control. All treatments receiving Kocide, Maneb, Firewall, Actigard, and Quintec provided significant disease suppression compared to the non-treated trays on 11 Sep rating. Only Kocide alone, Firewall, and Kocide + Maneb provided significant suppression on the final rating on 18 Sep. The control treatment did not have the highest disease severity, and Oxidate and BmJ showed the least effective suppression of the disease at the last rating.

Evaluation of bactericidal treatments for suppressing bacterial leaf spot of pepper transplants.

	Disease severity*			
Treatment and rate/A	28 Aug	4 Sep	11 Sep	18 Sep
ProPhyt 54.5L, 3 pt……………………………………..	0.0	27.3 ab	50.3 abc	192.5 a
Clorox 5.25L, 10 % v/v……………………………...	0.0	-	-	-
Kocide 3000 30DF, 1 lb Maneb 75DF, 1 lb……………………………………	0.0	20.8 abc	25.8 cd	169.0 bc
Firewall 22.4WP, 6.4 oz……………………………..	0.0	17.0 bc	20.3 d	153.3 c
Kocide 3000 30DF, 1 lb………………………..........	0.0	15.3 bc	25.8 cd	169.3 bc
Serenade 14.6WP, 1 lb………………………..........	0.0	26.3 ab	54.0 ab	197.8 a
Kocide 3000 30DF, 1 lb Maneb 75DF, 1 lb Tanos 50DF, 8 oz…………………………..............	0.0	19.5 abc	30.5 bcd	188.8 ab
Actigard 50WG, 2 oz ………………………..............	0.0	2.8 c	18.8 d	189.5 ab
Starner 20WP, 4 lb…………………………….........	0.0	25.3 ab	39.5 a-d	187.3 ab
BmJ 3.0 X 10^9WP, 1 oz ……………………………..	0.0	25.3 ab	48.8 abc	198.0 a
Maneb 75DF, 1 lb……………………………………	0.0	16.0 bc	29.3 bcd	186.0 ab
Kasugamycin 2.3L, 6.84 fl oz…………………..........	0.0	26.3 ab	48.3 abc	196.5 a
Quintec 2.08SC, 6 fl oz………………………..........	0.0	21.8 abc	32.0 bcd	189.3 ab
Tanos 50DF, 8 oz…………………………..............	0.0	17.5 bc	39.3 a-d	197.8 a
Oxidate 27L, 1.0 % v/v……………………………...	0.0	21.0 abc	53.8 ab	199.0 a
Non-treated……………………………………..........	0.0	40.8 a	61.3 a	196.0 a

* Disease severity is measured by mean number of infected plants per transplant tray.
* Means followed by the same letter do not significantly differ at P=.05 using the Student-Newman-Keuls test.
* Mean comparisons performed only when AOV treatment P(F) is significant at mean comparison

EVALUATION OF FUNGICIDES FOR CONTROL OF CERCOSPORA LEAF SPOT OF CARROT, 2007

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Introduction

Approximately 1,369 acres of carrots were grown in Georgia in 2007 which were worth $8,294,508 in farm gate income. Many foliar diseases of carrot occur in Georgia with Cercospora leaf spot (caused by *Cercospora carotae*) beginning to emerge as a significant pathogen. While several fungicides are labeled for suppression of this disease in carrot, many have not been critically evaluated for use in Georgia. This trial specifically evaluates some of the fungicide options available for carrots and their efficacy on Cercospora leaf spot.

Materials and Methods

Carrot seed were planted on 21 Nov 07 on 6-ft beds in Lake Park, GA. Seed were planted every 1.5 in. in twin rows spaced 8 in. apart. Standard practices for management of irrigation, weeds, nematodes and insects for carrots grown in Georgia were followed throughout the season. The experiment utilized randomized complete block design with 5 replications. Fungicide plots were 20-ft long with a 5-ft buffer between replications. Fungicides were applied using a CO_2 -pressurized backpack sprayer calibrated to deliver 40 gal/A at 75 psi through TX-18 hollow cone nozzles. Once disease was observed, microscopic examination of the lesions indicated the presence of conidia of Cercospora carotae and no Alternaria dauci was found for either rating date. Plots were harvested by digging and weighing the two center rows of each plot on 15 May.

Results

Weather conditions during the experiment were very dry with rainfall accumulation almost 15 in. below the 98 year average for Nov through May. The onset of Cercospora leaf blight occurred late and symptom development was not severe until after the last application of fungicide. Plots receiving Topsin M were the only treatments that did not significantly suppress Cercospora leaf spot compared to the check on either rating date. However, yield was only significantly improved with applications of Endura at 7.8 oz and Omega 500F. The lack of suppression offered by Topsin M in this study indicate that the pathogen may be resistant to benzimidazole chemistry. No phytotoxicity was observed in the test.

Efficacy of certain fungicides for suppression of Cercospora leaf blight of carrot.

Treatments, rate/A, and spray dates ()[z]	Cercospora Leaf Blight[y] 19 Apr	Cercospora Leaf Blight[y] 15 May	Yield[x]
Endura 70EG, 7.8 oz (1-6)	1.0 d[w]	1.2 c	60.5 a
Endura 70EG, 4.5 oz (1-6)	1.0 d	2.0 c	52.0 ab
Omega 500F, 1.0 pt (1-6)	1.9 bc	5.8 ab	57.7 a
Rovral 4F, 2.0 pt (1-6)	1.4 cd	4.2 b	49.6 ab
Rovral 4F, 1.0 pt (1-6)	2.2 b	4.2 b	43.8 b
Topsin M 70WP, 2.0 lb (1-6)	4.4 a	6.6 a	42.6 b
Topsin M 70WP, 1.5 lb (1-6)	4.5 a	7.0 a	42.8 b
Non-treated check	4.2 a	6.2 a	44.5 b

[z]Spray dates are as follows: 1=8 Feb; 2=22 Feb; 3=8 Mar; 4=22 Mar; 5=5 Apr; 6=18 Apr.
[y]Cercospora leaf spot ratings used a 0-10 scale where 0=no symptoms and 10=total defoliation.
[x]Yield was recorded in lbs/plot.
[w]Means in columns with letter(s) in common are not significantly different according to Fisher's Protected LSD test at P=0.05.

EVALUATION OF FUNGICIDES FOR CONTROL OF PHOMOPSIS BLIGHT IN EGGPLANT, 2007

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Introduction

Eggplant is an important but low acreage crop (1,102 acres) grown in Georgia. In 2007 the farm gate value was $11,854,923. The most destructive and reoccurring disease of eggplant is Phomopsis blight caused by the fungus *Phomopsis vexans*. Little to no data exists to indicate efficacy of fungicides that could be used to suppress this disease. Therefore this trial was conducted to do just that.

Materials and Methods

Eggplant transplants were planted on 13 Apr on black plastic mulch covered beds at Tifton Vegetable park, a unit of the Coastal Plain Experiment Station in Tifton, GA. Mulched beds had a 36-in. top, were laid on 6-ft centers, were drip-irrigated, and were fumigated with 350 lbs/A of 98:2 (98% methyl bromide: 2% chloropicrin) prior to planting. Transplants were set in one row per bed and were spaced 2 ft apart within the row, resulting in 8 plants per plot. Plots were 15 ft long, and separated on each end by 5 ft of bare plastic, and were arranged in a randomized complete block design with four replications. Fertility, insects and weeds were managed according to standard University of Georgia Extension Service recommendations. Fungicide treatments were applied with Lee Spider Spray Trac® calibrated to deliver 40 gal/A at 75-80 psi through TX-18 hollow cone nozzles mounted on drop-booms. Plots were harvested on 28 May, 5 Jun and 26 Jun. Severe drought conditions were experienced during most of the test and rainfall accumulation was 7.3 in. total for Apr, May, and Jun which was 4.4 in. below the 92 yr average.

Results

Phomopsis blight was first observed on fruit on 28 May and increased to high levels by 26 June. All treatments significantly reduced the percentage of infected fruit. The treatment containing Topsin M had less than half of the infected fruit recorded in the non-treated check. No phytotoxicity was observed with any treatments.

Evaluation of fungicides and fungicide programs for control of Phomopsis blight of eggplant fruit.

Treatments, rates/A, and (spray times)[z]	Percent Phompsis Infected Fruit[y]	
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Topsin M 70WP, 2.0 lb (2,4)	31.2	c[x]
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Cabrio 20EG, 12.0 oz (2,4)	39.6	bc
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Scala 600SC, 7.0 fl oz (2,4)	40.2	bc
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Indar 75WSP, 2.0 oz (2,4)	41.9	bc
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5)	42.6	bc
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Tanos 50DF, 10.0 oz (2,4)	43.6	bc
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Endura 70WG, 3.5 oz (2,4)	44.8	bc
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Captan 50WP, 5.0 lb (2,4)	47.7	bc
Kocide 3000, 0.75 lb (1-5) Maneb 70WP, 2.0 lb (1-5) Switch 62.5WG, 14.0 oz (2,4)	48.4	b
Non-treated	65.6	a

[z]Spray dates were: 1=7 Jun; 2=15 Jun; 3=21 Jun; 4=28 Jun; 5=4 Jul.
[y]Incidence of symptomatic vs. asymptomatic fruit was pooled over all harvests to calculate percentage infected fruit.
[x]Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at P=0.05.

EVALUATION OF FUNGICIDES FOR SUPPRESSING GUMMY STEM BLIGHT IN GEORGIA WATERMELON, 2007

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Introduction

Watermelons are second only to sweet corn in acreage (24,215) and onions in farm gate value ($104,604,248) among vegetables grown in Georgia. Gummy stem blight (caused by the fungus *Didymella bryoniae*) is the most widespread and destructive disease of watermelons in Georgia. The fungus is favored by hot, wet conditions and can survive from year to year on infested debris or seed. Many fungicides are labeled for this disease, but few are effective. Those that have been very effective in the past have had the pathogen develop resistance to them rapidly. Therefore constant screening for fungicide efficacy is warranted. This study is one such screen.

Materials and Methods

Watermelons were transplanted into black plastic 18-in. wide on the Black Shank Research Farm in Tifton, GA on 31 Jul. Rows were 6-ft apart with plants spaced 36-in. apart within the row. Each plot was a single row 30-ft long and a non-treated border row separated each plot. The trial was arranged in a randomized complete block with five replications per treatment. Vines were pruned back into the row so plants were no more than 6-ft wide. A bare-ground buffer of 10-ft separated the ends of all plots. Standard practices for managing fertility and controlling weeds and insects were implemented according to University of Georgia Cooperative Extension Service. Fungicide treatments were applied with a Lee Spider Spray Trac® calibrated to deliver 40 gal/A at 75-80 psi through TX-18 hollow cone nozzles**.** Plots were evaluated for disease on 24, 31 Aug and 7, 14, 21Sep. Weather during the experiment was hot and wet with 9.6 in. of rainfall recorded for the months of Aug and Sept. This rainfall total is 1.2 in. over the 91 year average with 61% of this accumulation occurring between 23 Aug and 2 Sep.

Results

Gummy stem blight (GSB) was first detected on 24 Aug and increased to severe levels by the last spray. By the final rating it was evident that disease was very severe at a point where fruit were very immature so that no harvest could be obtained. Most treatments significantly reduced disease severity compared to the non-treated plots on the 31 Aug rating except plots sprayed with Pristine alone, the treatment where Pristine was applied at sprays 1 and 2 with Bravo WeatherStik applied on the third spray, LEM 17 SC applied at 16.8 and 24.0 fl oz, LEM 17 EC applied at 24.0 fl oz, and the two programs that contained late season applications of Serenade Max, although Serenade had not been applied at the time of the rating. On 7 Sep, disease severity of the plots treated with Pristine alone was significantly higher than the non-treated plots while plots treated with Bravo WeatherStik alone and those receiving Inspire or Inspire + Vangard provided significant disease suppression compared to the non-treated plots. Plots treated with Inspire or Inspire + Vangard were the only plots that demonstrated significant disease suppression compared to the non-treated plots on 14 Sep. Few clear differences were observed among treatments on the 21 Sep disease severity rating. The area under the disease progress curve (AUDPC) was significantly less than the non-treated plots in plots treated with Inspire or Inspire + Vangard,, Bravo WeatherStik alone, LEM 17 SC at the 9.6 fl oz rate, and the grower standard program of Bravo WeatherStik rotated with Pristine with a late application of Topsin + Penncozeb. This trial represents the first documentation of a field failure of Pristine on GSB indicating possible problems with fungicide resistance.

Efficacy of certain fungicides for suppression of gummy stem blight of watermelon.

Treatments, rates, and (spray times)[z]	Disease Severity[y] 31 Aug	7 Sep	14 Sep	21 Sep	AUDPC[x]
Inspire 250EC, 7.0 fl oz (1,2,4,5) Vangard 75WG, 5.0 oz (1,2,4,5) Bravo WeatherStik 6SC, 2.0 pt (3)	2.2 b[w]	13.0 e	32.5 e	49.0 b	185.5 i
Inspire 250EC, 7.0 fl oz (1,2,4,5) Vangard 75WG, 7.0 oz (1,2,4,5) Bravo WeatherStik 6SC, 2.0 pt (3)	3.3 b	14.0 e	36.0 c-e	54.0 ab	247.1 hi
Inspire 250EC, 7.0 fl oz (1,2,4,5) Bravo WeatherStik 6SC, 2.0 pt (3)	3.0 b	16.0 de	34.0 de	54.0 ab	252.0 hi
Bravo WeatherStik 6SC, 2.0 pt (1-5)	3.0 b	16.0 de	44.0 b-e	54.0 ab	287.0 g-i
LEM 17 SC, 9.6 fl oz (1-5)	2.2 b	25.0 c-e	44.0 b-e	60.0 ab	344.4 f-h
Bravo WeatherStik 6SC, 2.0 pt (1,3) Pristine 38WG, 14.5 oz (2,4) Topsin 4.5F, 10.0 fl oz + Penncozeb 75DF, 3.0 lb (5)	2.2 b	29.0 c-e	43.0 b-e	58.0 ab	368.9 e-h
Bravo WeatherStik 6SC, 2.0 pt (1,3,5) Pristine 38WG, 14.5 oz (2,4)	3.4 b	29.0 c-e	47.0 b-e	63.0 ab	391.3 d-g
Pristine 38WG, 14.5 oz (1,2,4,5) Bravo WeatherStik 6SC, 2.0 pt (3)	6.0 ab	29.0 c-e	45.0 b-e	75.0 a	406.0 c-g
LEM 17 SC, 16.8 fl oz (1,3,5) Bravo WeatherStik 6SC, 2.0 pt (2,4)	4.8 b	35.0 b-d	45.0 b-e	62.0 ab	411.6 c-g
Topsin 4.5F, 10.0 fl oz + Penncozeb 75DF, 3.0 lb (1-5)	4.8 b	33.0 b-e	42.0 b-e	54.0 ab	411.6 c-g
LEM 17 EC, 16.8 fl oz (1-5)	4.2 b	32.0 b-e	49.0 a-d	61.0 ab	424.9 c-f
LEM 17 EC, 16.8 fl oz (1,3,5) Bravo WeatherStik 6SC, 2.0 pt (2,4)	2.6 b	36.0 b-d	45.0 b-e	50.0 b	427.7 c-f
LEM 17 SC, 24.0 fl oz (1-5)	5.7 ab	36.0 b-d	49.0 a-d	66.0 ab	463.4 c-f
USF 2010 50WG, 3.0 oz (1-5)	3.8 b	40.0 bc	47.0 b-e	59.0 ab	471.1 c-f
Pristine 38WG, 14.5 oz (1,3,5) Bravo WeatherStik 6SC, 2.0 pt (2,4)	3.5 b	39.0 bc	51.0 a-c	59.0 ab	476.0 c-f
LEM 17 EC, 9.6 fl oz (1-5)	4.6 b	35.0 b-d	46.0 b-e	65.0 b-e	480.2 b-f
LEM 17 EC, 24.0 fl oz (1-5)	8.0 ab	38.0 bc	50.0 a-d	61.0 ab	497.0 b-e
USF 2010 50WG, 8.0 oz (1-5)	7.0 ab	41.0 bc	46.0 b-e	59.0 ab	497.0 b-e
Bravo WeatherStik 6SC, 2.0 pt (1,3) Pristine 38WG, 14.5 oz (2,4) Serenade Max WP, 1.0 lb + Topsin 4.5F, 5.0 fl oz + Biotune, 0.125% v/v (5)	7.2 ab	38.0 bc	49.0 a-d	71.0 ab	507.5 b-d
Bravo WeatherStik 6SC, 2.0 pt (1,3) Pristine 38WG, 14.5 oz (2,4) Serenade Max WP, 1.0 lb + Penncozeb 75DF, 1.5 lb + Biotune, 0.125% v/v (5)	5.6 ab	44.0 bc	53.0 ab	66.0 ab	532.7 bc
LEM 17 SC, 16.8 fl oz (1-5)	8.5 ab	53.0 ab	53.0 ab	58.0 ab	616.0 ab
Pristine 38WG, 14.5 oz (1-5)	11.0 a	61.0 a	63.0 a	76.0 a	724.5 a
Non-treated	11.0 a	43.0 bc	57.5 ab	68.0 ab	528.5 b-d

[z]Spray times are: 1=16 Aug; 2= 22 Aug; 3=28 Aug; 4=5 Sep; 5=13 Sep.
[y]Disease severity value where 1=little to no disease and 10=100% foliage diseased.
[x]Area under the disease progress curve was calculated from ratings taken beginning 24 Aug through 21 Sep.
[w] Means followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at P≤0.05.

EVALUATION OF SELECTED FUNGICIDES FOR CONTROL OF POWDERY MILDEW IN SUMMER SQUASH IN GEORGIA, 2007

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Introduction

Powdery mildew, caused by the fungus *Sphaerotheca fuliginea*, is on of the most costly diseases of cucurbits both in yield loss and cost of control. Several fungicides have been developed through the years which have been used to suppress losses to powdery mildew but have become ineffective due to a shift towards more aggressive, less fungicide sensitive pathogen populations and because of development of resistance to certain fungicidal modes of action. Cucurbit growers have few fungicide options open to them that provide adequate powdery mildew suppression that can also serve as alternative modes of action for fungicide resistance management. Several fungicides with high levels of efficacy against powdery mildew and with different modes of action are needed to provide adequate disease control and to maintain the effectiveness of powdery mildew fungicides.

Materials and Methods

Summer squash were direct seeded onto black plastic mulch with 12-in bed top on 3 May. Beds were on 6-ft centers with a 2-ft plant spacing within rows. Plots were 15-ft long with 8 plants per plot and 5-ft unplanted borders between plot ends. The test design was randomized complete block with four replications. The crop was grown according to University of Georgia Extension guidelines except for fungicide applications. Fungicide treatments were applied using a Lee Spider Spray Trac® with TX-18 hollow cone nozzles calibrated to deliver 40 gal/A at 75-80 psi. The test was conducted at the Tifton vegetable park, Tifton, Georgia on a Tifton sandy loam soil**.** Rainfall during the experiment was very dry and the cumulative rain fall for May and June was 3.1 in below the 91 year average.

Results

Symptoms were first noticed on 15 Jun and the diseased progressed to high levels on 28 Jun. On 15 Jun, all treatments significantly reduced powdery mildew on the upper sides of the leaves, while Adament, Sonata, and Sonata + Procure were the only treatments not significantly better than the non-treated control on the lower leaves. On 28 Jun, all treatments except those receiving the low rate of Adament, Prevam + Nova, Sonata + Procure and the Sonata alone treatment, significantly reduced powdery mildew on the upper leaf surface while no treatments reduced powdery mildew on the lower leaves. No phytotoxicity was observed.

Efficacy of biological and synthetic fungicides on cucurbit powdery mildew.

Treatments, rates, and (spray times)[z]	Powdery Mildew[y] 15 Jun Upper	Lower	Powdery Mildew 28 Jun Upper	Lower
Non-treated………………………………………….	4.0 a[x]	8.8 a	7.0 a	10.0 a
Adament, 50WG, 8 oz/A, 1,3,5,6…………………...	1.3 c	7.8 a-c	5.0 b-d	9.0 a
Adament 50WG, 3 oz/A, 1,3,5,6……………………	2.3 b	8.5 ab	5.8 a-c	9.5 a
Pre-vam, 50 floz/100gal, 1,3,5,6 Nova 40WP, 2.5 oz/A, 1,3,5,6……………………...	1.3 c	7.0 b-e	5.5 a-c	9.3 a
Pre-vam, 50 floz/100gal, 1,3,5,6 Procure 480SC, 4 fl oz/A, 1,3,5,6…………………..	1.0 c	5.5 e	4.5 cd	8.5 a
Nova 40WP, 2.5 oz/A, 1,3,5,6……………………...	1.8 cb	6.8 c-e	5.3 b-d	9.0 a
Procure 480SC, 4 fl oz/A, 1,3,5,6…………………..	1.5 cb	7.0 c-e	5.3 b-d	9.3 a
Sonata, 2 qt/A + Biotune, 1pt/100gal, 1,2,4,6,7…….	1.5 cb	7.8 a-c	7.0 a	10.0 a
Sonata, 2qt/A,+ Biotune, 1pt/100gal, 1,2,4,6,7 Nova 40WP, 2.5 oz/A, 1,2,4,6,7……………………	1.5 cb	5.8 de	5.3 b-d	9.0 a
Sonata, 2 qt/A, + Biotune, 1pt/100gal, 1,2,4,6,7 Procure 480SC, 4 fl oz/A, 1,2,4,6,7………………...	1.8 cb	7.3 a-e	6.3 ab	10.0 a
Procure 480SC, 8fl oz/A, 1,3,5,6…………………...	1.0 c	5.8 de	5.0 b-d	9.0 a
Pristine 38WG, 14.5 oz/A, 1,3,5,6………………….	1.3 cb	6.3 c-e	3.8 d	8.0 a

[z] Spray dates were: 1=31 May; 2=6 Jun; 3=7 Jun; 4=11 Jun; 5=13 Jun; 6=21 Jun; 7=26 Jun.

[y]Powdery mildew severity was rated on a 1-10 scale where1=1-10% leaf are affected and 10=100% leaf area affected of the upper and lower leaf surfaces.

xMeans followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at $P \leq 0.05$.

EVALUATION OF FUNGICIDES FOR CONTROL OF COMMON RUST OF SWEET CORN ON A RESISTANT AND A SUSCEPTIBLE CULTIVAR, 2007

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Introduction

Common rust of sweet corn (caused by the basidiomycete fungus *Puccinia sorghi*) is ever-present in plantings of spring-grown sweet corn in Georgia. While it is generally not difficult to control with labeled fungicides, one often questions whether spraying fungicides on rust-resistant varieties is effective. This trial evaluates the performance of specific fungicides for suppression of common rust on susceptible and rust-resistant sweet corn cultivars.

Materials and Methods

Sweet corn seed of both varieties were planted on 2 Apr at the University of Georgia's at the branch research station in Attapulgus Georgia. Seed were planted every 8 in. rows spaced 36 in. apart. The experiment utilized two row, split plots with the main block being fungicide treatment and the subplot being corn variety. These split plots were arranged in a randomized complete block design with 4 replications. Fungicide plots were 30-ft long a 5-ft buffer between replications. Fungicides were applied using Lee Spray Trac® calibrated to deliver 15 gal/A at 40 psi through 8002 hollow cone nozzles. Treatments were initiated at late whorl stage on 29 May and were sprayed twice more on 5 and 12 Jun. Once disease was observed, microscopic examination of the pustules indicated the presence of urediniospores of *Pucciniua sorghi*. Standard practices for management of irrigation, weeds, nematodes and insects for sweet corn grown in Georgia were followed throughout the season.

Results

Rainfall from Apr-Jun in Attapulgus was only 2.66 in. total. This was extremely dry for that area and was 11.4 in. below the 93 year average. However, common rust onset occurred on 12 Jun and reached moderate levels in non-treated plots by the rating date. All treatments significantly reduced common rust on susceptible cultivars except Manzate alone while all treatments significantly reduced common rust on the resistant cultivar.

Evaluation of fungicides on common rust of sweet corn cultivars.

	Common Rust Rating 21 Jun[1]	
Treatments, rate/A	Sugar Twist (susceptible)	Providence(resistant)
Amistar 80WG, 3.0 oz		
Bravo Weatherstik 6SC, 1.5 pt	1.3 e[2]	1.0 c
Quilt 200SE, 14.0 fl oz	1.5 e	1.0 c
Absolute 500SC, 5.0 fl oz + Induce, 1 pt/100 gal	1.8 e	1.4 bc
Tilt 3.6EC, 4.0 fl oz	1.9 e	1.0 c
Amistar 80WG, 3.0 oz		
Manzate 75DF, 1.5 lb	2.0 de	1.3 c
Absolute 500SC, 5.0 fl oz	2.2 de	1.4 bc
Absolute 500SC, 6.0 fl oz	2.2 de	1.3 c
Headline 250EC, 6.0 fl oz	2.4 c-e	1.4 bc
Tilt 3.6EC, 4.0 fl oz		
Bravo Weatherstik 6SC, 1.5 pt	2.5 c-e	1.4 bc
Amistar 80WG, 3.0 oz	2.7 b-d	2.0 bc
Bravo Weatherstik 6SC, 1.5 pt	3.5 b-d	2.0 bc
Tilt 3.6EC, 4.0 fl oz		
Manzate 75DF, 1.5 lb	3.5 b-d	2.0 bc
Stratego 250EC, 10.0 fl oz	3.8 bc	2.0 bc
Manzate 75DF, 1.5 lb	4.3 ab	2.4 b
Non-treated check	5.8 a	3.5 a

[1]Common rust ratings used a 0-10 scale where 0=no rust on the canopy above the ear leaf and 10=100 percent leaf area covered in pustules on foliage above the ear leaf.
[2]Means in columns with letter(s) in common are not significantly different according to Fisher's Protected LSD test at *P*=0.05.

EVALUATION OF BACTERICIDE SPRAYS FOR THE CONTROL OF BACTERIAL FRUIT BLOTCH ON WATERMELON, 2007

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Introduction

Watermelon fruit blotch is a devastating disease in Georgia which is caused by the bacterium *Acidovorax avenae* subsp. c*itrulli*. The pathogen is seedborne and causes watermelon fruit to rupture and rot. Once the pathogen has been taken to the field the only control measure left is to apply copper fungicides weekly until fruit set. This trial evaluates copper programs and other materials for suppression of bacterial fruit blotch of watermelon.

Materials and Methods

Watermelons were transplanted onto single row bare ground beds on 30 Apr. Beds were on 6-ft centers with a 4-ft plant spacing within rows. Plots were 30-ft long with 7 plants per plot with 10-ft unplanted borders between plot ends. The test design was randomized complete block with four replications. Prior to planting, one cotyledon of each transplant was inoculated by syringe infiltration of 0.2ml of $1X10^8$ cfu/ml *Acidovorax avenae* subsp. *citrulli* suspended in tap water. Bactericide treatments were applied using a Lee Spider Spray Trac® with TX-18 hollow cone nozzles calibrated to deliver 40 gal/A at 75-80 psi. The crop was grown according to University of Georgia Extension production guidelines, and the test was conducted at the University of Georgia, Horticulture farm in Tifton, Georgia. Overhead irrigation was applied as needed. Rainfall during the experiment was very dry and the cumulative rain fall for May and June was 3.1 in below the 91 year average.

Results

Foliar symptoms on cotyledons and true leaves appeared 5-10d after planting and by fruit set foliar symptoms were hard to find and were not distinguishable between treatments. Symptoms on fruit were first observed on 22 Jun and the disease increased on fruit until the last rating on 10 July. On both rating dates, no treatment was better than the non-treated check, however, the Kasumin treatment was significantly worse that the non-treated check on both dates. No phytotoxicity was observed.

Evaluation of products for suppression of bacterial fruit blotch of watermelon.

Treatments, rates, and (spray times)[z]	Fruit Blotch[y] 2 July	Fruit Blotch[y] 10 July
Non-treated check……………………………………………………................	1.3 b[x]	1.8 b
Serenade max 14.6% WP, 1.5 lb/A, (1,2,3,4,5) Kocide 3000 30% WP, 1.25 lb/A, (1,2,3,4,5)………………………………....	1.3 b	0.8 b
Serenade max 14.6% WP, 1.5 lb/A, (1,2,3,4,5) Kocide 3000 30% WP, 0.5 lb/A, (1,2,3,4,5)……………………………….……	1.3b	2.3 ab
Kocide 3000 30% WP, 0.5 lb/A, (1,2,3,4,5)……………………………….……	0.5 b	1.0 b
Kocide 3000 30% WP, 1.25 lb/A, (1,3,5)………………………………..…....	1.3 b	1.8 b
Kocide 3000 30% WP, 1.25 lb/A, (1,2,3,4,5)……………………….……….	0.3 b	0.8 b
Kocide 3000 30% WP, kocide rate? (1,3,5) Kasumin 2% L, 100ppm/A, (2,4)…………………………….……….……...	0.5 b	1.3 b
Kasumin 2% L, 100ppm/A, (1,2,3,4,5)…………………………..………..	3.3 a	4.0 a

[z] Spray dates were: 1=24 May; 2=30 May; 3=6 Jun; 4=14 Jun; 5=13 Jun; 6=20 Jun
yFruit blotch incidence was rated by counting the number fruit with symptoms in each plot.
xMeans followed by the same letter(s) are not significantly different according to Fisher's protected LSD test at P≤ 0.05.

EVALUATION OF Bt & SYNTHETIC INSECTICIDE TREATMENTS IN CABBAGE

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Introduction

Cabbage, *Brassica oleracea* (L.) Capitata group (in this test 'Platinum Dynasty'), is a key Brassica crop in Georgia. It is faced with multiple pests that attack the leaves, namely, diamondback moth (DBM); *Plutella xyllostella*, cabbage looper (CL); *Trichoplusia ni*, and imported cabbage worm (ICW); *Pieris rapae*. This test evaluated new numbered Bt insecticide compounds from Valent BioSciences, compared with new materials from Bayer, Syngenta and Dupont used in this crop. The use of new chemistries and product rotations are critical for managing insecticide resistance in DBM.

Materials and Methods

Cabbage was transplanted into 2 rows per 6-ft beds on 6 March 2007 and maintained with standard cultural practices at the Lang Farm, Georgia Coastal Plain Experiment Station at Tifton. A total of 500 lbs of 10-10-10 and 300 lbs of 34-0-0 were applied to Tift pebbly clay loam field plots. Plots were irrigated regularly with an overhead sprinkler system. Scouting was conducted weekly from 3 April using two samples of 6 plants per plot. Foliar applications of insecticides were made approximately weekly from 30 March to 22 May. Plant tops were harvested from 10 ft of the center of the plot row on 4 June and heads with wrapper leaves were weighed and categorized as 0=not damaged, 1=slightly damage, 2=moderately damaged, 3=severely damaged by worms. Damage ratings >1 were not marketable cabbage heads. Data was analyzed using GLM and LSD tests for separation of means (SAS Institute 1990).

Results and Discussion

All of the treatments were effective compared to the check and provided similar levels of control of Lepidoptera larvae based on season long averages. The most significant results in terms of separating out efficacy between treatments were in the ratings of damage to wrapper leaves and the head. As a group, Spintor, Synapse and E2Y45 performed better than most of the Bt insecticides relative to damage to the head, with the exception of 60125. In terms of significant increases in marketable yield, the Synapse treatment performed best, followed by Spintor, E2Y45, and 60125 and 60126. The results were consistent with the synthetic compounds having quicker knockdown activity than the Bt compounds, with all treatments providing good levels of control of Lepidoptera larvae.

Treatment - rate per acre	Diamond-back moth larvae 4/24/07	Cabbage looper larvae 4/27/07	Diamond-back moth larvae 5/4/07	Cabbage looper larvae 5/4/07	Imported cabbage worms 5/4/07	Total Lepidoptera larvae 5/4/07	Imported cabbage worms 5/15/07
1. Untreated Check	4.5 a	0.5 a	8.5 a	1.5 a	2.75 a	12.8 a	5.5 a
2. VBC-60125 1 lb/a	2.3 bc	0.0 b	3.8 bc	0.3 b	1.0 b	5.0 bcd	0.5 b
3. VBC-60126 1 lb/a	0.8 cd	0.0 b	5.0 bc	0.0 b	0.0 b	5.0 bcd	0.5 b
4. VBC-60127 1 lb/a	2.5 abc	0.0 b	5.8 ab	0.0 b	0.8 b	6.5 bc	2.0 b
5. VBC-60128 1 lb/a	3.0 ab	0.0 b	4.8 bc	0.0 b	1.0 b	5.8 bc	0.8 b
6. VBC-60129 1 lb/a	0.5 cd	0.0 b	6.3 ab	0.8 ab	0.0 b	7.0 b	0.8 b
7. ABG-6405 1 lb/a	2.3 bc	0.0 b	2.3 c	0.0 b	0.0 b	2.3 d	0.5 b
8. Spintor 6 oz prod/a	1.0 bcd	0.0 b	3.8 bc	0.0 b	0.0 b	3.8 cd	0.5 b
9. Synapse 24WG 3 oz prod/a	0.0 d	0.0 b	4.0 bc	0.0 b	0.5 b	4.5 bcd	0.3 b
10. E2Y45 0.066 lbs ai/a	1.8 bcd	0.0 b	5.3 b	0.0 b	0.3 b	5.5 bc	1.0 b

* Means within columns followed by the same letter are not significantly different (LSD, P<0.05).

Treatment - rate per acre	Overall Cabbage looper	Overall Diamond-back moth	Imported cabbage worm	Leps total Overall		Wrapper Damage rating	Head Damage rating	Marketable Weight of Cabbage
1. Untreated Check	1.1 a	5.0 a	2.0 a	8.1 a		2.72 a	2.50 a	12 e
2. VBC-60125 1 lb/a	0.1 b	2.2 b	0.4 bc	2.7 b		0.95 d	0.58 de	43 bc
3. VBC-60126 1 lb/a	0.1 b	2.8 b	0.3 bc	3.1 b		1.35 c	0.78 cd	43 bc
4. VBC-60127 1 lb/a	0.1 b	2.9 b	0.8 b	3.8 b		1.70 b	1.40 b	24 de
5. VBC-60128 1 lb/a	0.1 b	2.6 b	0.5 bc	3.1 b		1.45 bc	1.10 bc	36 cd
6. VBC-60129 1 lb/a	0.3 b	2.6 b	0.3 bc	3.2 b		1.51 bc	1.00 c	38 c
7. ABG-6405 1 lb/a	0.2 b	2.5 b	0.1 c	2.8 b		1.60 bc	1.08 bc	35 cd
8. Spintor 6 oz prod/a	0.2 b	1.8 b	0.3 bc	2.2 b		0.66 e	0.41 ef	54 ab
9. Synapse 24WG 3 oz prod/a	0.1 b	2.3 b	0.3 bc	2.8 b		0.30 f	0.10 f	56 a
10. E2Y45 0.066 lbs ai/a	0.1 b	2.7 b	0.3 bc	3.1 b		0.30 f	0.08 f	47 abc

* Seasonal means within columns followed by the same letter are not significantly different (LSD, P<0.05).

EVALUATION OF FMC INSECTICIDE TREATMENTS IN CABBAGE 2007

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Introduction

Cabbage, *Brassica oleracea* (L.) Capitata group (in this test 'Platinum Dynasty'), is a key Brassica crop in Georgia. It is faced with multiple pests that attack the leaves, namely, diamondback moth (DBM); *Plutella xyllostella*, cabbage looper (CL); *Trichoplusia ni*, and imported cabbage worm (ICW); *Pieris rapae*. This test evaluated numbered insecticide compounds from FMC, compared with Provado. The use of new chemistries and product rotations are critical for managing insecticide resistance in DBM.

Materials and Methods

Cabbage was transplanted into 2 rows per 6-ft beds on 6 March 2007 and maintained with standard cultural practices at the Lang Farm, Georgia Coastal Plain Experiment Station at Tifton. A total of 500 lbs of 10-10-10 and 300 lbs of 34-0-0 were applied to Tift pebbly clay loam field plots and irrigation was applied regularly with an overhead sprinkler system. Scouting was conducted weekly from 3 April using two samples of 6 plants per plot. Foliar applications of insecticides were made on the following dates: 27 Mar, 3, 10, 17, 25 Apr and 1, 9, 16, 22 May. Plant heads were harvested from 10 ft of the center of the plot row on 4 June and heads with wrapper leaves were weighed and categorized as 0=not damaged, 1=slightly damage, 2=moderately damaged, 3=severely damaged by worms. Damage ratings >1 were not marketable cabbage heads. Data was analyzed using GLM and LSD tests for separation of means (SAS Institute 1990).

Results and Discussion

All of the treatments except Provado were effective compared to the check in providing significant levels of control of Lepidoptera larvae, averaged over all dates. The best treatments for the control of Lepidoptera larvae were F6305 and Brigade followed by F2700 and F1785 based on season long averages. All of these treatments provided significant reductions in head damage and increased marketable yields compared to the untreated check.

Treatment - rate per acre	Diamond-back moth larvae 5/8/07	Total Lepidoptera larvae 5/8/07	Diamond-back moth larvae 5/15/07	Cabbage looper larvae 5/15/07	Total Lepidoptera larvae 5/15/07	Imported cabbage worms 5/22/07	Total Lepidoptera larvae 5/22/07
1. F6305 30 WG 0.11 lb ai/a	2.3 b	2.8 d	3.3 b	0.0 b	4.3 b	0.3 b	5.3 c
2. F1785 10 WP 0.088 lb ai/a	4.0 b	6.0 bc	3.3 b	1.0 ab	5.0 b	5.5 ab	15.0 abc
3. Brigade WSB 10WP 0.1 lb ai/a	3.0 b	3.0 d	3.5 b	0.3 b	4.0 b	0.3 b	7.8 c
4. F2700-04-1 0.83EC 0.025 lb ai/a	2.8 b	3.8 cd	4.0 b	0.0 b	5.3 b	0.3 b	1.0 bc
5. Provado 1.6 3.8 oz product/a	3.5 b	7.3 b	4.8 b	0.8 b	5.8 b	6.5 a	21.5 a
6. Untreated check	6.8 a	12.0 a	10.5 a	2.0 a	15.0 a	10.3 a	19.8 ab

- Means within columns followed by the same letter are not significantly different (LSD, P<0.05).

Treatment - rate per acre	Overall Cabbage looper	Overall Diamond-back moth	Imported cabbage worm	Leps total Overall		Wrapper Damage rating	Head Damage rating	Marketable Weight of Cabbage
1. F6305 30 WG 0.11 lb ai/a	0.06 b	1.69 b	0.19 b	1.94 c		1.23 de	0.28 c	48 a
2. F1785 10 WP 0.088 lb ai/a	0.67 a	1.97 b	0.86 b	3.50 bc		2.13 bc	0.95 b	34 ab
3. Brigade WSB 10WP 0.1 lb ai/a	0.08 b	1.89 b	0.08 b	2.06 c		1.00 e	0.23 c	45 a
4. F2700-04-1 0.83EC 0.025 lb ai/a	0.14 b	2.28 ab	0.31 b	2.72 bc		1.68 cd	0.73 bc	43 ab
5. Provado 1.6 3.8 oz product/a	0.78 a	2.97 ab	1.00 ab	4.75 ab		2.63 ab	1.75 a	24 bc
6. Untreated check	0.92 a	3.50 a	1.86 a	6.28 a		2.73 a	2.03 a	11c

* Seasonal means within columns followed by the same letter are not significantly different (LSD, P<0.05).

EVALUATION OF EXPERIMENTAL INSECTICIDE TREATMENTS IN COLLARD

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Introduction

Collards, *Brassica oleracea* (L.) Acephala group (in this test`Top Bunch'), is the other main Brassica crop, next to cabbage, in Georgia. It is faced with similar multiple pests that attack the leaves, namely, diamondback moth (DBM); *Plutella xyllostella*, cabbage looper (CL); *Trichoplusia ni*, and imported cabbage worm (ICW); *Pieris rapae*. This test evaluated new number compounds from Syngenta, compared to a standard pyrethroid insecticide. The use of new chemistries and product rotations are critical for managing insecticide resistance in DBM.

Materials and Methods

Collards was transplanted into 2 rows per 6-ft beds on 6 March 2007 and maintained with standard cultural practices at the Lang Farm, Georgia Coastal Plain Experiment Station at Tifton. A total of 500 lbs of 10-10-10 and 300 lbs of 34-0-0 were applied to Tift pebbly clay loam field plots and irrigation was applied regularly with an overhead sprinkler system. Scouting was conducted weekly from 3 April using two samples of 6 plants per plot. Foliar applications of insecticides were made approximately weekly from 6 April to 18 May. Plant tops were harvested from 10 ft of the center of the plot row on 7 and 24 May and plant tops were weighed and categorized as 0=not damaged, 1=slightly damage, 2=moderately damaged, 3=severely damaged by worms or contaminated by whitefly nymphs. Damage ratings >1 were not marketable collards. Data was analyzed using GLM and LSD tests for separation of means (SAS Institute 1990).

Results and Discussion

All of the treatments except for the Warrior treatment provided excellent control of lepipodteran pests across all species encountered. Even Warrior provided significant control of diamondback moth, but started to lose efficacy by the last sample date. The best treatments in terms of control of Lepidoptera larvae, reduction in damage, and increased marketable yield of collards were all rates of A15397 50/100SC and all rates of A15365 250SC except the lowest rate of 30 grams ai/ha which experienced a significant increase in damage and decrease in marketable yield compared to the high rates. All pest species of Lepidoptera encountered in this test were controlled by A15397 50/100SC and the higher rates of A15365 250SC which resulted in significant increases in marketable yield.

Treatment - rate per acre	Diamond-back moth small larva 4/30/07	Diamond-back moth large larva 4/30/07	Diamond-back moth pupa 4/30/07	Diamond-back moth 4/30/07	Leps total 4/30/07	Cabbage Looper 5/11/07	Diamond-back moth 5/11/07
1. Untreated Check	2.5 a	1.3 a	3.0 a	6.8 a	7.5 a	3.3 a	9.5 a
2. A15397 50/100SC 45 gai/ha	0.0 c	0.5 abc	0.3 c	0.8 cde	2.0 bc	0.0 b	2.5 cd
3. A15397 50/100SC 60 gai/ha	0.3 bc	0.0 c	0.3 c	0.5 de	1.1 bc	0.3 b	3.0 bcd
4. A15397 50/100SC 75 gai/ha	0.0 c	0.3 bc	0.0 c	0.3 e	0.5 c	0.5 b	3.8 bc
5. A15397 50/100SC 90 gai/ha	0.5 bc	0.8 abc	0.5 bc	1.8 bcd	2.0 bc	0.3 b	1.5 d
6. A15365 250SC 30 gai/ha	0.8 bc	0.5 abc	0.3 c	1.5 bcde	1.5 bc	0.8 b	3.3 bc
7. A15365 250SC 40 gai/ha	0.3 bc	1.0 ab	0.5 bc	1.8 bcd	1.8 bc	1.0 b	3.0 bcd
8. A15365 250SC 50 gai/ha	1.0 b	0.3 bc	0.8 bc	2.0 bc	2.3 bc	0.0 b	3.5 bc
9. A15365 250SC 60 gai/ha	0.3 bc	0.8 abc	1.5 b	2.5 b	2.8 b	0.5 b	2.5 cd
10. Warrior/Zeon 1CS 28 gai/ha	0.3 bc	0.5 abc	0.5 bc	1.3 bcde	3.0 b	1.3 b	4.3 b

* Means within columns followed by the same letter are not significantly different (LSD, P<0.05).

Treatment - rate per acre	Overall Cabbage looper	Overall Diamond-back moth	Imported cabbage worm	Leps total Overall		First Damage rating	Overall Damage rating	Marketable Weight of Collards
1. Untreated Check	0.58 a	3.5 a	1.2 a	5.3 a		1.9 a	2.2 a	11 c
2. A15397 50/100SC 45 gai/ha	0.04 b	1.2 b	0.4 b	1.6 b		0.6 d	1.2 d	35 ab
3. A15397 50/100SC 60 gai/ha	0.17 b	1.7 b	0.2 b	2.0 b		0.7 cd	1.3 cd	28 ab
4. A15397 50/100SC 75 gai/ha	0.13 b	1.9 b	0.3 b	2.4 b		0.6 d	1.3 cd	29 ab
5. A15397 50/100SC 90 gai/ha	0.08 b	1.2 b	0.5 ab	1.8 b		0.8 cd	1.2 d	39 a
6. A15365 250SC 30 gai/ha	0.13 b	1.5 b	0.5 b	2.1 b		0.9 bc	1.5 bc	21 bc
7. A15365 250SC 40 gai/ha	0.25 ab	1.4 b	0.3 b	1.9 b		0.7 cd	1.3 cd	36 ab
8. A15365 250SC 50 gai/ha	0.08 b	1.6 b	0.5 b	2.2 b		0.7 cd	1.1 d	41 a
9. A15365 250SC 60 gai/ha	0.08 b	1.5 b	0.5 b	2.1 b		0.7 cd	1.1 d	37 a
10. Warrior/Zeon 1CS 28 gai/ha	0.38 ab	1.9 b	0.7 ab	3.0 b		1.1 b	1.8 b	20 bc

* Seasonal means within columns followed by the same letter are not significantly different (LSD, $P<0.05$).

EVALUATION OF SURFACTANT EFFECTS ON EFFICACY OF CORAGEN AGAINST LEPIDOPTEROUS PESTS AND WHITEFLIES ON COLLARDS AND SQUASH

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Introduction

Coragen is a new insecticide being developed by DuPont. This product represents a new chemistry and has shown activity against a variety of caterpillar pests and silverleaf whiteflies. Coragen has shown excellent systemic activity when applied in the root zone. Foliar activity has not been as strong in some tests, and addition of a surfactant has been proposed to aid foliar applications. These tests were conducted to evaluate the effects of the addition of Dyne-Amic on efficacy of Coragen. One test was conducted to evaluate effects on efficacy against lepidopterous pests on collards, and a second test evaluated the effects on efficacy against sweetpotato whitefly on squash.

Materials and Methods

Both tests were conducted at the UGA Horticulture Farm in Tifton, Georgia. Both tests were established as RCB designs with four replications. Both crops were grown with a single row on a six foot bed, but were treated as a three foot row for insecticide applications. Collards (var. Flash) were transplanted on 2 Aug., 2007. Squash (var. Destiny III) was direct seeded. Experimental plots were one row by 20 feet in the collards, and one row by 25 feet in squash.

Treatments in the squash trail included Coragen alone at 0.044 and 0.088 lb AI/ac and Coragen at 0.044 lb AI/ac plus Dyne-Amic at 0.5% v/v. The insecticide standard treatment for this test consisted of a single foliar application of Venom at 3 oz/ac pre-bloom, followed by foliar applications of Warrior at 0.03 lb AI/ac. A non-treated check was also included. The collards trail consisted only of the 0.o44 lb AI/ac rate of Coragen with and without the Dyne-Amic, and a non-treated check. All foliar applications were applied with a CO_2 pressurized backpack sprayer (60 PSI) in 40 GPA with three hollow-cone nozzles per row (one nozzle over-the-top and two on drops).

The collards test was treated on 5 and 25 Sept. Caterpillar densities were monitored by visual examination of 5 randomly selected plants per plot and identifying and counting all caterpillars present. Additionally, plot damage ratings were conducted on two dates, with plots rated as follows: 0 = no damage, 1= light damage on < ½ of plants in the plots, 2 = light damage on > ½ of plants, 3 = moderate damage on < ½ of plants, 4 = moderate damage on > ½ of plants, 5 = heavy damage on < ½ of plants, and 6 = heavy damage on > ½ of plants.

The squash trail was treated on 24 Sept (Venom in the venom/warrior treatment), and 1, 9 and 16 Oct. (Warrior in the venom warrior treatment). The check was treated with Venom on 25 Sept to maintain live plants in these plots. The entire squash test was treated with Venom at 6 oz/ac through the drip system on 10 Sept, and was treated with bifenthrin+orthene on 14, 20 and 27 Sept to aid in whitefly control (although resistance appears to have made these treatments futile). Plots were rated for silverleaf (but data is not shown as no effects were detected). Vigor ratings were conducted based on relative growth of plants within a plot, with vigor rated as follows: 1 = largest plants in test, 2 = intermediate, 3 = severely stunted plants, 4 = most plants dead. Yields were collected by harvesting all fruit of marketable size.

All data were analyzed with the PROC-ANOVA procedure of PC-SAS. Where significant differences (P<0.05) occurred, means were separated with LSD (P=0.05).

Results and Discussion

In the squash test, silverleaf symptoms were severe and fairly uniform throughout the test and are not reported. Plant vigor ratings and yields (Table 1) reflect impacts on whitefly, which were severe enough to actually kill plants. Only minor differences occurred through 4 Oct. (whitefly treatments were applied uniformly across the entire test through 27 Sept.). On 12 Oct., plant growth differences were obvious. Those treatments receiving Venom foliar applications (Check and Venom/Warrior treatments) and the Coragen+DyneAmic treatment showed much less stunting than the Coragen treatments without surfactant. Yields showed the same trends as plant vigor ratings. Thus, these data clearly show increased efficacy of Coragen against whitelfies in squash with the addition of Dyne-Amic.

Results in the collards trail show no effect of the addition of Dyne-Amic to Coragen (Tables 2 and 3). Coragen did provide reduction in caterpillar densities and damage in the collards trail, but no difference was detected between the Coragen alone and Coragen plus Dyne-Amic.

These two test clearly show different results. While several factors may have influenced the results, the simplest explanation lies in the purpose of the surfactant and the insects feeding habits. The surfactant is intended to aid penetration into the leaf. The caterpillar pests consume large sections of the leaf (including the surface) and thus consume the pesticide even if it is primarily on the surface. However, whiteflies feed on plant sap within the leaf tissue and addition of a surfactant to aid leaf penetration exposes this pest to a greater concentration of insecticide.

Table 1. Plant vigor ratings yields, Coragen surfactant test in squash, UGA, Horticulture Farm, Tifton, GA, 2007.

Treatment	Vigor Ratings			No. of fruit harvested per plot	
	28 Sept.	4 Oct.	12 Oct.	15 Oct.	Total
Check	2.00 a	1.25 a	1.50 b	12.25 a	15.25 a
Venom/ Warrior	1.63 a	1.75 a	1.63 b	9.50 a	10.75 ab
Coragen 0.044	2.00 a	1.88 a	3.00 a	2.50 b	3.50 b
Coragen 0.088	2.38 a	2.25 a	3.25 a	2.75 b	4.25 b
Coragen 0.044 +DyneAmic	2.00 a	1.88 a	1.88 b	11.25 a	17.50 a

Numbers within columns followed by the same letter are not significantly different (LSD; P=0.05)
* Differences were detected at P=0.1

Table 2. Coragen foliar treatments in collards, with and without surfactant. UGA Horticulture Farm, 2007.

Treatment	Average number of caterpillars per plot (primarily cabbage looper)					
	7 Sept.	11 Sept.	14 Sept.	18 Sept.	24 Sept.	28 Sept.
	2 DAT-1	6 DAT-1	9 DAT-1	13 DAT-1	19 DAT-1	3 DAT-2
Check	0.75 a	1.75 a*	5.50 a*	4.25 a*	3.00 a	1.75 a
Coragen	0.00 b	0.00 a	0.00 a	0.25 a	2.75 a	1.00 a
Coragen+ DyneAmic	0.00 b	0.00 a	0.25 a	0.00 a	1.50 a	0.50 a
	2 Oct.	5 Oct.	8 Oct.	12 Oct.	15 Oct.	22 Oct.
	7 DAT-2	10 DAT-2	13 DAT-2	17 DAT-2	20 DAT-2	27 DAT-2
Check	3.00 a	2.50 a	1.50 a	3.00 a	6.75 a	5.00 a
Coragen	0.75 b	0.50 b	1.25 a	1.00 a	1.50 b	4.25 a
Coragen+ DyneAmic	0.25 b	0.25 b	0.00 a	1.50 a	1.50 b	6.75 a

Numbers with species and column followed by the same letter are not significantly different (LSD; P=0.05).
*ANOVA results indicated P>0.1 for the model, but treatment effect P<0.05.

Table 3. Plot damage ratings, Coragen surfactant test in collards, UGA Horticulture Farm, Tifton, GA, 2007.

Treatment	Average plot damage rating	
	24 Sept.	22 Oct.
	19 DAT-1	27 DAT-2
Check	4.50 a	5.67 a
Coragen	0.75 b	5.00 b
Coragen+ DyneAmic	1.25 b	4.75 b

Numbers within columns followed by the same letter are not significantly different (LSD; P=0.05).

DuPONT VYDATE L VEGETABLE TRIAL
CROP YIELD AND PRODUCE QUALITY ENHANCEMENT ON CUCURBITS

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Jesse McMillan, University of Georgia
Unessee Hargett, University of Georgia

Introduction

Vydate L is currently labeled as a systemic insecticide and nematicide for use on various crops. This trial was conducted to evaluate whether applications of Vydate L can provide quality enhancement of fruiting vegetable crops and cucurbit crops and show a positive effect on produce yield .

Methods and Materials

This study was located at the Black Shank Farm, CPES- Tifton, Ga. in a field with a history of assorted vegetable production. Field plot areas were turned on 08 March and fertilized with an application of 10-10-10 on 19 March. Fertilizer was roto-tilled into soil after application. On 21 March, beds were shaped and covered with 1 mil black polyethylene mulch with drip tape in the center of the bed approximately 1 inch deep. Drip tape was brand AquaTraxx™ with a 12-inch emitter spacing and a flow rate of .45 gal/min with a 12- PSI regulator. Methyl bromide 67%, treatments #3 and #4 were applied at the time of bed shaping and covering. Plots were staked and set up in a randomized complete block design (RCBD) with five replications on 23 March. Each plot was 25 feet long, 30" wide beds with 5 foot alleys.

Yellow crook-neck squash variety 'Gemini' was transplanted into test plots on single rows 09 April. Plant spacing was 12". Individual treatments of Vydate L @ 2.0qts/A were applied through the drip tape on 10, 17, and 26 April post-transplant.

Vigor ratings were conducted on 17, 24 April, and 03 May. Plant vigor was rated on a scale of 1 to 10, with 10 representing live and healthy plants and 1 representing dead plants. Height measurements were taken on 17, 25 April, and 02 May. Height measurements were done in centimeters measuring plants from the base of plant to the tip of the longest leaf.

All squash fruit were hand harvested from all plants in each bed. Fruits were harvested when they were immature, approximately 6 inches long, with a light yellow color and soft flesh that could be easily pierced, and when flowers were desiccated and/ or abscised from fruit. Each harvest was separated into marketable and cull fruits per plot number, counted and weighed in pounds. Marketable fruits were then graded by commercial sizes. Grade standards were taken from the following publication and table:

U.S. Standards for Grades of Summer Squash 51.4050-51.4053
Table I (USDA).

Size Designations	**Inches** **Minimum Diameter**	**Maximum Diameter**
Fancy	1 1/2	2
US #1	2	2 1/2
US #2	2 1/2	3
Large	3	

Each squash fruit was passed through one of four round openings of a designated diameter. Numbers of squash fruit in each size category was recorded for each plot number. There were a total of five harvests and grades done on 15, 21, 25 & 30 May and 08 June.

All plots were sprayed for insect control as follows: Asana 9.6oz/A on 30 May.. Lannate was applied on 08 June.

Squash roots were dug 16 July and a root gall evaluation was conducted on 17 July. Ten plants per plot were evaluated using a 0-10 scale whereby 0= no galls, 1= very few small galls, 2=numerous small galls, 3= numerous small galls of which some are grown together, 4= numerous small and some big galls, 5= 25% of roots severely, 6= 50% of roots severely galled, 7=75% of roots severely galled, 8= no healthy roots but plant is still green, 9= roots rotting and plants dying, 10= plant and roots dead.

<u>Summary</u>

Squash grew well and were very vigorous throughout the trial. The data indicated that MB and MB + Vydate traveled to increase grade and yield of squash and the low level of root knot damage way explain some of those differences. However with the root knot index as low as was detected, other factors that increase yield and Vigor may be in play with this system.

Dupont Vydate L Quality Trial on Cucurbits 2007

Table 1. Effect of Vydate L on Yield of 'Gemini' variety yellow crookneck summer squash

Treatment	Marketable Number	Marketable Weight (lbs)	Cull Number	Cull Weight (lbs.)	Total Number Cull & Marketable fruits	Total weight Cull & Marketable fruits (lbs.)
1. Untreated Control	171.6 a	132.8 b	11.4 a	1.56 a	183.0 a	134.4 b
2. Vydate L	177.0 a	134.3 b	14.8 a	5.6 a	191.8 a	140.0 ab
3. Methyl Bromide 67%	174.4 a	140.0 ab	11.6 a	2.0 a	186.0 a	142.0 ab
4. Vydate L + Methyl Bromide 67%	184.2 a	149.2 a	8.4 a	2.7 a	192.6 a	151.9 a

[1] Data are means of five replications. Means in the same column followed by the same letter are not different (P=0.05) ccording to Duncan's Multiple range test. No letters indicate non-significant difference.
[2] The fruit collected from each individual plot that was considered to be marketable and showed no symptoms of disease was seperated and counted on 21, 25, 27 June and 09 July.
[3] The fruit collected separately from each plot and considered marketable and non-diseased was weighed (in lbs.) on 15, 21, 25, and 30 May and 08 June.
[4] The fruit collected from each individual plot that was considered to be diseased and non-marketable was seperated and counted on 15, 21, 25, and 30 May and 08 June.
[5] The fruit collected separately from each plot and considered diseased and non-marketable was weighed (in lbs.) on 15, 21, 25, and 30 May and 08 June.
[6] Equals the total number of fruits harvested both marketable and culls.
[7] Equals total yield (in lbs.) Of fruits harvested both marketable and cull.

Dupont Vydate L Quality Trial on Cucurbits 2007

Table 2. Numbers of marketable fruit, yellow crookneck summer squash variety 'Gemini', per grade according to USDA commercial standards

	Grades[2]			
Treatment	**Fancy**	**US #1**	**US #2**	**Large**
1. Untreated Control	46.0 a	35.6 a	41.4 a	44.0 a
2. Vydate L	47.0 a	43.8 a	43.2 a	44.6 a
3. Methyl Bromide 67%	46.4 a	37.8 a	40.6 a	49.2 a
4. Vydate L + Methyl Bromide 67%	45.2 a	38.0 a	45.6 a	52.8 a

[1] Data are means of five replications. Means in the same column followed by the same letter are not different (P=0.05) according to Duncan's multiple range test.
No letters indicate non-significant difference.
[2] Marketable fruit were graded according to size standards set forth in the USDA publication **"United States Standards for Grades of Summer Squash", section 51.4050-4053.**
Grades of squash were determined by the separating squash according to minimum and maximum sizes in inches as follows: Fancy 1 ½"-2", US#1 2"-2 ½", US#2 2 ½"-3", Large 3" and larger. Marketable fruit were graded at the time of harvest on 15, 21, 25, and 30 May and 08 June.

Dupont Vydate L Quality Trial on Cucurbits 2007

Table 3. Effect of Vydate L on vigor, plant height and populations of plant parasitic nematodes on 'Gemini' yellow crookneck summer squash

	Vigor Rating (0-10)[2]				Height Measurement[3]				
Treatment	**April 17**	**April 24**	**May 02**	**Average Vigor**	**April 17**	**April 25**	**May 02**	**Average height**	**Gall Rating**
1. Untreated Control	8.0 c	7.4 c	6.6 c	7.7 c	8.76 a	16.3 a	40.0 c	15.9 b	0.26 a
2. Vydate L	8.2 bc	8.2 b	7.6 bc	8.2 b	8.63 a	16.0 a	43.3 ab	17.2 ab	0.80 a
3. Methyl Bromide 67%	8.8 b	9.6 a	8.0 b	9.2 a	8.58 a	16.4 a	42.4 b	17.3 ab	0.00 a
4. Vydate L + Methyl Bromide 67%	9.6 a	9.6 a	9.2 a	9.6 a	9.70 a	21.2 a	45.3 a	20.6 a	0.00 a

[1] Data are means of five replications. Means in the same column followed by the same letter are not different (P=0.05) according to Duncan's multiple range test.
No letters indicate non-significant difference.
[2] Vigor was done on a scale of 1-10 with 10= live and healthy plants and 1 = dead plants and an average was taken of vigor. Ratings were conducted on 17, 24 April and 03 May.
[3] Height measurements were conducted by measuring each plant from the base of the plant to the tip of the longest leaf. Measurements were taken in centimeters on 17, 24, April and
02 May.
[4] Root gall ratings were taken on July 17 using a scale of 0-10. 10= dead plants and roots and 0= no galls and a healthy plant. Root gall ratings were done after the last harvest.
Ten plants per plot were rated.

DuPONT VYDATE L VEGETABLE TRIAL
CROP YIELD AND PRODUCE QUALITY ENHANCEMENT ON TOMATO

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Jesse McMillan, University of Georgia
Unessee Hargett, University of Georgia

Introduction

Vydate L is currently labeled as a systemic insecticide and nematicide for use on various crops. This trial was conducted to evaluate whether applications of Vydate L can provide quality enhancement of fruiting vegetable crops and cucurbit crops and show a positive effect on produce yield .

Methods and Materials

This study was located at the Black Shank Farm, CPES- Tifton, Ga. in a field with a history of assorted vegetable production. Field plot areas were turned on 08 March and fertilized with an application of 10-10-10 on 19 March. Fertilizer was rototilled into soil after application. On 21 March, beds were shaped and covered with 1 mil black polyethylene mulch with drip tape in the center of the bed approximately 1 inch deep. Drip tape was brand AquaTraxx™ with a 12-inch emitter spacing and a flow rate of .45 gal/min with a 12- PSI regulator. Methyl bromide 67%, treatments #3 and #4 were applied at the time of bed shaping and covering. Plots were staked and set up in a randomized complete block design (RCBD) with five replications on 23 March. Each plot was 25 feet long, 30" wide beds with 5 foot alleys.

Tomato variety 'Bella Rosa' was transplanted into test plots on single rows 28 March. Plant spacing was 18". Individual treatments of Vydate L @ 2.0qts/A were applied through the drip tape on 29 March, 5 and 12 April post-transplant.

Vigor ratings were conducted on 04, 11, and 17 April. Plant vigor was rated on a scale of 1 to 10, 10 representing live and healthy plants and 1 representing dead plants. Height measurements were taken on 04, 11, and 18 April. Height measurements were done in centimeters measuring plants from the base of plant to the tip of the longest leaf.

All tomato fruit were hand harvested from a 10 foot center section of each bed (approximately 7 plants). Fruits were harvested when they showed at least a 50% color break. Each harvest was separated into marketable and cull fruits per plot number, counted and weighed in pounds. Marketable fruits were then graded by size. Grade sizes were taken from the following publication and table:

U.S. Standards for Grades of Fresh tomatoes 51.1859- Size
Table I (USDA).

Size Designations	Inches Miniumum Diameter[1]	Maximum Diameter[2]
Small	2 4/32	2 9/32
Medium	2 8/32	2 17/32
Large	2 16/32	2 25/32
Extra Large	2 24/32	

[1] Will not pass through a round opening of the designated diameter when tomato is placed with the greatest transverse diameter across the opening

[2] Will pass through a round opening of the designated diameter in any position

Each tomato fruit was passed through one of four round openings of a designated diameter. Numbers of tomato fruit in each size category was recorded for each plot number. There were a total of four harvests and grades done on 21, 25 & 27 June and 09 July.

All plots were sprayed for insect control as follows: Asana 9.6oz/A on 22 & 31 May, 13, 22 & 27 June. Lannate was applied on 08 June. Bravo720 2pt/A was applied on 27 June.

Foliar applications of Calcium Boron were applied on 17 May and 13 June for control of Blossom End Rot.

Tomato roots were dug 16 July and a root gall evaluation was conducted on 17 July. Ten plants per plot were evaluated using a 0-10 scale whereby 0= no galls, 1= very few small galls, 2=numerous small galls, 3= numerous small galls of which some are grown together, 4= numerous small and some big galls, 5= 25% of roots severely, 6= 50% of roots severely galled, 7=75% of roots severely galled, 8= no healthy roots but plant is still green, 9= roots rotting and plants dying, 10= plant and roots dead.

Summary

Tomato grew well and even though under drought conditions during the year, ship applied water satisfied growing needs of plants. The drought condition and high temperatures may have contributed to blossom end rot of fruit which appeared to be high in the MB treated plots. Correction measures of Ca-Boron may have been applied too late for early loss, but corrected later develop of fruits.

Unexpectedly, root knot nematode was present in a few of the replications of the test and may have contributed to the variability among replications. Root knot damage was heavy in a few of the rows treated control and Vydate along treatments.

Dupont Vydate L Quality Trial on Tomato 2007

Table 1. Effect of Vydate L on Yield of 'Bella Rosa' variety tomato

Treatment	Marketable Number [2]	Marketable Weight [3]	Cull Number [4]	Cull Weight [5]	Total Number Cull & Marketable fruits [6]	Total Weight Cull & Marketable fruits [7]
1. Untreated Control	202.2 a	75.03 a	53.2 a	16.1 a	255.4 a	91.1 a
2. Vydate L	209.4 a	92.48 a	50.4 a	18.0 a	259.8 a	10.4 a
3. Methyl Bromide 67%	213.2 a	86.73 a	56.8 a	15.6 a	270.0 a	102.4 a
4. Vydate L + Methyl Bromide 67%	170.0 a	82.72 a	73.8 a	22.7 a	243.8 a	105.4 a

[1] Data are means of five replications. Means in the same column followed by the same letter are not different (P=0.05) according to Duncan's multiple range test.
No letters indicate non-significant difference.
[2] The fruit collected from each individual plot that was considered to be marketable and showed no symptoms of disease was separated and counted on 21, 25, 27 June, and 09 July.
[3] The fruit was collected separately by each plot and the fruit considered marketable and non-diseased was weighed (in lbs.) on 21, 25, 27 June, and 09 July.
[4] The fruit collected from each individual plot that was considered diseased and non-marketable was separated and counted on 21, 25, 27 June, and 09 July.
[5] The fruit was collected separately by each plot and the fruit diseased and non-marketable was weighed (in lbs.) on 21, 25, 27 June, and 09 July.
[6] Equals total number of fruits harvested both marketable and culls
[7] Equals total yield (in lbs.) of fruits harvested both marketable and culls.

Dupont Vydate L Quality Trial on Tomato 2007

Table 2. Numbers of marketable fruit, tomato variety 'Bella Rosa', per size grade according to USDA size standards

	Grades [2]			
Treatment	**Small**	**Medium**	**Large**	**X-Large**
1. Untreated Control	14.4 a	23.8 a	31.8 a	132.2 a
2. Vydate L	9.8 a	22.8 a	30.0 a	137.0 a
3. Methyl Bromide 67%	8.0 a	16.2 a	34.8 a	154.2 a
4. Vydate L + Methyl Bromide 67%	4.6 a	14.2 a	23.4 a	127.8 a

[1] Data are means of five replications. Means in the same column followed by the same letter are not different (P=0.05) according to Duncan's multiple range test.
No letters indicate non-significant difference.
[2] Marketable fruit were graded according to size standards set forth in the USDA publication **"United States Standards for Grades of Fresh Tomatoes", section 51.1859 Size. Table I.** Size designations as listed in table are in inches with minimum and maximum dimensions as follows: Small 2 4/32 to 2 9/32, Medium 2 8/32 to 2 17/32, Large 2 16/32 to 2 25/32, and
Extra Large 2 24/32 or larger. Marketable fruit were graded at the time of harvest on 21, 25, 27 June, and 09 July

Dupont Vydate L Quality Trial on Tomato 2007

Table 3. Effect of Vydate L on vigor, plant height and populations of plant parasitic nematodes on 'Bella Rosa' tomato

	Vigor Rating (0-10)[2]				Height Measurements[3]				
Treatment	April 04	April 11	April 17	**Average Vigor**	April 04	April 11	April 18	**Average height**	**Gall Rating [4]**
1. Untreated Control	8.2b	8.0b	8.0c	**7.7c**	10.6a	21.2a	33.2a	**15.9b**	2.2a
2. Vydate L	9.2 a	9.0a	9.2b	**8.2b**	10.9a	22.6a	32.3a	**17.2ab**	1.6ab
3. Methyl Bromide 67%	9.6a	9.2a	9.8a	**9.2a**	10.8a	22.9a	34.7a	**17.3ab**	0.0b
4. Vydate L + Methyl Bromide 67%	9.8a	9.0a	9.4ab	**9.6a**	11.0a	22.8a	34.1a	**20.6a**	0.1b

[1] Data are means of five replications. Means in the same column followed by the same letter are not different (P=0.05) according to Duncan's multiple range test.
No letters indicate non-significant difference.
[2] Vigor was done on a scale of 1-10 with 10= live and healthy plants and 1 = dead plants and an average was taken of vigor. Ratings were conducted on 04, 11 and 17 April.
[3] Height measurements were conducted by measuring each plant from the base of the plant to the tip of the longest leaf. Measurements were taken in centimeters on 04, 11, and 18 April.
[4] Root gall ratings were taken on July 17 using a scale of 0-10. 10= dead plants and roots and 0= no galls and a healthy plant. Root gall ratings were done after the last harvest.
Ten plants per plot were rated.

INTEGRATED USE OF RIDOMIL GOLD AND OTHER COMPOUNDS FOR MANAGEMENT OF PHYTOPHTHORA BLIGHT IN SQUASH

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Introduction

Phytophthora blight caused by *Phytophthora capsici* is responsible for serious losses to growers of summer squash in Georgia and other states. The efficacy of current strategies for management of this disease is limited. Resistant squash cultivars are not available and no single fungicide has shown to provide consistent and effective suppression of the disease. Integrated use of different compounds through soil treatments and foliar applications may improve the efficacy in disease suppression. This study was to evaluate the effectiveness of integrating Ridomil Gold and other products for control of *P. capsici* on squash.

Materials and Methods

This trial was conducted at University of Georgia Coastal Plain Experiment Station (Black Shank Farm) located in Tifton, GA. The field site has been used as a *P. capsici* nursery and was inoculated with the pathogen. Raised beds were prepared for squash growth that were 6-inch-high by 30-inch-wide and centered 6 feet apart. Yellow squash seedlings (cv. Gemini) were transplanted at 12 inch spacing within a row into raised beds in the field on April 9. The experimental plots consisted of a single row which was 25 feet long. Buffer zones with 5 feet spacing without planting of squash seedlings were maintained between plots. A randomized complete block design was employed with five replications. The drip tape used was Aquatraxx^{tm} with a 12-inch emitter spacing and a flow rate of 0.45 gal/min with a 12-PSI regulator. All plots were irrigated with additional overhead water twice a day starting May 1 and three times a day beginning May 25 until June 1. On June 2 plots received more than 2 inches of rainfall. Additional inoculum of *P. capsici* was applied to each plot on May 16 by placing 1/8 teaspoon of *P. capsici* infested beet seed (approximately 15-20 seeds) in three locations in each plot just below the soil surface. Asana (9.6 oz./A) was sprayed on May 31 for control of insects.

Ridomil Gold 480SL and other products were applied through drip irrigation tubes or as foliar sprays at the rates as described in Table 1. Non-treated plots and Ridomil Gold 480SL applied alone were used as controls. Plants with Phytophthora blight were counted weekly after first appearance of symptoms in the field. All plots were hand harvested on May 14, 21, 25, 30, and June 6. Marketable and unmarketable yields were determined and the number of *P. capsici* infected fruit was recorded. Analysis of variance (ANOVA) was used to determine the effect of the treatments on disease incidence and squash yield using the Statistical Analysis System (SAS Institute, Cary, NC).

Results and Discussion

The squash cultivar Gemini was susceptible to Phytophthora blight and the final disease incidence reached 47% in the non-treated control plots (Table 1). Soil treatment with Ridomil Gold 480SL prior to transplanting in conjunction with 3 or 4 foliar sprays of Revus, Activator, Kocide and 2 or 3 foliar applications of Ridomil Gold Copper provided significant disease suppression compared with the non-treated control (Table 1). Ridomil Gold applied alone did not reduce disease incidence significantly compared to the non-treated control. Combined use of Ridomil Gold 480SL as soil treatment with four foliar sprays of Revus, Activator, Kocide (1.5 lb/acre) and two foliar applications of Ridomil Gold Copper also increased plant vigor and total number of squash fruit (data not shown). The number of infected fruit was not significantly affected by all the treatments.

Table 1. Efficacy of Ridomil Gold and other compounds in control of Phytophthora blight on squash.

Treatment and rate	Application schedule[1]	Yield (lb/A)[2] Marketable	Yield (lb/A)[2] Total	Disease Infected fruit[2,3]	Disease Infected plant (%)[2,4]
Non-treated control	----	50,573 b	54,036 a	8.8 a	47.2 a
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Kocide 3000 46.1DF, 1.5 lb/A Ridomil Gold Copper 65WP, 2 lb/A	A BCEF BCEF BCEF DG	49,528 ab	54,428 a	13.4 a	23.2 b
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Kocide 3000 46.1DF, 0.75 lb/A Ridomil Gold Copper 65WP, 2 lb/A	A BCEF BCEF BCEF DG	53,840 ab	59,851 a	13.0 a	18.4 b
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Kocide 3000 46.1DF, 1.5 lb/A Ridomil Gold Copper 65WP, 2 lb/A	A BDF BDF BDF CEG	51,880 ab	56,584 a	10.4 a	26.4 b
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Ridomil Gold Copper 65WP, 2 lb/A	A BDF BDF CEG	58,479 a	63,314 a	13.2 a	38.4 ab
Ridomil Gold 480SL, 16 fl. oz/A	ABCDEF	57,499 ab	61,877 a	7.4 a	36.8 ab

[1] A = preplant, B = 1 week post transplanting (PP), C = 2 weeks PP, D = 3 weeks PP, E = 4 weeks PP, F = 5 weeks PP, G = 6 weeks PP.

[2] Data are means of five replications. Means within a column followed by the same letter are not significantly different (P = 0.05) according to Duncan's multiple range test.

[3] Number of *P. capsici* infected fruit each plot.

[4] Final disease incidence.

EVALUATION OF V-10161 FOR CONTROL OF PHYTOPHTHORA FRUIT ROT ON TOMATO

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Introduction

Phytophthora blight, caused by *Phytophthora capsici*, is a serious disease and a major constraint in the production of vegetables in Georgia and other areas throughout the world. The disease has three phases: root rot, crown rot, and fruit rot. The root rot and crown rot phases can kill a plant by attacking the root system and the above ground portion of the plant, and fruit rot can occur from the time of fruit set until harvest or after harvest and in storage. All the three phases result in significant yield losses. This study was conducted to evaluate the efficacy of V-10161 in control of Phytophthora fruit rot on tomato.

Materials and Methods

The field experiments were conducted at University of Georgia Coastal Plain Experiment Station (Black Shank Farm) located in Tifton, GA. The field sites have been used as a *P. capsici* nursery and were inoculated with the pathogen. Raised beds were prepared for plant growth that were 6-inch-high by 30-inch-wide and centered 6 feet apart. Tomato (cv. Bella Rosa) seedlings were transplanted at 18 inch spacing on April 4. The experimental plots consisted of a single row which was 25 feet long. Buffer zones with 5 feet spacing without planting of crops were maintained between plots. A randomized complete block design was employed with five replications.

V-10161 and other products were applied through drip irrigation tubes or as foliar sprays at the rates as described in Table 1. Non-treated plots and Ridomil Gold 76.5WP applied alone were used as controls. Tomato fruit were harvested on June 18, 28, and July 9. Marketable and unmarketable yields were determined and the number of *P. capsici* infected fruit was recorded. Analysis of variance (ANOVA) was used to determine the effect of the treatments on disease incidence and yield using the Statistical Analysis System (SAS Institute, Cary, NC).

Results and Discussion

Tomato seedlings were less susceptible to this disease with no plant death due to *P. capsici* infection in the experiment. However, tomato fruit were heavily infected by *P. capsici* with 34% of the fruit showing symptoms in the non-treated control. V-10161-1635 applied at 3 fl. oz/acre, V-10161-1562 applied at 4 fl. oz/acre, and use of V-10161-1562 (3 or 4 fl. oz/acre) in conjunction with Bravo and Ridomil Gold significantly reduced fruit infection (Table 1). V-10161-1562 (3 or 4 fl. oz/acre), V-10161-1635 (3 fl. oz/acre), and combined use of V-10161-1562 (3 fl. oz/acre) with Bravo and Ridomil Gold increased marketable yield significantly compared with the non-treated control.

Table 1. Efficacy of V-10161 in control of Phytophthora fruit rot on tomato

Treatment and rate	Yield (lb/A)[1]		Infected fruit (%)[1,2]
	Marketable	Total	
Non-treated control	14,506 b	22,935 b	34.2 a
V-10161-1562 4.0SC, 2 fl. oz/A	19,472 a	29,012 a	30.7 ab
V-10161-1562 4.0SC, 3 fl. oz/A	26,137 a	34,239 a	24.8 abc
V-10161-1635 4.0SC, 3 fl. oz/A	22,804 a	28,163 a	20.3 c
V-10161-1562 4.0SC, 4 fl. oz/A	22,347 a	31,560 a	21.0 bc
V-10161-1562 4.0SC, 3 fl. oz/A Bravo 4.17SC, 2.25 pt/A Ridomil Gold 76.5WP, 2 lb/A	23,785 a	31,560 a	20.1 c
V-10161-1562 4.0SC, 4 fl. oz/A Bravo 4.17SC, 2.25 pt/A Ridomil Gold 76.5WP, 2 lb/A	21,367 a	27,901 a	21.0 bc
Ridomil Gold 76.5WP, 2 lb/A	24,895 a	35,089 a	23.5 abc

[1] Means within a column followed by the same letter are not significantly different (*P* = 0.05) according to Duncan's multiple range test.
[2] Percentage of *P. capsici* infected fruit.

EFFICACY OF V-10161 AND OTHER PRODUCTS IN CONTROL OF *PHYTOPHTHORA CAPSICI* IN SQUASH

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Introduction

Phytophthora blight caused by *Phytophthora capsici* is a devastating disease in the production of cucurbits, peppers, tomatoes, and several other vegetable crops in Georgia and other states. *P. capsici* is favored by wet and humid weather conditions that are typical in the southeastern states of the U.S. The efficacy of current strategies for management of this disease is limited. No single fungicide has shown to consistently and effectively suppress the disease when environmental conditions are favorable for the development of the disease. Due to the destructive nature of the disease and lack of efficient control measures, development of alternative or complementary approaches for effective management of this disease is highly desirable. This study was conducted to evaluate the efficacy of V-10161 in control of Phytophthora blight on squash.

Materials and Methods

The field experiments were conducted at University of Georgia Coastal Plain Experiment Station (Black Shank Farm) located in Tifton, GA. The field sites have been used as a *P. capsici* nursery and were inoculated with the pathogen. Raised beds were prepared for plant growth that were 6-inch-high by 30-inch-wide and centered 6 feet apart. Yellow squash seedlings (cv. Gemini) were transplanted at 12 inch spacing within a row into raised beds on April 9. The experimental plots consisted of a single row which was 25 feet long. Buffer zones with 5 feet spacing without planting of crops were maintained between plots. A randomized complete block design was employed with five replications.

V-10161 and other products were applied through drip irrigation tubes or as foliar sprays at the rates as described in Table 1. Non-treated plots and Ridomil Gold 76.5WP applied alone were used as controls. Plants with Phytophthora blight were counted weekly after first appearance of symptoms in the field. Squash fruit were hand harvested on May 14, 18, 24, and 29. Marketable and unmarketable yields were determined and the number of *P. capsici* infected fruit was recorded. Analysis of variance (ANOVA) was used to determine the effect of the treatments on disease incidence and yield using the Statistical Analysis System (SAS Institute, Cary, NC).

Results and Discussion

The squash cultivar Gemini was susceptible to Phytophthora blight and the final disease incidence reached 87% in the non-treated control plots (Table 1). All the treatments significantly reduced disease, compared to the non-treated control, based on the final disease incidence (% infected plants). Application of V-10161-1562 or V-10161-1635 alone was not significantly different from Ridomil Gold in disease suppression. All treatments also increased marketable and total yield of squash significantly compared to the non-treated control (Table 1).

Table 1. Efficacy of V-10161 and other compounds in control of Phytophthora blight on squash

Treatment and rate	Yield (lb/A)[1]		Disease	
	Marketable	Total	Infected fruit[1,2]	Infected plant (%)[1,3]
Non-treated control	26,708 b	27,851 b	1.4 a	87.0 a
V-10161-1562 4.0SC, 2 fl. oz/A	39,449 a	39,858 a	0.0 c	53.0 b
V-10161-1562 4.0SC, 3 fl. oz/A	42,226 a	42,716 a	0.2 bc	44.0 b
V-10161-1635 4.0SC, 3 fl. oz/A	36,264 a	36,754 a	0.0 c	55.0 b
V-10161-1562 4.0SC, 4 fl. oz/A	39,204 a	39,694 a	1.2 ab	49.0 b
V-10161-1562 4.0SC, 3 fl. oz/A Bravo 4.17SC, 2.25 pt/A Ridomil Gold 76.5WP, 2 lb/A	39,858 a	40,021 a	0.0 c	49.0 b
V-10161-1562 4.0SC, 4 fl. oz/A Bravo 4.17SC, 2.25 pt/A Ridomil Gold 76.5WP, 2 lb/A	37,408 a	37,734 a	0.2 bc	47.0 b
Ridomil Gold 76.5WP, 2 lb/A	38,469 a	38,796 a	0.6 abc	47.0 b

[1] Data are means of five replications. Means within a column followed by the same letter are not significantly different (P = 0.05) according to Duncan's multiple range test.
[2] Number of *P. capsici* infected fruit each plot.
[3] Final disease incidence.

EVALUATION OF REVUS AND OTHER COMPOUNDS FOR MANAGEMENT OF PHYTOPHTHORA BLIGHT ON BELL PEPPER

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Introduction

Phytophthora blight, caused by *Phytophthora capsici,* is a serious disease on bell pepper and several other vegetable crops. *P. capsici* is a soil-borne pathogen and produces different types of spores in its life cycle, such as zoospores, sporangia, and oospores, which facilitate the survival and infection of the pathogen. Phytophthora blight is among the most difficult to control. No conventional measure has shown to consistently and effectively suppress losses related to *P. capsici* epidemics. It is desirable to develop integrated approaches using soil treatments and foliar applications to improve the efficacy in disease control. This study was to evaluate the effectiveness of integrating Revus, Ridomil Gold and other compounds for control of *P. capsici* on bell pepper.

Materials and Methods

This experiment was conducted at University of Georgia Coastal Plain Experiment Station (Black Shank Farm) located in Tifton, GA. The field site has been used as a *P. capsici* nursery and was inoculated with the pathogen. Raised beds were prepared for pepper growth that were 6-inch-high by 30-inch-wide and centered 6 feet apart. Bell pepper seedlings (cv. Aristotle) were transplanted at 18 inch spacing within a row into raised beds in the field on March 29. Experimental plots consisted of a single row which was 25 feet long. Buffer zones with 5 feet spacing without planting of bell pepper seedlings were maintained between plots. A randomized complete block design was employed with five replications. Revus and other products were applied by foliar sprays or through drip irrigation tubes at the rates as described in Table 1. Non-treated plots and Ridomil Gold 480SL applied alone were used as controls. Plants with Phytophthora blight were counted weekly after first appearance of symptoms in the field. All plots were hand harvested on June 4, 14, and 20. Marketable and unmarketable yields were determined and the number of *P. capsici* infected fruit was recorded. Analysis of variance (ANOVA) was used to determine the effect of the treatments on disease incidence and pepper yield using the Statistical Analysis System (SAS Institute, Cary, NC).

Results and Discussion

Final disease incidence in the non-treated control plots reached 56% (infected plants) at the end of the experiment (Table 1). All the treatments reduced disease incidence numerically but not significantly. The treatment that resulted in the lowest disease incidence was soil application of Ridomil Gold 480SL prior to transplanting in conjunction with four foliar sprays of Revus, Activator, Kocide (0.75 lb/acre) and two foliar applications of Ridomil Gold Copper, which reduced disease incidence by approximately 50% compared to the non-treated control. Plots treated with Ridomil Gold 480SL in conjunction with four foliar sprays of Revus, Activator, Kocide (1.5 lb/acre) and two foliar applications of Ridomil Gold Copper produced the highest marketable and total yield, which was significantly different from the non-treated control or Ridomil Gold 480SL applied alone (Table 1). Number of infected fruit was not significantly affected by any of the treatments.

Table 1. Efficacy of Revus and other compounds in control of Phytophthora blight on bell pepper

Treatment and rate	Application schedule[1]	Yield (lb/A)[2]		Disease	
		Marketable	Total	Infected fruit[2,3]	Infected plant (%)[2,4]
Non-treated control	----	4,835 bc	5,750 bc	1.4 a	56.5 a
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Kocide 3000 46.1DF, 1.5 lb/A Ridomil Gold Copper 65WP, 2 lb/A	A BCEF BCEF BCEF DG	9,736 a	10,846 a	1.7 a	35.3 a
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Kocide 3000 46.1DF, 0.75 lb/A Ridomil Gold Copper 65WP, 2 lb/A	A BCEF BCEF BCEF DG	5,815 bc	6,991 bc	1.8 a	28.2 a
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Kocide 3000 46.1DF, 1.5 lb/A Ridomil Gold Copper 65WP, 2 lb/A	A BDF BDF BDF CEG	7,645 ab	8,886 ab	1.9 a	38.8 a
Ridomil Gold 480SL, 16 fl. oz/A REVUS 2.09SC, 8 fl. oz/A Activator 90 Ridomil Gold Copper 65WP, 2 lb/A	A BDF BDF CEG	6,338 bc	7,645 abc	2.0 a	34.1 a
Ridomil Gold 480SL, 16 fl. oz/A	ABCDEF	3,659 c	4,312 c	1.0 a	44.7 a

[1] A = preplant, B = 1 week post transplanting (PP), C = 2 weeks PP, D = 3 weeks PP, E = 4 weeks PP, F = 5 weeks PP, G = 6 weeks PP.
[2] Data are means of five replications. Means within a column followed by the same letter are not significantly different ($P = 0.05$) according to Duncan's multiple range test.
[3] Number of *P. capsici* infected fruit each plot.
[4] Final disease incidence.

EVALUATION OF *MUSCODOR ALBUS* FOR CONTROL OF *PHYTOPHTHORA CAPSICI*

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Introduction

Phytophthora blight, caused by *Phytophthora capsici*, has become a devastating disease in recent years in the production of cucurbits, peppers, tomatoes, and several other vegetable crops in Georgia. *Phytophthora capsici* is a soil-borne pathogen and persists in soils over long periods, which provides inoculum sources between crop growing seasons. Hence, soil treatment using adequate fumigants to reduce or eliminate soil populations of the pathogen is an appropriate strategy in the management of this disease. This study was to evaluate the efficacy of a biofumigant-producing product QRD 300 (*Muscodor albus*) in control of *P. capsici* on squash.

Materials and Methods

This study was conducted at University of Georgia Coastal Plain Experiment Station (Black Shank Farm) located in Tifton, GA. The field site has been used as a *P. capsici* nursery and was inoculated with the pathogen. Raised beds were prepared for squash growth that were 6-inch-high by 30-inch-wide and centered 6 feet apart. Yellow squash seedlings (cv. Gemini) were transplanted at 12 inch spacing within a row into raised beds in the field on April 27. Experimental plots consisted of a single row which was 25 feet long. Buffer zones with 5 feet spacing without planting of squash seedlings were maintained between plots. A randomized complete block design was employed with five replications. Asana (9.6 oz./A) was sprayed on all plots for control of insects on 31 May.

QRD 300 was banded at bedding or broadcast applied prior to bedding as described in Table 1. Non-treated plots and Ridomil Gold plus Ridomil Gold Copper treatments were used as controls. All plots were irrigated with additional overhead water twice a day starting on May 1 and three times a day beginning on May 25 until June 1. On June 2 plots received more than 2 inches of rainfall. Plants with Phytophthora blight were counted weekly after first appearance of symptoms in the field. All plots were hand harvested on June 4. Marketable and unmarketable yields were determined and the number of *P. capsici* infected fruit was recorded. Analysis of variance (ANOVA) was used to determine the effect of the treatments on disease incidence and squash yield using the Statistical Analysis System (SAS Institute, Cary, NC).

Results and Discussion

The yellow squash cultivar Gemini was very susceptible to Phytophthora blight and the disease progressed rapidly in the field. Final disease incidence reached 82% in the non-treated control plots, indicating high inoculum pressure (Table 1). None of the QRD 300 treatments provided significant disease reduction based on the final disease incidence (infected plants) or number of infected fruit. Ridomil Gold soil treatment plus foliar applications of Ridomil Gold Copper did not reduce disease neither (Table 1). In addition, none of the treatments increased squash yield significantly (data not shown).

Due to the multiple phases of the disease, integration of soil applied and foliar applied treatments might provide greater disease suppression compared to soil treatment alone. Hence, combined use of QRD 300 as soil treatment and other measures as foliar treatment deserves evaluation for a more comprehensive understanding of the efficacy of QRD 300 in control of Phytophthora blight.

Table 1. Efficacy of QRD 300 (*Muscodor albus*) in control of Phytophthora blight on squash

Treatment and rate	Application schedule	Disease: Infected fruit[1,2]	Disease: Infected plant (%)[1,3]
Non-treated control	----	6.8 ab	82.0 a
QRD 300, 3.75 g/L soil	Banded at bedding	3.6 ab	88.7 a
QRD 300, 1.9 g/L soil	Banded at bedding	4.4 ab	88.7 a
QRD 300, 0.55 g/L soil	Banded at bedding	7.0 ab	89.3 a
QRD 300, 1.9 g/L soil	Broadcast prior to bed	8.4 a	86.7 a
Ridomil Gold, 2.0 pt/A	At transplant		
Ridomil Gold Copper, 2.5 lb/A	Four weekly applications beginning at flowering post plant	1.8 b	81.3 a

[1] Data are means of five replications. Means within a column followed by the same letter are not significantly different (*P* = 0.05) according to Duncan's multiple range test.
[2] Number of *P. capsici* infected fruit each plot.
[3] Final disease incidence.

EFFICACY OF RANMAN AND OTHER PRODUCTS IN CONTROL OF *PHYTOPHTHORA CAPSICI* IN SQUASH AND BELL PEPPER

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Introduction

Phytophthora blight caused by *Phytophthora capsici* is responsible for serious losses in the production of cucurbits, peppers, and several other vegetable crops in Georgia. The disease is among the most difficult to control and the efficacy of current strategies for management of this disease is limited. Cultural practices such as using well-drained soils with raised beds help reduce the disease but not enough to prevent disease outbreaks when weather conditions are favorable for the pathogen. Development of integrated approaches using chemicals, biologicals, and cultural practices may improve disease control. This study was to evaluate the effectiveness of several chemical fungicides for control of *P. capsici* on squash and bell pepper.

Materials and Methods

The experiment was conducted at University of Georgia Coastal Plain Experiment Station (Black Shank Farm) located in Tifton, GA. The field site has been used as a *P. capsici* nursery and was inoculated with the pathogen. Raised beds were prepared for plant growth that were 6-inch-high by 30-inch-wide and centered 6 feet apart. Yellow squash (cv. Gentry) and bell pepper (cv. Plato) seedlings were transplanted at 12 inch spacing within a row into raised beds on April 11. The experimental plots consisted of a single row which was 15 feet long. Buffer zones with 4 feet spacing without planting of crops were maintained between plots. A randomized complete block design was employed with four replications.

Ranman, Omega and other products were applied at the rates as described in Table 1. Non-treated plots and Ridomil Gold treatment were used as controls. Plants with Phytophthora blight were counted weekly after first appearance of symptoms in the field. Squash fruit were hand harvested on May 14, 21, 25, 30 and June 14 and bell pepper fruit were harvested on June 14. Marketable and unmarketable yields were determined and the number of *P. capsici* infected fruit was recorded. Analysis of variance (ANOVA) was used to determine the effect of the treatments on disease incidence and yield using the Statistical Analysis System (SAS Institute, Cary, NC).

Results and Discussion

The squash cultivar Gentry was susceptible to Phytophthora blight and the final disease incidence reached 70% (infected plants) in the non-treated control plots (Table 1). Application of Omega in conjunction with Ranman provided 45% disease reduction compared with the non-treated control though this reduction was not statistically significant. All the treatments reduced disease incidence numerically compared to the non-treated control (Table 1).

Final disease incidence on bell pepper reached 56% (infected plants) in the non-treated control plots. Application of Ranman in conjunction with Kocide resulted in a 53% disease reduction, compared to the non-treated control, based on the final percentage of infested plants. But none of the treatments provided significant disease suppression.

Table 1. Efficacy of Ranman and other products in control of Phytophthora blight

Treatment and rate	Application schedule	Disease (squash)		Disease (pepper)	
		Infected fruit[1,2]	Infected plant [1,3]	Infected fruit[1,2]	Infected plant[1,3]
Non-treated control		9.8 b	70.0 a	9.5 b	56.3 ab
Ranman, 2.75 fl. oz/A Ranman, 2.75 fl. oz/A + Silwet, 2.0 oz/A + Kocide 2000, 1.5 lb/A	At transplant directed spray Directed spray every two weeks	23.0 a	55.0 a	22.5 a	26.6 b
Omega, 1.5 pt/A Omega, 1 pt/A Ranman, 2.75 fl. oz/A	At transplant directed spray At two weeks post plant At 30 days PHI (pre-harvest interval)	24.0 a	38.4 a	24.0 a	43.8 ab
K-Phite	At transplant directed spray Directed spray every two weeks	9.5 b	65.0 a	9.0 b	71.9 a
Ridomil Gold, 2 pt/A	At transplant At two weeks post plant At 30 days PHI	17.3 ab	46.7 a	16.8 ab	48.4 ab

[1] Data are means of four replications. Means within a column followed by the same letter are not significantly different ($P = 0.05$) according to Duncan's multiple range test.
[2] Number of *P. capsici* infected fruit each plot.
[3] Final disease incidence (% infected plant).

CONTROL OF CATERPILLARS IN EARS WITH FOLIAR INSECTICIDES APPLIED TO SWEET CORN DURING SILKING

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Introduction

The primary pests of sweet corn in Georgia are the corn earworm and the fall armyworm. While both species can survive on sweet corn foliage and can damage the crop through most of the season, the greatest concern is for direct damage to the ears. Additionally, once inside of the ear, the caterpillar is protected from insecticides and is allowed to feed and grow. Thus, sweet corn typically receives multiple insecticide applications during the silking period to prevent infestation of ears by these caterpillars. Pyrethroid insecticides are frequently used in these applications because of their efficacy and relatively minor costs. However, when fall armyworm is present, alternative chemistries are usually needed as the pyrethroid insecticides are not as efficacious against this pest. Additionally, concerns have arisen in the last few years with potential pyrethroid resistance in the corn earworm. This test was conducted to evaluate the efficacy of selected insecticides against these two pest species in sweet corn.

Materials and Methods

Sweet corn (var. Double Up) was direct seeded in 36 inch rows on 30 July, 2007, at the UGA Tifton Vegetable Park in Tifton, Georgia. The test was conducted in the fall to increase the probability of good pest pressure. Plots were established in a RCB design with three replications. Experimental plots were 4 rows by 25 feet. The entire test was treated weekly with Rimon prior to silking to prevent foliar damage by fall armyworm. The insecticides evaluated were applied on Mondays, Wednesdays and Fridays during silking.

Treatments evaluated were Warrior 1SC at 0.03 lb AI/ac, Lambda-cyhalothrin 1EC at 0.03 lb AI/ac, Dipel DF at 1 lb/ac, SpinTor 2SC at 3 oz/ac, and Lannate 2.4EC at 0.45 lb AI/ac. A non-treated Check was included for comparison. Insecticide applications were made on 10, 12, 14, 17, 19, 21, and 24 Sept. 2007. Applications were made with a CO_2 pressurized backpack sprayer (60 PSI) in 40 GPA with 4 hollow-cone nozzles per row (two on each side of the row aimed at ear zone). Actual application was made with a boom with four nozzles, with two pointed toward the ear zones of adjacent rows. The row middles of each plot were walked; thus the two middle rows were treated on each side and the outside rows were treated only from the interior of the plot.

For evaluation, twenty five ears were harvested from the middle two rows of each plot. Ears were shucked and examined for presence of caterpillars (identified to species and counted). Ears were rated for damage by caterpillars on the 0 to 3 scale, with 0 = no damage, 1 = minor damage (generally less than 5 kernels damaged at tip), 2 = tip of ear with severe damage, but less than 1 inch down the ear, and 3 = significant damage extending more than 1 inch down the ear.

All data were analyzed with the PROC ANOVA procedure of PC-SAS. Where significant differences were detected ($P<0.05$), means were separated with LSD ($P=0.05$).

Results and Discussion

Pest pressure was very heavy in this test. Sample taken at the end of the field on 21 Sept. consisted entirely of corn earworm. However, fall armyworm were also collected at harvest time. Larvae collected in the check were approximately 75% corn earworm and it is assumed this species contributed most of the damage.

All of the insecticide treatments, with the exception of Dipel, significantly reduce corn earworm densities and ear damage. There were no significant differences in ear damage among these insecticide treatments. SpinTor appeared to be slightly weaker on corn earworm than the other insecticides, but was the only insecticide treatment with no fall armyworm.

None of the insecticides in this test provided adequate suppression of damage. This is undoubtedly a result of the heavy pest pressure and the extended application frequency (3 days between applications on weekends).

Table 1. Damage ratings and caterpillar collections, Sweet Corn Efficacy Trial, Tifton Vegetable Park, Fall, 2007.

Treatment	Number of ears (of 25) damaged by caterpillars (by damage category)					Number of larvae per plot	
	Rating 0	Rating 1	Rating 2	Rating 3	Rating 2-3	CEW	FAW
Check	1.7 b	0.0 a	1.7 a	21.7 a	23.3 a	11.3 a	4.3 a
Dipel	1.3 b	0.0 a	6.7 a	17.0 b	23.7 a	13.3 a	3.7 a
Lannate	12.0 a	2.3 a	4.7 a	6.0 c	10.7 b	4.0 c	2.0 a
SpinTor	10.7 a	0.7 a	6.3 a	7.3 c	13.7 b	9.7 ab	0.0 a
Warrior	9.0 a	0.3 a	7.3 a	8.3 c	15.7 b	2.7 c	3.7 a
Lambda-cy	13.0 a	1.0 a	5.0 a	6.0 c	11.0 b	5.3 bc	2.7 a

EVALUATION OF INSECTICIDE TREATMENTS IN SQUASH 2007

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Introduction

Summer squash is targeted in the summer and fall growing seasons in southern Georgia by pickleworm, *Diaphania nitidalis* (Stoll), cucumber beetles, D*iabrotica* spp., squash bugs, *Anasa* spp., and sweetpotato whitefly, *Bemisia tabaci* (Gennadius). This experiment evaluated various control options for these pests in 2007.

Materials and Methods

Yellow Crook Neck squash was direct seeded into 2 rows per 6-ft bare ground beds on 15 June and maintained with standard cultural practices at the Lang Farm, Georgia Coastal Plain Experiment Station at Tifton. A total of 500 lbs/a of 10-10-10 and 1 pt/a Curbit was applied at planting to Tift pebbly clay loam field plots followed by two side-dress applications of 150 lbs/a Cal-nitrate. Irrigation was applied weekly with an overhead sprinkler system. Scouting was initiated on 22 June and continued weekly until harvest. Four applications of insecticide were made on 19, 26 June and 2, 11 July. One sample of 5 plants, with one leaf per plant for whitefly and aphid counts, was scouted per plot after weekly applications. Squash was harvested from 40 ft of 2 rows on 17, 24 July and fruit were categorized as marketable, pickleworm damage, or virus damaged and the average weight was measured. Damage ratings for pickleworm along with larvae per fruit were reported. Data was analyzed using GLM and LSD tests for separation of means (SAS Institute 1990).

Results and Discussion

The best treatments in terms of pickleworm control were the E2Y45 treatments and Novaluron alternated with Spintor. These treatments also had the lowest damage fruit from pickleworm along with Spintor alone and Synapse. Whitefly counts were low and inconclusive since no treatments were significantly different from the check. In terms of marketable yields, the best treatments were the Avaunt treatment and the high rate of E2Y45. Pickleworm control was a significant factor in the increased yields.

Treatment - rate per acre	Silverleaf rating on 12 July	Average Number of Aphids	Average number of Whitefly adults	Average number of squash bugs	Average number of cucumber beetle	Pickle worms collected in fruit	Weight of pickle worm damaged fruit	Weight of mosaic virus damaged fruit	Weight of clean market-able fruit
1. Untreated Check	0.8 abc	6.7 a	0.5 bcd	0.1 a	0.0 a	12.8 ab	3.8 ab	6 a	13 b
2. E2Y45 0.044 lb ai/a + Dynamic	0.3 c	5.8 a	0.4 cd	0.0 a	0.1 a	0.3 c	0.0 d	17 a	16 b
3. E2Y45 0.044 lb ai/a	0.0 c	4.7 a	0.4 d	0.1 a	0.0 a	0.0 c	0.0 d	15 a	21 ab
4. E2Y45 0.088 lb ai/a	0.3 c	4.3 a	0.6 bcd	0.1 a	0.1 a	0.0 c	0.0 d	14 a	30 a
5. Spintor 2SC 0.078 lbs ai/a	0.5 bc	4.8 a	0.7 bcd	0.2 a	0.1 a	4.5 bc	0.8 cd	13 a	22 ab
6. Novaluron 0.83EC 0.078 lb ai/a	0.8 abc	5.1 a	0.9 ab	0.1 a	0.1 a	9.8 bc	2.5 bc	14 a	21 ab
7. Novaluron 0.83EC 0.078 lb ai/a Alternate with Spintor 0.078 lbs ai/a	1.3 ab	6.6 a	0.8 abc	0.0 a	0.1 a	0.7 c	1.1 cd	15 a	23 ab
8. Avaunt 30 WDG 0.065 lbs ai/a	0.3 c	5.8 a	1.1 a	0.1 a	0.1 a	4.8 bc	2.6 bc	14 a	31 a
9. Synapse 24WG 3oz prod/a	0.8 abc	4.2 a	0.7 abcd	0.1 a	0.1 a	4.5 bc	1.1 cd	16 a	19 b
10. Montana 2FL 2.3 oz prod/a	0.8 abc	3.8 a	0.7 abcd	0.4 a	0.0 a	20.0 a	5.1 a	12 a	19 b
11. Admire Pro 4.6F 10 oz prod/a**	1.5 a	3.8 a	0.5 bcd	0.1 a	0.0 a	5.5 bc	4.3 ab	11 a	21 ab
12. Admire Pro 4.6F 10 oz prod/a** Followed by Novaluron 0.078 lb ai/a	0.0 c	3.0 a	0.4 d	0.1 a	0.1 a	7.5 bc	4.0 ab	11 a	22 ab

* Means within columns followed by the same letter are not significantly different (LSD, P<0.05).

EVALUATION OF HGW86 INSECTICIDE TREATMENTS IN SQUASH 2007

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Introduction

Summer squash is heavily targeted in the fall growing seasons in southern Georgia by the b-strain sweetpotato whitefly, *Bemisia tabaci* (Gennadius) or silverleaf whitefly. This experiment evaluated various drip injection control options for this pest in 2007.

Materials and Methods

Yellow squash, Hyb. Liberator III, was direct seeded into 2 rows per 6-ft plastic mulched beds on 20 July and maintained with standard methyl-bromide fumigated plastic-cultural practices at the Tifton Vegetable Park, Georgia Coastal Plain Experiment Station at Tifton. A total of 500 lbs/a of 10-10-10 was applied at planting to Tift sandy clay loam field plots followed by four 20-20-20 soluble fertilizer injection applications of 7 lbs/a. Irrigation was applied weekly with a 12-inch emitter spaced drip system. Injection treatments were made initially as the seed was germinating using 3 liters of water per all four reps of 50 ft row plots on 24 July. The drip injection protocol was based on 14,520 linear ft of bed per acre and 200 ft per treatment (50 x 4 reps). We estimated 0.5 gallons per minute per 100 ft overall water usage for standard 12" tape. The system was calibrated with water soluble dye before treatment injection. The drip line was filled with water first for 8 min and then we injected one treatment at the time (all 4 plots hooked up at once with cap at end of each plot locked). We mixed 3 liters of treatment volume and injected over 1 hour (approximately 30-40 min after all product is gone from the injection bottle, flushing the line until the dye cleared). We used 20 psi in the mixing tank and a #41 orifice in injector coupling. We also used 2.6 ml of buffer to a pH of 5.0. Five foliar applications of fungicide using 61 gallons/a, 60 psi, and 3 TX18 hollow cone tips per row were made on a weekly basis through the first harvest. Scouting was initiated on 5 September and continued weekly until harvest. One sample of 5 plants, with one leaf per plant for whitefly and aphid counts, was scouted per plot after weekly applications. Silver-leaf ratings were done on ten plants per plot with a rating of 0=dark green to 3=severely silvered leaves (maximum damage value of 30). A plant vigor rating was given for the entire plot from 0=severely stunted or dead to 3=apparent normal growth. Squash was harvested from 40 ft of 2 rows on 27 September and 2, and 5 October. Fruit were categorized as marketable, pickleworm damaged, or virus damaged and the average weight was measured. Squash fruit color ratings for whitefly induced whitening were also reported with 0=no fruit harvested, 1=all white fruit, 2= mixed white and yellow fruit, and 3=normal yellow colored fruit and summed over 11 harvests (maximum value of 33, or 3 x 11 harvests). Data was analyzed using GLM and LSD tests for separation of means (SAS Institute 1990).

Results and Discussion

The effective treatments in terms of silverleaf control were HGW86 and E2Y45, but there was no rate response detected in the nymph count. Also, there was not a detectable rate response in terms of number of fruit and weight of squash produced even though the highest rate of HGW86 did have the highest number of clean fruit. The only detectable rate response was relative to silver-leaf rating and squash fruit color where color increased in normal yellow color with the higher rates of HGW86. The relationship of whitefly nymphs to silver leaf symptoms and yield was not adequately assessed with the sampling method used. We need to increase the leaf sample number and possibly target only leaves with later instar nymphs in future evaluations.

Treatment - rate per acre (type of application was drip injection for all treatments)	Silverleaf rating on 28 Aug 0 to 30 (silvered)	Silverleaf rating averaged 0 to 30 (silvered)	Whitefly eggs	Whitefly small nymphs	Whitefly large nymphs
1. HGW86 200SC 0.066 lb ai/acre	26 b*	27 b	124 a	7 b**	0.3 a
2. HGW86 200SC 0.088 lb ai/acre	17 c	22 c	122 a	23 ab	3.0 a
3. HGW86 200SC 0.134 lb ai/acre	14 c	17 d	110 a	19 ab	6.6 a
4. E2Y45 200SC 0.044 lb ai/a	17 c	21 c	112 a	10 b	0.8 a
5. Untreated Check.	30 a	30 a	168 a	44 a	5.8 a

* Means within columns followed by the same letter are not significantly different (LSD, <0.05).
** Means within this one column followed by the same letter are not significantly different LSD, P<0.1).

Treatment - rate per acre (type of application was drip injection for all treatments)	Silverleaf rating on 13 Sep 0 to 30 (silvered)	Fruit Color rating 0 to 9 (normal yellow)	Number of clean market-able fruit	Weight lb of clean market-able fruit
1. HGW86 200SC 0.066 lb ai/acre	27 ab	16.5 c	194 a	35 a
2. HGW86 200SC 0.088 lb ai/acre	27 ab	17.3 bc	182 a	34 a
3. HGW86 200SC 0.134 lb ai/acre	20 c	22.0 a	216 a	53 a
4. E2Y45 200SC 0.044 lb ai/a	25 b	19.3 b	181 a	43 a
5. Untreated Check.	30 a	5.5 d	36 b	6 b

* Means within columns followed by the same letter are not significantly different (LSD, <0.05).
** Means within this one column followed by the same letter are not significantly different LSD, P<0.1).

EVALUATION OF DRENCH & FOLIAR APPLIED INSECTICIDE TREATMENTS IN SQUASH 2007

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Introduction

Summer squash is targeted in the summer and fall growing seasons in southern Georgia by pickleworm, *Diaphania nitidalis* (Stoll), cucumber beetles, D*iabrotica* spp., squash bugs, *Anasa* spp., and sweetpotato whitefly, *Bemisia tabaci* (Gennadius). This experiment evaluated various drench and foliar control options for these pests in 2007.

Materials and Methods

Yellow squash, Hyb. Destiny III, was direct seeded into 2 rows per 6-ft bare ground beds on 3 August and maintained with standard cultural practices at the Lang Farm, Georgia Coastal Plain Experiment Station at Tifton. A total of 500 lbs/a of 10-10-10 was applied at planting to Tift pebbly clay loam field plots followed by two side-dress applications of 150 lbs/a Cal-nitrate. Irrigation was applied weekly with an overhead sprinkler system. Drench treatments of insecticide were made over the seed furrow using 1 gallon of water per 40 ft row. Four foliar applications of insecticide were made on 15, 21, 30 August and 5 September. Scouting was initiated on 17 August and continued weekly until harvest. One sample of 5 plants, with one leaf per plant for whitefly and aphid counts, was scouted per plot after weekly applications. Squash was harvested from 40 ft of 2 rows on 5 and 11 September and fruit were categorized as marketable, pickleworm damaged, or virus damaged and the average weight was measured. Squash fruit color ratings for whitefly induced whitening were also reported with 0=no fruit harvested, 1=all white fruit, 2= mixed white and yellow fruit, and 3=normal yellow colored fruit. Data was analyzed using GLM and LSD tests for separation of means (SAS Institute 1990).

Results and Discussion

The best treatments in terms of whitefly control were the A15452 treatments with the highest rate providing the greatest control and highest marketable yield. The fruit from this treatment was also the closest to a normal yellow color. The higher rate of A15365 provided similar control to the lower rate of A15452. The whitefly pressure during this test was the highest seen by this author in over ten years, causing the check plot plants to collapse by the harvest date. Most of the foliar treatments were similar in that almost no fruit were harvest in these treatments, indicating the importance of systemic insecticide treatment in the presence of severe whitefly pest pressure.

Treatment - rate per acre (2-8 drench and 9-15 foliar)	Silverleaf rating on 28 Aug	Silverleaf rating on 14 Sept	Silverleaf rating averaged	Whitefly adults on 17 Aug	Whitefly adults on 31 Aug	Fruit Color rating 0 to 3 (normal yellow)	Number of clean market-able fruit	Weight of clean market-able fruit
1. Untreated Check	2.95 a	3.0 a	3.0 a	142 abc	214 a	0.1 c	1 d	0.2 e
2. A15452 300SC 150ga/h	0.30 bc	2.7 bcd	1.5 b	102 cd	106 cd	1.6 ab	124 ab	33.2 bcd
3. A15452 300SC 225ga/h	0.13 bc	2.5 d	1.3 b	106 bcd	120 cd	1.6 ab	124 ab	38.8 b
4. A15452 300SC 300ga/h	0.05 c	2.0 e	1.0 b	76 d	105 cd	2.1 a	133 a	50.5 a
5. A15365 250SC 50ga/h	0.28 bc	2.8 abc	1.5 b	106 bcd	191 ab	1.3 b	101 bc	27.3 cd
6. A15365 250SC 75ga/h	0.13 bc	2.6 cd	1.4 b	99 cd	167 abc	1.8 ab	125 ab	35.2 bc
7. A15365 250SC 100ga/h	0.45 bc	2.9 ab	1.7 b	154 ab	117 cd	1.6 ab	101 bc	33.6 bcd
8. Platinum 240SC 150ga/h	0.53 b	2.9 ab	1.7 b	109 bcd	145 bcd	1.4 b	79 c	24.9 d
9. Provado 1.6SC 3.75oz/a	2.65 a	3.0 a	2.8 a	150 abc	146 bcd	0.3 c	14 d	1.6 e
10. Montana 2SC 2.3oz/a	2.73 a	3.0 a	2.9 a	123 bcd	162 abcd	0.1 c	2 d	0.5 e
11. Spintor 2SC 5oz/a +Provado 1.6SC 3.75oz/a	2.80 a	3.0 a	2.9 a	108 bcd	152 bcd	0.3 c	22 d	3.1 e
12. Synapse 24WG 3oz/a	2.88 a	3.0 a	2.9 a	149 abc	153 abcd	0.3 c	19 d	5.5 e
13. Spintor 2SC 5oz/a	2.90 a	3.0 a	3.0 a	177 a	133 bcd	0.0 c	0 d	0.0 e
14. QRD 400 25EC .3gal/a	2.73 a	3.0 a	2.9 a	130 abc	141 bcd	0.1 c	1 d	0.1 e
15. Ag Oil .3gal/a	2.73 a	3.0 a	2.9 a	125 bcd	102 d	0.1 c	1 d	0.2 e

* Means within columns followed by the same letter are not significantly different (LSD, P<0.05).

EVALUATION OF DRENCH & FOLIAR APPLIED E2Y45 INSECTICIDE TREATMENTS IN SQUASH 2007

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Introduction

Summer squash is heavily targeted in the fall growing seasons in southern Georgia by the b-strain sweetpotato whitefly, *Bemisia tabaci* (Gennadius) or silverleaf whitefly. This experiment evaluated various drench and foliar control options for this pest in 2007.

Materials and Methods

Yellow squash, Hyb. Destiny III, was direct seeded into 2 rows per 6-ft bare ground beds on 25 August and maintained with standard cultural practices at the Lang Farm, Georgia Coastal Plain Experiment Station at Tifton. A total of 500 lbs/a of 10-10-10 was applied at planting to Tift pebbly clay loam field plots followed by two side-dress applications of 150 lbs/a Cal-nitrate. Irrigation was applied weekly with an overhead sprinkler system. Drench treatments of insecticide were made over the seed furrow using 1 gallon of water per 40 ft row on 28 August. Seven foliar applications of insecticide using 61 gallons/a, 60 psi, and 3 TX18 hollow cone tips per row were made on 4, 7, 11, 13, 18, and 25 September. Scouting was initiated on 5 September and continued weekly until harvest. One sample of 5 plants, with one leaf per plant for whitefly and aphid counts, was scouted per plot after weekly applications. Silverleaf ratings were done on ten plants per plot with a rating of 0=dark green to 3=severely silvered leaves (maximum damage value of 30). A plant vigor rating was given for the entire plot from 0=severely stunted or dead to 3=apparent normal growth. Squash was harvested from 40 ft of 2 rows on 27 September and 2, and 5 October. Fruit were categorized as marketable, pickleworm damage, or virus damaged and the average weight was measured. Squash fruit color ratings for whitefly induced whitening were also reported with 0=no fruit harvested, 1=all white fruit, 2= mixed white and yellow fruit, and 3=normal yellow colored fruit and summed over 3 harvests (maximum value of 9). Data was analyzed using GLM and LSD tests for separation of means (SAS Institute 1990).

Results and Discussion

The best treatments in terms of whitefly control were the combination drench and foliar treatments, E2Y45 plus either Admire or Knack. These treatments provided the greatest control of whitefly damage, as indicated by silver-leaf symptom and plant vigor ratings, and highest marketable yield. The fruit from this treatment was also the closest to a normal yellow color. The whitefly pressure during this test was the highest seen by this author in over ten years, causing the check plot plants to collapse by the harvest date. Because of this, the plots with the most protection against whitefly remained greener longer causing even more insects to visit these plots than the untreated plots that were stunted early on. Thus the foliar insect counts were of little value in trying to assess efficacy. Most of the foliar treatments were similar in that almost no fruit were harvest in these treatments, with the exception of E2Y45 plus Dynamic. The adjuvant, Dynamic which includes methylated seed oil, assists in the entry of the insecticide into the plant tissue. These results indicated the importance of systemic insecticides with severe whitefly.

Treatment - rate per acre (type of application)	Silverleaf rating on 19 Sept 0 to 30 (silvered)	Silverleaf rating on 1 Oct 0 to 30 (silvered)	Silverleaf rating averaged 0 to 30 (silvered)	Plant vigor rating on 19 Sept 0 to 3	Plant vigor rating on 1 Oct 0 to 3	Plant vigor rating averaged 0 to 3	Fruit Color rating 0 to 9 (normal yellow)	Number of clean market-able fruit	Weight of clean market-able fruit
1. Untreated Check	30 a	30 a	30.0 a	0.0 d	0.0 f	0.0 f	0.0 e	0 d	0.0 b
2. E2Y45 200g/l 0.066 lb ai/a (foliar) + Dynamic 0.5% v/v	8 bcd	19 b	14.8 d	2.5 ab	1.8 bc	2.1 bc	2.8 bc	10 cd	1.3 b
3. E2Y45 200g/l 0.066 lb ai/a (foliar)	28 a	30 a	29.0 a	0.3 cd	0.0 f	0.3 ef	0.5 de	3 d	0.3 b
4. E2Y45 200g/l 0.088 lb ai/a (foliar)	26 a	27 a	27.4 a	0.8 c	0.5 ef	0.6 e	0.0 e	0 d	0.0 b
5. Provado 3.75 oz/a (foliar)	28 a	28 a	28.8 a	0.5 cd	0.3 ef	0.3 ef	0.0 e	0 d	0.0 b
6. E2Y45 200g/l 0.066 lb ai/a (drench)	7 bcd	21 b	15.0 cd	2.3 b	1.3 cd	1.8 cd	2.5 bcd	32 bc	2.3 b
7. E2Y45 200g/l 0.088 lb ai/a (drench)	10 b	26 a	19.8 bc	2.3 b	0.8 de	1.5 d	1.3 cde	8 d	0.8 b
8. Admire Pro 10.5 oz/a (drench)	10 bc	30 a	20.5 b	2.5 ab	0.3 ef	1.4 d	0.5 de	8 d	0.6 b
9. Admire Pro 10.5 oz/a (drench) + E2Y45 0.066 lb a (foliar)	3 cd	17 b	10.7 de	3.0 a	2.3 b	2.5 ab	4.5 b	62 a	8.1a
10. E2Y45 200g/l 0.066 lb ai/a (drench) + Knack 0.83EC 8 oz/a (foliar)	2 d	10 c	6.9 e	2.8 ab	3.0 a	2.8 a	7.8 a	43 ab	7.6 a

* Means within columns followed by the same letter are not significantly different (LSD, P<0.05).

EVALUATION OF SOIL DRENCH AND FOLIAR APPLIED INSECTICIDES FOR CONTROL OF WHITEFLY ON SQUASH

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<u>Introduction</u>

The sweetpotato whitefly (a.k.a silverleaf whitefly) is a key pest of many vegetable crops grown in the fall in south Georgia. It is particularly damaging in squash, as even low densities of this pest can result in silverleaf symptoms. The neonicotinoid insecticides have been the cornerstone of whitefly management for more than a decade and results in 2006 trials suggested that resistance may be developing in south Georgia. Thus, it is imperative that we evaluate additional chemistries for control of whiteflies. This test was conducted to evaluate the efficacy of soil applied and foliar applied insecticides for control of sweetpotato whitefly.

<u>Materials and Methods</u>

A small plot trail was conducted at the UGA Horticulture Farm in Tifton, Georgia. Squash (var. Destiny III) was direct seeded, with a single row on six foot beds. Once plants emerged, plots were established in a RCB design with three replications. Experimental plots were one row by 19 feet. Although the rows were on six foot beds, for application purposes they were treated as if they were on 3 foot beds.

Three insecticide drench treatments were included in the test. Admire Pro was applied at 10.5 oz/ac, Venom at 6 oz/ac and Coragen at 5 oz/ac. Drench treatments were applied shortly after stand establishment (only cotyledons were present). The insecticide required for application to a single plot was mixed in three liters of water. The treatment was poured over the row and the row was immediately drenched with water. The water drench consisted of a 6 to 8 inch band with about 1 gallon per 10 feet.

The foliar insecticide treatments evaluated were Venom at 3 oz./ac, Bifenthrin at 0.1 lb AI/ac + Orthene at 0.5 lb AI/ac, Knack at 8 oz/ac + Thiodan at 0.75 lb AI/ac, Oberon at 8.5 oz/ac, and Coragen at 5 oz/ac + DyneAmic 0.5%. A non-treated Check was included for comparison. Foliar insecticides were applied with a CO_2 pressurized backpack sprayer (60 PSI) in 40 GPA, with 3 hollow-cone nozzles per row (one over-the-top and two on drops).

The soil drench applications were applied 11 Sept. Foliar insecticide treatments were applied on 17, 24, and 30 Sept. In addition to the treatments being evaluated, the entire test was treated with bifenthrin at 0.1 lb AI/ac + Orthene at 0.5 lb AI/ac on 14, 20 and 27 Sept. These treatments were intended to aid in whitefly suppression and allow for better evaluation of the experimental treatments under extreme pest pressure.

Plots were evaluated for silverleaf symptoms and plant vigor. Silverleaf was rated as follows: 0 = no silverleaf, 1 = light silverleaf with a spotty distribution, 2 = light silverleaf but throughout the plot, 3 = moderate spots of silverleaf in the plot, 4 = moderate silverleaf throughtout the plot, 5 = heavy spots of silverleaf, 6 = heavy silverleaf throughout the plot, 7 = heavy silverleaf and most plants severely stunted, and 8 = most plants in the plot dead Plant vigor ratings consisted of the following: 1 = best plots in the test (most growth), 2 = intermediate plots, 3 = worst plots still alive, and 4 = most plants dead.

Data were analyzed with the PROC ANOVA procedure of PC-SAS. Where significant differences were detected ($P<0.05$), means were separated with LSD ($P=0.05$)>

Results and Discussion

It should first be noted that no silverleaf symptoms were noticeable in the test on 21 Sept. (4 days after the first foliar application. On 24 Sept. (7 days after the first foliar application and 13 days after the soil applications) several treatments showed severe silverleaf symptoms and some showed stunting. The Venom foliar treatment provided the most suppression of silverleaf on the first sample date, followed by the three soil treatments with moderate levels of silverleaf. The soil applications had lost their efficacy as silverleaf progressively worsened with subsequent sample dates. The Venom foliar treatment was the only treatment to maintain silverleaf ratings below a 4 for the entire test (4 = moderate symptoms throughout the plot). The Oberon and the Bifenthrin+Orthene treatments generally had no impact on silverleaf development and resembled the Check in development of silverleaf and eventual death of plants. The Coragen foliar treatment did not prevent development of silverleaf, but did maintain plant survival and moderate growth. The Knack+Thiodan treatment appeared to be providing some recovery of the plants as the silverleaf ratings declined on the final sample date.

Plant vigor ratings followed similar trends as the silverleaf ratings. The soil applied treatments initially were rated best to intermediate, but both Admire Pro and Coragen were rated progressively worse in subsequent ratings. The Venom soil treatment maintained good plant vigor ratings despite heavy silverleaf symptoms. The Venom foliar treatment was rated among the better plots throughout the test. As with the silverleaf symptoms, the Oberon and the Bifenthrin+Orthene treatments performed poorly, the Coragen foliar treatment was intermediate, and the Knack+Thiodan treatment showed some indication of recovery in the final rating.

The greatest concern in the results of this test is the relatively poor results with the neonicotinoid insecticides, relative to expected results. The relatively poor performance of the neonicotinoid insecticides ,and all of the other insecticides in this test, can be explained in part by the extreme pest pressure. However, these products typically provide excellent control of whiteflies. The Admire and Venom drench treatments should prevent silverleaf symptoms for a minimum of three to four weeks, however, silverleaf was moderate to severe in both treatments within two weeks of the application. Similarly, the Venom foliar treatment typically prevents, or at least halts, development of silverleaf. Results with these products is indicative of resistance to the neonicotinoid group of insecticides (and has been supported by laboratory bioassays). Also of concern is the very poor results with bifenthrin+orthene. This treatment was applied twice each week (once as the evaluation treatment and once as a full test suppression treatment) and failed to provide any noticeable activity. Laboratory bioassays also indicated resistance to bifenthrin and these data indicate the resistance was severe enough to cause a complete field failure.

Coragen does represent a new chemistry for use against whiteflies. While Coragen did not provide the level of control experienced in some test, it did show good activity under extreme pest pressure. This product should add a valuable tool for both pest management and resistance management.

Table 1. Plot ratings for silverleaf and plant vigor, sweetpotato whitefly efficacy study in squash, UGA Horticulture Farm, Tifton, Georgia, 2007.

Treatment	App. type	Silverleaf Ratings				Vigor Ratings		
		24 Sept.	28 Sept.	4 Oct.	12 Oct.	28 Sept.	4 Oct.	12 Oct.
Check		6.8 ab	7.5 a	8.0 a	8.0 a	3.3 ab	4.0 a	4.0 a
Admire Pro	Soil	4.7 c	5.7 c	7.0 b	7.8 a	2.0 cd	3.2 bc	3.8 a
Coragen	Soil	4.7 c	5.8 c	6.0 c	7.0 b	2.0 cd	2.7 cd	3.2 b
Venom	Soil	4.0 c	5.8 c	6.0 c	6.0 c	1.0 e	1.0 f	1.2 e
Bifenthrin +Orthene	Foliar	6.5 ab	6.7 b	7.7 a	8.0 a	2.8 b	3.7 ab	4.0 a
Oberon	Foliar	7.0 a	7.3 a	8.0 a	8.0 a	3.7 a	4.0 a	4.0 a
Coragen	Foliar	6.0 b	5.7 c	5.8 c	6.0 c	2.0 cd	2.0 e	2.0 c
Knack +Thiodan	Foliar	6.2 ab	6.0 c	6.2 c	4.3 d	2.2 c	2.2 de	1.7 d
Venom	Foliar	3.0 d	3.7 d	3.7 d	3.7 e	1.5 de	1.3 f	1.0 e

Sept 21 - there was no silverleaf in the test.
Numbers within columns followed by the same letter are not significantly different (LSD; P=0.05).

EVALUATION OF TRANSPLANT DRENCH TREATMENTS FOR CONTROL OF SILVERLEAF IN SQUASH

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Introduction

The sweetpotato whitefly (a.k.a silverleaf whitefly) is a key pest of many vegetable crops grown in the fall in south Georgia. It is particularly damaging in squash, as even low densities of this pest can result in silverleaf symptoms. The neonicotinoid insecticides have been the cornerstone of whitefly management for more than a decade and results in 2006 trials suggested that resistance may be developing in south Georgia. Thus, it is imperative that we evaluate additional chemistries for control of whiteflies. This test was conducted to evaluate the efficacy potential soil applied drench applications of selected insecticides for control of sweetpotato whitefly.

Materials and Methods

A small plot trial was conducted at the UGA Horticulture Farm in Tifton, Georgia. The trail was established as a RCB design with four replications. Squash transplants (var. Destiny III) were started in the greenhouse on 30 July, 2007. These plants were transplanted and treated on 13 August, 2007. The insecticide treatments were applied in 3 oz of water per transplant. The transplant hole was punched in dry soil and the plant was placed into the hole. The transplant water with the designated treatment was then poured onto the root ball in the transplant hole and the hole then filled in with soil. Each experimental plot consisted of twelve with 1.5 foot in-row plant spacing.

Treatments evaluated were Admire Pro at 7 oz/ac, Venom 70WDG at 6 oz/ac, Coragen at 5 oz/ac, Movento 240SC at 8 oz/ac, and a water check. Rates applied were based on 14520 plants per acre (3 feet between rows and 1 foot in-row).

It was intended that plots would be rated for silverleaf and growth after plant growth to occurred and differences became apparent; however, this never happened. The test ended with a single plot rating on 29 August (16 days after transplanting). Silverleaf symptoms were severe and evenly distributed throughout the test and plant growth was minimal in the best treatments. Plots were rated as 1= plants alive with some growth, 2 = plants alive but with little or no growth, or 3 = most plants dead. Plot ratings were analyzed with the PROC ANOVA procedure of PC-SAS. Where significant differences were detected ($P<0.05$), means were separated with LSD ($P=0.05$).

Results and Discussion

Pest pressure was extremely high. No treatment provided enough control to prevent silverleaf and none of the plots exhibited anything resembling normal growth. Plants were stunted even in the best plots and it was obvious that none of the treatments would have carried the plants to any level of yield. Differences were detected in plant health at 16 days after transplanting (Table 1), but none of the treatments were truly “healthy”. Coragen, Admire Pro and Venom provided some benefit with plants still alive, but with minimal growth. Under extreme whitefly pressure, it is doubtful that any single application will provide control for long and that applications applied at transplanting may not enter the plant rapidly enough to prevent severe plant damage.

Table. Plot health ratings, Squash transplant drench trail, UGA Horticulture Farm, Tifton, Georgia, 2007.

Treatment	Check	Movento	Venom	Admire Pro	Coragen
Plot rating	3.00 a	2.75 a	2.00 b	1.50 bc	1.25 c

EVALUATION OF PLANTING DATE EFFECTS ON THE INCIDENCE OF ARTHROPOD PEST AND BENEFICIAL SPECIES, SEED DAMAGE AND YIELD IN SNAP BEANS

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Introduction

Snap bean production has steadily increased in south Georgia during the past several years. Insect pests can cause economic losses throughout the growing season, especially from blooming until the harvest of fresh beans. This study was conducted to examine the incidence of arthropod species (insects plus spiders), the amount of seed injury and the fresh yield of snap beans planted on three different dates, mid-April, mid-May, and mid-June, 2007.

Materials and Methods

'Carlo' snap beans were planted in conventionally prepared seedbeds at the Belflower Research Farm in Tift County Georgia into plots that were 16 rows wide (36" spacing) by 100 feet long. The snap beans were planted on three different dates, 16 April, 16 May, and 15 June 2007, in a randomized block design with 3 replications. Standard production practices for weed control, nematode suppression, soil insect control, and cultivation were followed according to the Cooperative Extension Service guidelines. All plots were sampled weekly, from 17 May until harvest, by taking a 25-sweep sample down a single row and counting all the live arthropods captured. Each plot was harvested by taking a random 10-feet sample, removing all pods and then weighing the fresh sample. From each harvest sample, a subsample was examined for pod and seed damage. The total percentage of seeds damaged (insect piercing, weather and pathogens, combined) was then calculated.

Results and Discussion

Weather conditions during this study were generally hot and dry; however, the plots were irrigated a total of 4 times to keep the snap bean stands healthy and growing. Stink bug populations were very low in all plots throughout the growing season regardless of the planting date (Table 1). Caterpillar population densities were also low overall, but the 15 June planting did have a higher mean density than in the 16 April planting. This difference was primarily due to mid-July through mid-August samples taken in the 15 June planting (1-4 worms per 25 sweeps) when no samples were taken from the 16 April planting because it was already harvested. The mean populations of lady beetles were not different between the planting dates while total arthropod predators (bigeyed bugs, nabids and spiders, combined) were more abundant in the 15 June planting than in the 16 May planting (Table 1). Seed damage and yield reductions were severe in the 15 June planting. This was due to the combination of hot weather, whiteflies (over 900 immatures/leaf on 15 August) and disease (sooty mold, mildew, and virus-like symptoms) (Table 1). The 16 May planting had intermediate seed damage and yield reductions while the 16 April planting had very low seed damage and very good yield (Table 1).

In conclusion, the delayed 15 June planting date had limited impact on the seasonal incidence of arthropod pests except for whiteflies which were severe in the late planted snap beans. The later planting date also had severe seed quality problems and yield reductions.

Table 1. Effects of planting date on the abundance of arthropods, percentage of seed damage, and total fresh green yield (pods and seeds) in Carlo snap beans, Tifton, GA 2007.

Planting	Mean arthropods per 25 sweeps[1]				% damaged	Yield
Date	Stink bugs[2]	Worms[3]	Lady beet.[4]	Predators[5]	seeds[6]	lbs/acre[7]
16 April	0.19 a	0.15 b	0.26 a	1.6 ab	7.8 c	9968 a
16 May	0.00 a	0.19 ab	0.29 a	0.9 b	64.5 b	3237 b
15 June	0.14 a	0.62 a	0.90 a	1.9 a	100.0 a	181 c

[1]Means from all weekly sampling dates between 17 May and 16 August.
[2]Very low seasonal populations and most were southern green stink bugs.
[3]Very low seasonal caterpillar populations and most were velvetbean caterpillars.
[4]Several lady beetle species but the most common was the convergent lady beetle.
[5]Predatory arthropods include bigeyed bugs, nabids and spiders, combined.
[6]Seed damage includes insects, weather and pathogens, combined.
[7]Yield reductions in May and June planting primarily due to whitefly infestations (over 900 immatures/leaf on 15 Aug in the 15 June planting) and disease.

EVALUATION OF ACARICIDES FOR CONTROL OF SPIDER MITES ON WATERMELON

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Introduction

Spider mites have become a more consistent pest in a variety of vegetable crops in Georgia over the past few years. They are prone to population outbreaks under the hot, dry conditions we tend to experience in the summer months. In 2007, spider mite reached potentially damaging populations in watermelons in many areas of south Georgia. This test was conducted in Turner County to evaluate several currently registered acaricides for efficacy against the twospotted spider mite in watermelons.

Materials and Methods

A small plot trail was established in a cooperative growers field in which spider mites had reached treatable levels. Plots were established in a RCB design with four replications. Experimental plots measured one row (treated 6 feet) by 25 feet. Actual row spacing was nine feet, thus there was a non-treated six foot buffer between adjacent plots.

Treatments evaluated were Agri-Mek at 12 and 16 oz/ac, Acramite at 1lb/ac, Oberon at 8.5 oz/ac, and a non-treated check. A single application of treatments was made on 1 June, 2007. Treatments were applied with a CO_2 pressurized backpack sprayer (60 PSI) in 40 GPA, with 4 hollow-cone nozzles per row (broadcast).

Spider mite densities were monitored periodically after treatment. On each sample date, five leaves were selected from each plot. Leaves were selected based on appearance of damage suggesting the leaf was, or had been, infested by spider mites. The leaves were transported to the lab and the lower surface examined under a dissecting microscope. All live mites were counted on each leaf and recorded by leaf. The five leaves were totaled prior to analyses (thus the data represent live mites per five leaves).

Data were analyzed with the PROC ANOVA procedure of PC-SAS. Where significant differences were detected ($P<0.05$), means were separated with LSD ($P=0.05$). Initial analyses with the raw data showed no significant differences because of the extreme variability common in spider mite counts. The data were re-analyzed with a Log of X+1 transformation, which revealed significant differences among the treatments.

Results and Discussion

Results are presented in the Table 1. The means shown were calculated from the raw data. The statistical separations shown are based on analyses of the transformed data. All of the products tested numerically reduced spider mite counts, however, Acramite failed to significantly separate from the Check. The general trends in counts across dates indicate that all of the treatments required more than 4 days, and probably more than 7 days, to show full effects. However, the general trends in the check follow this same decline in populations, confounding interpretation. Agri-Mek did appear to work quicker than the other products, with significant separation from the Check at 7 days after treatment. By 13 days after treatment, all of the products were statistically similar, although the Acramite treatment was not significantly different from the Check. It should be noted that Acramite is a contact acaricide and the application methodology, combined with the growth habits of watermelon, likely had an impact on efficacy of this product. Additionally, no surfactant was used in this test, contrary to recommendations for Acramite.

Table 1. Spider mite efficacy trial in watermelons, Turner County, Georgia, 2007.

Treatment	Average number of mites per 5 leaves*			Density as percent of the Check		
	5 June	8 June	13 June	5 June	8 June	13 June
	4 DAT	7 DAT	12 DAT	4 DAT	7 DAT	12 DAT
Check	264.8 a	147.8 a	108.8 a	100.0	100.0	100.0
Acramite 1lb	94.3 a	106.3 ab	66.5 ab	35.6	71.9	61.1
Oberon 8.5oz	100.8 a	28.25 ab	2.3 b	38.1	19.4	2.1
Agri-Mek 12oz	89.0 a	5.0 b	1.0 b	33.6	3.4	0.9
Agri-Mek 16oz	43.3 a	3.3 b	0.0 b	16.4	2.2	0.0

* Averages were calculated from the raw (non-transformed) data.
Mean separations are based on transformed (Log of X+1) data.

Horticulture and Engineering

IMPACT ASSESSMENT OF PROPOSED EPA BUFFERS FOR CHLOROPICRIN

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Introduction

Tift and Echols Counties, located in South Central Georgia, rank second ($93.7 million) and third ($70.3 million), respectively, in the state in terms of Farm Gate value derived from vegetable production (1). In 2006, these combined counties' production comprised approximately 20% of the state's total value for the fresh vegetable industry. While this figure is impressive, even more significant is the total economic impact that agricultural sales generate for these counties on the local level.

Many vegetable crops are dependent on pre-plant soil fumigants for adequate control of weeds, insects and diseases during the growing season. However, since Georgia is growing at a rapid rate and urban sprawl is increasing around cities into the countryside, vegetable production is occurring more and more on land adjacent to or in close proximity to residential property. Of the several fumigants listed for proposed risk mitigation options, including buffer restrictions, chloropicrin (Arvesta Corporation, SanFrancisco, CA) is at the top of the list, requiring label re registration at the present time. Chloropicrin is highly effective for treating soil pathogens and some weeds, and is mixed with other fumigants, such as 1,3-dichloropropene, metam-sodium, or methyl bromide for better weed and nematode control to increase effectiveness in nearly all U.S. treated acreage. Tift and Echols Counties are some of the state's leaders in the production of cucurbits and bell peppers for the fresh market. From 2001 – 2005 in Georgia, the average acreage treated with chloropicrin for cucurbit crops was 4000, equaling 125,000 total pounds applied. For bell peppers, 88% of the total state acreage used this fumigant, accounting for 400,000 total pounds applied (2). One can therefore conclude that chloropicrin is essential for many Georgia farms' ability to provide high quality produce at a cost the average consumer can afford.

With the US Environmental Protection Agency's (EPA) declaration that chloropicrin and other soil fumigants are liable for risk mitigation measures such as buffer restrictions (3), many farmers, consultants, and extension personnel are greatly concerned that proposed buffers would have a significant negative impact on the amount of land available for production and a subsequent negative impact on income derived from farm sales. Therefore, an assessment was conducted for Tift and Echols Counties in Georgia to demonstrate the economic impact of U.S. EPA's risk mitigation proposal as relates to soil fumigant applications.

Materials and Methods

This study required three parameters to be collected and analyzed using ArcGIS: field boundaries of every field grown with plasticulture. Most of the chloropicrin used for vegetable production in the two studied counties is used under plastic mulch. Also needed were locations of every house, office, or other inhabitable structure in each county, and finally buffers of various pre-determined distances as calculated using ArcGIS software.

Field Boundaries: In late 2006 and early 2007, a list of vegetable producers in Tift and Echols Counties was developed using USDA FSA records and UGA Extension grower lists. Growers were notified by mail and phone, and field visits were made to conduct an impact assessment of proposed EPA buffers for common soil fumigants. Growers voluntarily identified fields and field boundaries planted in vegetables during the 2006 growing season. These boundaries were digitized using ArcGIS software with aerial imagery of both participating counties as a base.

Inhabited Structures: A point feature GIS layer for all E-911 address locations in Tift County was obtained from the Tift County GIS Department (Tax Assessors Office.) The layer showed the approximate point location for each E-911 address (inhabited structure) in the county. These locations included homes, businesses, churches, and any other locations where people assemble. The Field Boundary and Inhabited Structure layers were then overlaid in the GIS software. For Echols County, no E-911 address locations were ever digitized, so the county agent and farmers had to manually identify all structures surrounding their fields. Although this method was time-consuming, interest by farmers in both locations was high.

Buffers: Buffers were calculated at 150, 300, 600 and 1200 feet distances around inhabited structures using the ArcGIS Buffer tool. Next, the area from each buffer that intersected a field boundary was clipped from the buffer regions using the ArcGIS Intersect Tool. The result was the total area for each buffer distance that fell within a vegetable field. Areas were calculated to determine the total acres impacted at each buffer distance.

Lastly, ArcGIS calculated area (in acres) affected for all fields based on the various buffer distances.

Results and Discussion

Proposed buffers will negatively impact Tift and Echols County vegetable growers greatly in terms of reducing available land and total farm sales. Buffers of 150 feet, 300 feet, 600 feet, and 1200 feet would reduce available land in Tift County by 0.8%, 5.8%, 24.3%, and 60.6% respectively and subsequently reduce farm gate sales by $0.5, $3.5, $14.8, and $36.9 million dollars (Table 1).

For Echols County, buffers of 150 feet, 300 feet, 600 feet, and 1200 feet would reduce available land by 0.5%, 5.7%, 27.8%, and 71.2% respectively and subsequently reduce farm gate sales by $0.3, $3.6, $17.6, and $45 million dollars (Table 2).

One advantage of using ArcGIS to compile and report this type of data is that once this software has run the numbers on all associated fields, each farmer may obtain customized maps, with legends, of their own fields for their individual records and use. Files may be produced and printed for distribution to any who inquire.

What can only be speculated here are some of the future unknowns. For instance, it is unknown whether the EPA will ultimately decide to use property boundaries as a base or stay with structures to determine starting points for buffer distances. If property boundaries are used, data from the local tax assessors office may be imported into ArcGIS, but it is estimated that when the software using these new boundaries as buffer starting points is run, far more land and farm value will be lost to the producer.

Another unknown is whether current zoning laws will be favorable to producers. Currently, any land purchaser in these two counties may purchase land adjacent to a field and build a house on it. For farmers facing large buffer restrictions, this could potentially have a catastrophic effect on their ability to continue producing vegetables and income from that field.

Lastly, it is unknown what the EPA will decide regarding mitigation procedures farms may have the option of using to assist with buffer requirements. For instance, if a particular fumigant requires a buffer of 600 feet, will some farms have the ability to decrease that requirement if it can be proven that fumigants were applied under a pre-determined range of favorable soil moisture, soil compaction, and wind values? Could these buffer restrictions be reduced if farms use virtually impermeable films (VIF), observe application block limits, etc. (3)? If some of these “good” agricultural practices (GAPs) are used to modify some of these buffer restrictions, they would benefit the vegetable producer greatly, and would minimize the modifications, including field layout, irrigation zone changes, etc. he would have to make to keep farming his fields.

Conclusions

This study shows that certain proposed buffers will severely reduce available land for vegetable production in Tift County and Echols County, Georgia and subsequently reduce farm gate sales. The highest potential buffer examined in this study (1200 feet) would eliminate over 60% Tift County's vegetable production and 70% of Echols', costing farmers $81.9 million dollars in both counties combined, removing that income from the local economies. Such great buffer requirements would diminish the economic viability of agricultural land in both counties studied. These factors must be taken into consideration as buffer proposals are reviewed and implemented by government agencies. Additional impact assessments may be needed to determine long term affects of proposed field buffer restrictions on land values and residential growth.

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Table 1. Effect of Proposed Buffers on Tift County Vegetable Production.

Buffer Size (feet)	Impacted Area (acres)	Per cent of Total Acres	Impact on Farm Gate Value
150	43	0.9	$537,144
300	283	5.8	$3,520,049
600	1194	24.3	$14,849,867
1200	2973	60.6	$36,978,687

Table 2. Effects of Proposed Buffers on Echols County Vegetable Production.

Buffer Size (feet)	Impacted Area (acres)	Per cent of Total Acres	Impact on Farm Gate Value
150	11	0.5	$315,876
300	132	5.7	$3,600,986
600	644	27.8	$17,562,702
1200	1649	71.2	$44,980,733

RESCUE, NUTRIPHITE AND CALCIPHITE DO NOT SIGNIFICANTLY INCREASE YIELD OF WATERMELON AND SNAP BEAN

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Introduction

Snap beans and watermelons are routinely two of the largest commercial vegetable crops by acreage in Georgia, each accounting for over 20,000 acres annually. These crops combined are worth over $150 million in farm gate value in Georgia. A foliar nutrient product from Triangle Chemical called TriCard Rescue and two from Biagro Western Sales called Nutri-phite Magnum and Calci-Phite have been reported to increase yields in these crops. Nutri-phite Magnum is a 2-0-16 solution and Calci-Phite is a 0-0-5 solution with 8% calcium. TriCard Rescue is a 7-4-9 solution. These materials were applied according to label protocols to determine their effects on yield of fresh market snap beans and watermelons. Calci-Phite was not used on the snap beans.

Methods

Watermelon transplants (variety "Imagination", Syngenta Seed Co.) were produced in a UGA greenhouse. Plots were established at the Coastal Plain Experiment Station Tifton Vegetable Park (elev. 382 feet) in Tifton, GA. Plot land was deep turned and disked and 400 pounds 10-10-10 fertilizer was broadcast. Beds for watermelons were fumigated with methyl bromide (134 lb. a.i./acre) and black plastic mulch and drip tape installed prior to planting.

Watermelons were transplanted on April 17, 2007 into a Tifton sandy loam (fine-loamy siliceous thermic Plinthic Kandiudults) soil. "Nash" variety snap beans were direct seeded into bare ground plots on April 19, 2007. Watermelon plots consisted of a single row of plants 20 feet long with four feet between plants and were planted on raised beds that were spaced six feet apart (from center to center). Snap beans were seeded in four-row plots with an in-row spacing of two inches and plots were 25 feet in length. Plots were replicated four times in both tests. The experiments were arranged in a Randomized Complete Block Design.

TriCard Rescue was applied as a 1% solution to the foliage 1) when first male flowers appeared on melons and when first buds appeared on snap beans; 2) at pod fill on beans; and 3) after each harvest on melons. Nutri-phite Magnum was applied at one quart per acre at the same timings for both crops. Calci-Phite was applied at one quart per acre to watermelons at the same timings as the other two. Applications were made on May 25 and June 12 for snap beans and on May 25, May 30, June 4, June 8, June 13, June 18, June 25 June 29 and July 9, 2007 for watermelons. These were compared to an untreated check.

Additional fertilizer was applied through the drip irrigation system approximately weekly from May 3 through July 5 for watermelons. Snap beans were side dressed with 300 pounds per acre 10-10-10 four weeks after planting. A total of 180 pounds of N and K was applied during the season to watermelons. Watermelons were harvested on June 28, July 6, and July 13, 2007 and data collected on yield and fruit number. Snap beans were harvested once over by machine on June 20, 2007 and data collected on yield. Other than treatment applications, normal cultural and pest control practices were used. Data were analyzed using the Statistical Analysis System and means separated using Least Significant Difference.

Results

Results are presented in Table 1 and Table 2. Watermelons in the untreated check was numerically lower in yield and fruit number compared to watermelons treated with Rescue and Nutri-Phite, but the differences were not significant, but only yield fruit number was lower in the

Calci-Phite treated plots. The average fruit size of watermelons was largest in watermelons treated with Nutri-Phite and Calci-Phite but again not significantly. Yields of snap beans that were not treated fell between yields of snap beans treated with Nutri-Phite and Rescue, but they were not significantly different from each other in either case. Yields of snap beans treated with either product were statistically similar.

Table 1. Total marketable yield, fruit number and average fruit weight of watermelons treated with Rescue, Nutriphite Magnum, Calci-Phite and untreated watermelons at Tifton, Georgia in 2007.

Treatment	Yield (lbs)/Acre	Fruit/Acre	Average Fruit Size (lbs)
Rescue	62,345 a	6080 a	10.1 a
Nutriphite	57,790 a	5082 a	11.4 a
Calciphite	52,127 a	5082 a	10.5 a
Untreated	53,252 a	4991 a	10.3 a
Mean of Test	56,378	5308.9	10.6
L.S.D. (0.05)	24,091	1889	1.4
C.V. (%)	26.7	22.2	8.0

Table 2. Total marketable yield in pounds and 28-pound bushels per acre of snap beans treated with Rescue and Nutriphite Magnum and untreated beans at Tifton, Georgia in 2007.

Treatment	Yield (lbs./Acre)	Yield (28-pound bushels/Acre)
Rescue	8832 a	315.4 a
Nutriphite	8396 a	300.0 a
Untreated	8549 a	305.3 a
Mean of Test	8592	306.9
L.S.D. (0.05)	3874.1	138.4
C.V. (%)	26.1	26.1

CHARACTERIZATION OF FRUIT AND VEGETABLE WASTES FOR ENERGY PRODUCTION

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Introduction

The Georgia Department of Agriculture (GADOA, 2006) reports that in 2004 production of five fruits and vegetables (cucumber, bell pepper, squash, tomato, watermelon) in Georgia amounted to 860 million pounds (390 million kg). The weight of fruit and vegetables listed above only accounts for that produce harvested and does not account for that produce remaining in the field after the market has eroded. This eroded market is associated with both the large producer working with major distributors or the small farmer growing mainly for local and regional farmers markets. From discussions with the environmental manager of one packing house, an estimate of the amount of fruits and vegetables that would be culled (thrown out) at the packing house would be 7%. This means that 60 million pounds (27 million kg) of fruit and vegetable waste would need to be discarded annually in Georgia. Based on interviews of two watermelon farmers, an equal amount of unharvested watermelons remain in the field after harvest has occurred for sale. Collection of fruit and vegetable waste by the principal investigator indicates that 39,000 pounds of tomatoes and 49,000 pounds of watermelons are left on each acre (Hawkins, 2006) after harvest has been completed. This will change from year to year based on market and growing season, therefore collections will continue so that a long term average can be acquired. In 2004, Georgia had 6000 acres of tomatoes and 30,000 acres of watermelons planted (GA DOA, 2006).

Typically waste material from packing houses would be dumped in low lying areas on a farm, placed in landfills, incorporated into compost piles or fed to animals. Disposal of these waste products in low lying areas has the potential to pollute nearby waterways. Disposal in landfills costs the producer, fills the landfill space sooner and adds water to the landfill, potentially adding to leachate quantities. Composting of this material provides some conversion to materials that can be used as a soil amendment, but the waste product is typically greater than 85% moisture (Hawkins, 2006; Viturtia, et al., 1989; Viswanath et al., 1992) and has a high sugar content which aids in bacterial biomass growth, but little humus formation. Feeding to animals does dispose of the waste, but the potential transport cost could be a limiting factor to disposal.

As this material decomposes in an environment void of oxygen, the predominate gas produced is methane and some carbon dioxide. According to Vieitez and Ghosh (1999), decomposition of each metric ton of solid waste could potentially release 50-110 m^3 of carbon dioxide and 90-140 m^3 of methane. The release of carbon dioxide can add to the increasing problem with greenhouse gasses, but methane is known to be 23 times worse as a greenhouse gas.

However, by controlling the decomposition process in systems called anaerobic digesters, the methane can be captured and used for alternative energy sources verses released to the atmosphere and adding to the greenhouse gas problems. Anaerobic digesters have been used in many industries and in many countries to convert organic compounds into methane. These include municipalities, animal operations, fruit and vegetable processing plants and local food markets (Athanasopoulos, et al., 1990; Colleran, et al., 1983; Dugba and Zhang, 1999). One industry that has had little study in the US, but some around the world is using culled fruit and vegetable waste from packing houses or produce remaining in the field as the feedstock for anaerobic digestion for the formation of methane.

Anaerobic systems are best optimized if the feed rate of organic material into the digester is as constant as possible. This steady flow of organic material into the anaerobic digestion optimizes the conversion of the sugars in the waste material or feedstock into intermediate anaerobic products and helps keep the system functioning properly. Therefore, the purpose of this research was to begin defining the physical and chemical characteristics of some of the fruits and vegetables grown in Georgia.

Objectives of Research

The objectives of this research are to;

1. Define the physical characteristics of three fruits and vegetables grown in Georgia, and
2. Define the chemical characteristics of three fruits and vegetables grown in Georgia.

Materials and Methods

Samples of three fruits and vegetables were collected from research plots located in the Tifton Vegetable Research Park on the UGA-Tifton campus and local vegetable fields. Each sample consisted of a minimum of 10 fruits and vegetables each. These samples were taken as a subsample from harvested plots and fields. Samples were immediately returned to the lab, weighted, sliced, chopped, and dried. The samples were chopped into small manageable pieces and then further chopped into small pieces with a standard kitchen food processor. Once chopped, three samples of the pulp material, approximately 30 ml, was placed in a weighting pan for drying and ashing. From this same chopped sample a portion was taken, blended in a standard kitchen blender and squeezed to get a liquid sample for determining the chemical properties of the fruit or vegetable (Figure 1).

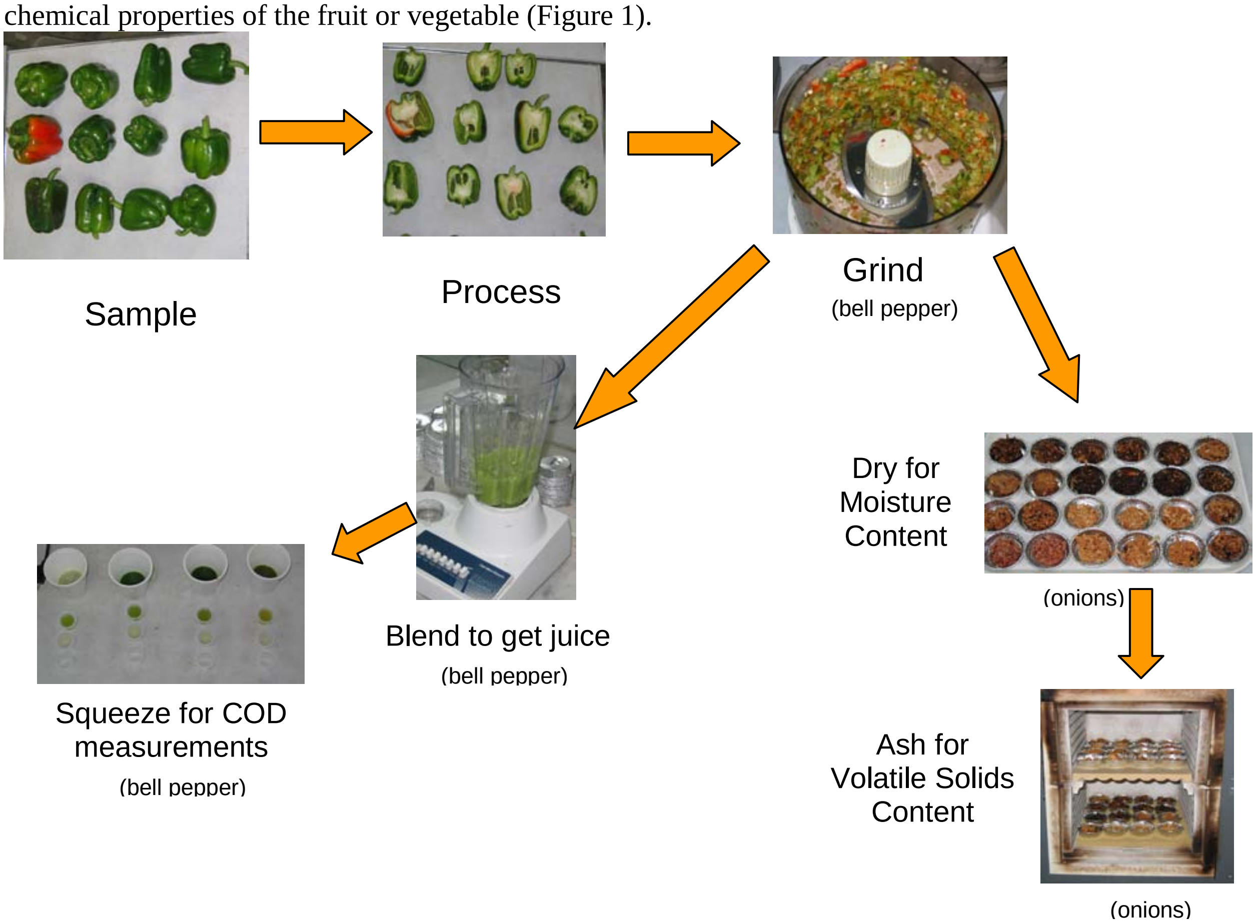

Figure 1. The process of taking a fruit or vegetable sample from a research plot or field, processing the sample through chopping, blending and squeezing to get solid and liquid materials to measure physical and chemical parameters.

The physical characteristics measured for each sample was percent moisture and percent volatile solids (VS). The samples were oven dried at 105°C and ashed at 550°C according to Standard procedures (APHA, 2005). The chemical characteristics measured for each sample was the chemical oxygen demand (COD). COD values for the samples were measured using the COD Test-N-Tube method (HACH Company, Loveland, CO) and are a measure of the amount of oxygen required to completely convert any organic compound into carbon dioxide and water. The COD measurement is also a means to characterize the strength of the liquid, in this case the tomato and bell pepper juice.. The VS and COD values are directly used in determining the amount of material that can be fed into an anaerobic digester on a daily basis.

Results and Discussion

The results shown in figures 2 and 3 are for three of the fruits and vegetables grown in Georgia. Others have been analyzed for physical and chemical characteristics and the results can be seen in Hawkins (2008a and 2008b).

The three bars shown on the graph are for total volatile solids (that amount of material that is converted to carbon dioxide when burned at 550°C), percent VS in the total sample and percent moisture of the sample calculated after drying in a 105°C oven. As can be seen in the graph, the VS content (blue bar/left most bar) for the tomatoes were slightly different numerically between years, but were not significantly different. Likewise, the VS content of the bell peppers were numerically different between years, but were not significantly different. Also, the VS content between the tomatoes and bell peppers were not significantly different between vegetables or years. The percent VS for the tomatoes and bell peppers were also not significantly different except for the 2007 tomatoes which were different from the 2006 tomatoes and both bell pepper years. These values are comparable to other research values (Carucci, et al., 2005; Bouallagui, et al., 2005). The percent moisture was significantly the same for the two bell pepper years and the 2007 tomatoes, but the 2006 tomatoes were different than the other three. As the data indicates there are differences in the VS, %VS and moisture from one growing season to another as well as there could be differences between fields. This data however, indicates that is the tomatoes and bell pepper were both being utilized as a feedstock for an anaerobic digester, they should be suitable to be co-fed at equal volumes. From figure 2, it can also be seen that the amount of VS in the broccoli is numerically and significantly higher than that of the bell pepper and the tomato. However, the %VS is significantly the same.

The measured chemical characteristic of two of the tested fruit and vegetables can be seen in Figure 3. The tomatoes and bell peppers were squeezed to get a juice fraction, but the broccoli was not squeezed, therefore there is no COD data available for that vegetable. As the data indicates, bell peppers have a COD or liquid strength approximately 9 times greater than that of tomatoes.

The data in figures 2 and 3 is useful in determining the amount of material that can be fed into an anaerobic digester. When looking at organic loading rates (OLR), the amount of material that can be fed to a reactor on a kilogram per liter of reactor per day basis is important to optimize the amount of conversion of organics to methane. In the literature, OLRs are usually given in terms of the VS or COD. Some values presented in the literature for fruit and vegetable waste are 3.6 - 6.4 kg VS $m^{-3}d^{-1}$ (Callaghan, et al., 2002; Bouallagui, et al., 2005; Viswanath, et al., 1992; Mata-Alvarez, et al., 1992) or 4 – 15 kg COD m^{-3} d^{-1} (Verrier, et al., 1983; Brondeau et al., 1982; Bouallagui, et al., 2004). This means that the anaerobic digester can receive 3.6 to 6.4 kg of volatile solids or 4 to 15 kg of COD per cubic meter of digester per day.

The values shown in figures 2 and 3 are good starting points to design anaerobic digestion systems, but other important information is needed to optimize the conversion of fruit and vegetable waste to methane. Additional information needed to optimize the conversion process is the nitrogen and carbon amounts to insure we have the proper N:C ratio to optimize biomass growth. Average volumes of materials produced daily and the frequency of that material production. All of this information is vital in designing a system to optimize methane output and reactor size. Lab scale digesters have been started on the UGA-Tifton campus and are being used to verify and determine optimal feed rates and methane outputs from different fruit and vegetable waste. When sufficient data is available, the values will be used to design pilot scale systems and be used to secure funding to design an operating plant for converting the waste to methane.

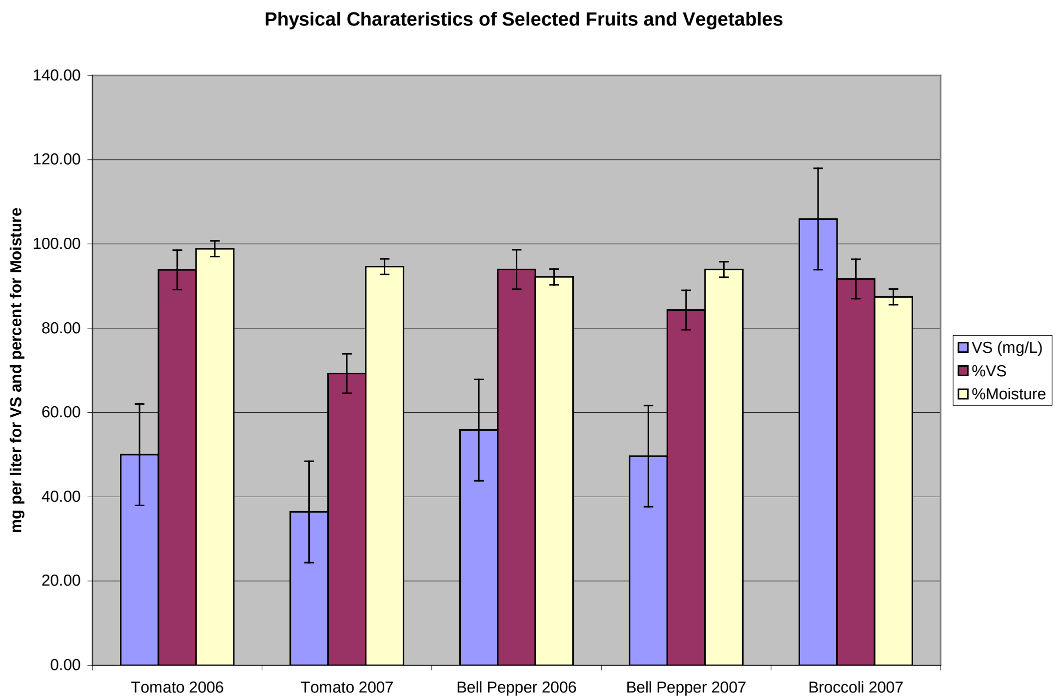

Figure 2. Data collected for the volatile solids, percent volatile solids and percent moisture of vegetables tested.

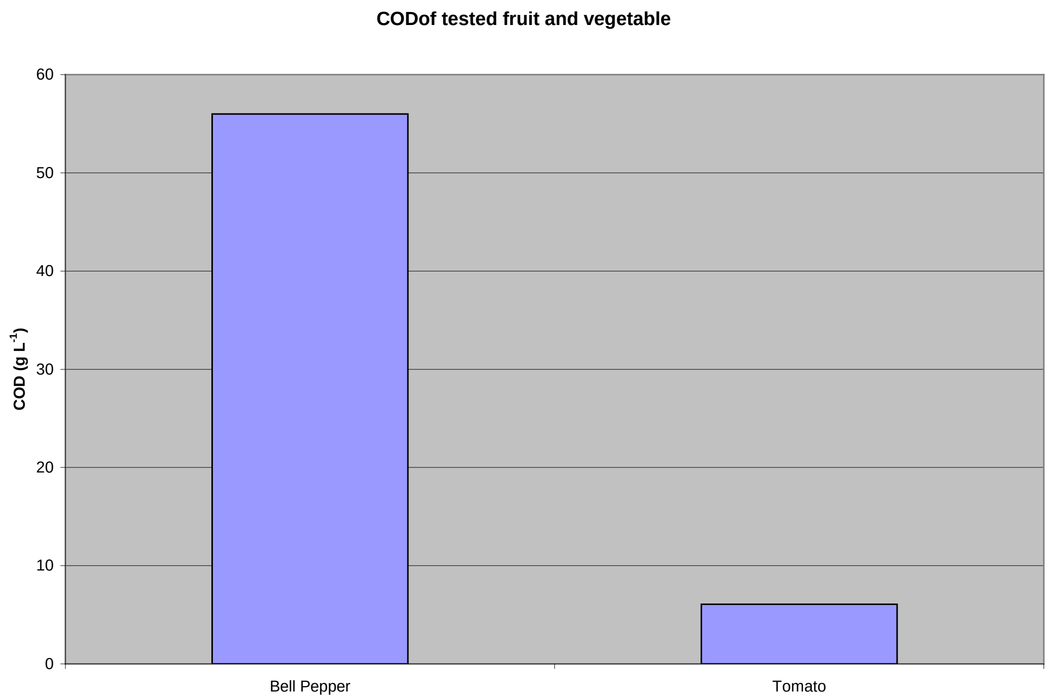

Figure 3. Chemical oxygen demand (COD) values for the tomatoes and bell pepper tested.

Conclusion

Determining the values for the physical and chemical characteristics of fruit and vegetable waste is the initial process in designing an anaerobic digestion system for the conversion of fruit and vegetable waste to energy. As can been seen from the data presented here, the VS contents of two of the three fruits and vegetables are significantly the same which means when designing an AD system based on VS we can load or feed the digesters at the same rate. Since the broccoli has a VS value double that of the tomatoes and bell pepper, a feed rate half that of the other two would be required. If however, we only concentrate on the liquid fraction as a feedstock for the AD system, the data indicates that bell pepper juice would have to be fed at a rate 9 times less than that of tomato.

Overall, when designing an anaerobic digestion system, the characteristics of the feedstock is important in that the microbial population in the digesters can only decompose and convert sugars, carbohydrates and proteins into methane at a given rate. Analyzing the physical and chemical characteristics of fruit and vegetable waste allows the anaerobic digestion manager to best optimize the feed rate of waste into the digesters and therefore optimize the output of methane.

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EFFECTS OF EXPERIMENTAL LIQUID SOIL AMENDMENTS ON GEORGIA STRAWBERRY PRODUCTION

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Introduction

Fresh market strawberry production has increased steadily in Georgia in recent years. Horizon Ag Products has several new liquid products with potential to increase strawberry yield. These are all numbered experimental compounds. These materials were applied at various rates and intervals to determine their effects on yield of strawberries.

Methods

Strawberry transplants (variety "Camarosa") were produced by a commercial plant grower. Plots were established at the Coastal Plain Experiment Station Tifton Vegetable Park (elev. 382 feet) in Tifton, GA. Plot land had been deep turned and disked in the spring. Beds had been fumigated with methyl bromide (134 lb. a.i./acre) and black plastic mulch and drip tape installed prior to the production of a spring crop of cantaloupes. Crop residue was killed with glyphosate and beds were fumigated through the drip tape with metam sodium three months prior to transplanting.

Strawberries were transplanted on November 9, 2006 into a Tifton sandy loam (fine-loamy siliceous thermic Plinthic Kandiudults) soil. Plots consisted of two rows of strawberries (~12 inches between rows) planted on raised beds that were spaced six feet apart (from center to center). In-row spacing was 15 inches per plant. Plots were each 12.5 feet long and were replicated four times. The experiment was arranged in a Randomized Complete Block Design.

HM 0402 and was injected at a 1.0 gallon/acre rate beginning one week prior to first flower at weekly, two week and four week intervals. HM 9947 was injected at a 1.0 gallon/acre rate at two week intervals beginning at the same time. HM 0506 was injected at 1.5 gallons/acre beginning one week before first flower at two and four week intervals and weekly beginning at first flower. The 1.5 gallon rate was also injected beginning four weeks and eight weeks after transplant and every two weeks thereafter. A 3.0 gallon/acre rate was injected every two weeks beginning at first flower. All injections were made through the drip irrigation system. These were compared to an untreated check.

Additional fertilizer was applied through the drip irrigation system approximately every other week from planting through mid February and weekly from then until the termination of the experiment. A total of 129.4 pounds of N and K was applied during the season. Strawberries were harvested on March 26, March 30, April 2, April 6, April 9, April 13, April 16, April 20, April 25, April 27, April 30, May 4, May 7, May 11, May 14 and May 18, 2007 and data collected on yield and fruit number. Other than soil amendments, normal cultural and pest control practices were used. Data was analyzed using the Statistical Analysis System and means separated using Least Significant Difference.

Results

Results are presented in Table 1. Average fruit weights were not significantly greater in treated plots compared to the check. However, the highest rate of HM 0402 was greater than two of the HM 0506 treatments. The highest total application rates of HM 0402 tended to produce the heaviest fruit. Fruit number was greatest where HM 0402 was applied weekly, but only compared to two of the other treatments. HM 0402 at the highest total application rates produced the highest yields, but these differences were only significant when compared to two of the HM 0506 treatments and a lower rate of HM 0402. None of the treatments differed from the untreated check.

Table 1. Average fruit weight, number of fruit per acre and yield of fruit per acre for strawberries grown with 11 soil amendments and one untreated check at Tifton, GA in 2006-2007.

Product	Rate	Application Timing	Initiation of Treatment	Average Fruit Weight (g)	No. Fruit per Acre	Weight of Fruit per Acre (lbs)
Untreated				13.25 abc	153.506 ab	4489.4 ab
HM 0402	1.0 g/A	Every 4 wks	1 wk before 1st flower	13.33 abc	143,574 b	4271.9 ab
HM 0402	1.0 g/A	Every 2 wks	1 wk before 1st flower	12.97 abc	144,968 ab	4224.3 b
HM 0402	1.0 g/A	Weekly	At 1st flower	14.11 ab	181,558 a	5646.8 a
HM 0402	2.0 g/A	Every 2 wks	1 wk before 1st flower	14.43 a	153,854 ab	4902.0 ab
HM 9947	1.0 g/A	Every 2 wks	1 wk before 1st flower	13.20 abc	161,346 ab	4774.7 ab
HM 0506	1.5 g/A	Every 4 wks	1 wk before 1st flower	13.62 abc	162,043 ab	4880.6 ab
HM 0506	1.5 g/A	Every 2 wks	1 wk before 1st flower	12.97 abc	139,741 ab	4014.6 b
HM 0506	1.5 g/A	Weekly	At 1st flower	12.64 bc	150,718 ab	4202.8 b
HM 0506	3.0 g/A	Every 2 wks	1 wk before 1st flower	12.99 abc	157,687 ab	4531.3 ab
HM 0506	1.5 g/A	Every 2 wks	At 4 wks after transplant	12.54 c	159,081 ab	4399.2 ab
HM 0506	1.5 g/A	Every 2 wks	At 8 wks after transplant	12.93 abc	158,907 ab	4520.6 ab
Mean of Test				13.25	155.581	4571.5
L.S.D. (0.05)				1.55	37,325	1406
C.V. (%)				8.1	16.7	21.4

HUGE YIELDS, HUGE DIFFERENCES IN GEORGIA-NORTH CAROLINA PUMPKIN VARIETY TRIALS

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Introduction

The 2007 pumpkin trial was conducted for the second consecutive year in Waynesville, North Carolina at the Mountain Research Station. The growing season was very favorable for good yields. Among the new varieties tested were a giant white pumpkin from Hollar Seeds called 'New Moon' and two experimental lines from Harris Moran that will be released as named varieties. All performed relatively well and should be good additions to available varieties. Miniature and white pumpkins were included in the trial and analyzed separately so that comparisons could be made between like types. Although, some varieties have now been in the Georgia trial for six or more years, many of the ones tested in 2007 were being evaluated for the first or second time. Excellent yields were the trend, but growers should keep in mind that yields in these small plot trials are greater than would be expected in large field production. However, the comparison between varieties remains valid.

Methods

Twenty-two commercially-available pumpkin varieties and four unreleased varieties were compared at the Mountain Research Station (elev. 2,600 feet) in Waynesville, North Carolina. Three of the varieties can be described as miniature pumpkins and four others as white specialty pumpkins. All pumpkins were field-seeded on July 10, 2007 into a Braddock clay loam soil (fine, mixed, semiactive, mesic Typic Hapludult). Plots consisted of single rows which contained six hills each. Plots were 24 feet in length with 12 feet between rows. The planting was arranged in a Randomized Complete Block Design with four replications.

Normal cultural practices were used for bare ground pumpkin culture in North Carolina/Georgia. Base fertilizer consisted of 800 pounds/A of 10-10-10 incorporated prior to planting followed by two side dress applications of 10-10-10 (300 pounds/A each). Ethalfluralin (0.38 lb. ai/A) and clomazone (0.2 lb. ai/A) were applied pre-emergence for weed control. Fungicide and insecticide applications were made according to current University of Georgia recommendations. Irrigation was applied as needed.

Pumpkins were harvested at maturity on October 5-6, 2007. Data were collected on yield, fruit number and average fruit weight. Results are summarized in Tables 1 and 2.

Results

Overall yields were exceptional. Individual pumpkin weights were generally very comparable to those expected according to commercial variety descriptions. Conditions were generally favorable for pumpkins with average conditions throughout most of the season. 'Aladdin' produced the greatest yield and 'Prizewinner' the largest fruit size among all varieties. 'Full Moon' was the only other "giant" size variety in the test besides 'Prizewinner' and they were the only pumpkins that averaged over 50 pounds. Four other varieties averaged over 30 pounds each, however.

Many of the large- and medium-sized varieties produced yields and fruit numbers within the range of acceptability for Southeast production. There were really no poor performers in the test, although 'Gladiator', 'Magician' and 'Phat Jack' probably trailed most other varieties. They did not produce yields and fruit numbers per acre that were competitive with other similarly-sized pumpkins. 'Aladdin', 'Gold

Rush’ and ‘SuperHerc' were all superior performers among the pumpkins over 30 pounds each. ‘Cinderella’, ‘Phantom’ and ‘Schooltime’ all did well in the over 20-pound class.

Among pumpkins in the 10-20-pound range, ‘Jarrahdale’, ‘Magic Lantern’, and ‘Oktoberfest' were the best performers with yields above 70,000 pounds per acre. The only pumpkins in the five to 10-pound range were ‘Lumina’ and ‘Cotton Candy’ which both did fairly well. ‘Iron Man’ was the only entry in the two to five-pound size class and produced over 10,000 fruit which was good for that size pumpkin.

In the miniature class, “Apprentice’ was by far superior to the other orange varieties. ‘Baby Boo’ did very well as a white miniature also. Both produced over 26,000 fruit per acre. ‘Lil’ Pump-ke-mon’ is another non-orange and along with ‘Jack-Be-Little’ produced over 17,000 fruit per acre. ‘Hooligan’ and ‘Gold Dust’ did not perform as well as the rest in the mini class.

Overall, ‘Aladdin' was one of the most exceptional performers. It achieved a size of just over 30 pounds on average with almost 4,000 fruit per acre. The yield of over 127,000 pounds per acre was second only to ‘Prizewinner’ - a much larger variety. ‘Full Moon’ was a major surprise in the quality of the white color and the size it achieved. This should quickly become a favorite on the market.

Table 1. Yield, number, and average weight of six varieties of small pumpkins grown at Waynesville, NC in 2007.

Variety	Sponsor	No. Fruit/A	Yield[1] (lb/Acre)	Fruit Wt (lbs.)
Bumpkin	Harris Seeds	29,948 a	29,747 a	1.00 c
Gooligan	Twilley	10,058 b	5,736 b	0.55 c
Hobbitt	Twilley	4,046 c	29,785 a	6.55 b
Lumina	Twilley	4,991 c	35,848 a	7.53 b
Mini-Treat	Twilley	6,806 bc	7,453 b	1.10 c
Valenciano	Rupp	2,836 c	28.073 a	9.80 a
Mean of Test		9,781	22,790	4.42
L.S.D. (0.05)		4,341	14,768	1.96
C.V. (%)		29.4	43.0	29.5

One-row plot, 24 ft. long x 12 ft. wide. Plants spaced four feet apart. [1]Marketable Yield.

Table 2. **Yield, number, and average weight of 20 varieties of large pumpkins grown at Waynesville, NC in 2007.**

Variety	Sponsor	No. Fruit/A	Yield[1] (lb/Acre)	Fruit Wt (lbs.)
Aladdin	Harris Moran	4,197 abcde	112,919abcdef	27.1 defg
Dependable	Abbott & Cobb	2,987 efg	106,783 abcdefg	35.8 bcd
EXT 13035718111	Seminis	3,176 efg	50,226 jk	15.7 j
Full Moon	Rupp	1,929 gh	84,904 cdefghij	44.7 b
Gladiator	Harris Moran	3,025 efg	58,677 ijk	19.9 fghij
Gold Challenger	Rupp	3,214 defg	63,309 hijk	19.5 ghij
Gold Medal	Rupp	4,613 abc	120,467 abcde	26.3 efgh
Harvest Time	Twilley	3,895 bcde	125,927 abc	32.5 cde
HSR 4700	Hollar	3,365 cdef	79,648 efghijk	23.5 efghij
HMX 6685	Harris Moran	4,159 abcde	98,105 bcdefghi	23.6 efghij
HMX 6686	Harris Moran	3,706 cde	66,149 ghijk	18.1 ghij
Howden	Hollar	3,706 cde	79,482 efghijk	21.2 fghij
Magic Lantern	Harris Moran	4,500 abcd	80,185 efghijk	17.8 hij
Magician	Harris Moran	5,143 ab	75,496 fghijk	14.7 j
New Moon	Hollar	3,214 defg	132,881 ab	41.8 b
Pro Gold #510	Twilley	5,256 a	124,501 abcd	23.8 efghi
Prizewinner	Seminis	2,269 fg	145,892 a	66.8 a
Super Herc	Harris Moran	3,630 cde	103,784 bcdefgh	28.6 def
20 Karat Gold	Rupp	4,197 abcde	83,687 defghijk	20.0 fghij
Wyatt's Wonder	Rupp	908 h	43,515 k	40.9 bc
Mean of Test		3554	91,827	28.1
L.S.D. (0.05)		1,302	41,047	9.1
C.V. (%)		25.9	31.6	22.8

One-row plot, 24 ft. long x 12 ft. wide. Plants spaced four feet apart. [1]Marketable Yield.

‘ATHENA’ STILL HARD TO BEAT IN CANTALOUPE TRAILS

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Introduction

Canteloupes continue to be a major crop for Georgia vegetable producers with over 5000 acres of melons planted in 2006. The crop is worth over $60 to the state’s farm gate value. ‘Athena’ has been the predominant variety of cantaloupe grown in Georgia for many years. Many attempts have been made to find a melon superior in yield and performance to ‘Athena’. However, ‘Athena’ continues to be popular with growers and buyers. One similar variety, ‘Aphrodite’, has been a suitable replacement, but is considered too large by most growers. This test compared three varieties being tested for commercial release to ‘Athena’ and ‘Aphrodite’ and also looked at how plant spacing could affect the size of ‘Aphrodite’ cantaloupes. All of these cultigens were Syngenta Seed Company releases and lines.

Methods

Two commercially-available cantaloupe varieties and three potential releases were compared at the Tifton Vegetable Park at the Coastal Plain Experiment Station (elev. 382 feet) in Tifton, Georgia. Additionally, ‘Aphrodite’ was planted at two different in-row spacings to determine the effect on fruit size of that variety.

Containerized cantaloupe transplants were produced in greenhouses on the research station. Plot land was deep turned and disked. Beds were laid off and 600 lb/A 10-10-10 was applied and incorporated. Methyl bromide was applied (134 lb. a.i./acre) when black plastic mulch and drip tape were installed. Cantaloupes were transplanted to the field on April 3, 2007 into a Tifton sandy loam soil (fine, loamy, siliceous, thermic Plinthic Kandiudult). Plots consisted of single rows which contained 15 plants each spaced two feet apart. Black plastic covered beds were six feet from center to center. The planting was arranged in a Randomized Complete Block Design with four replications.

Normal cultural practices were used for cantaloupe production in Georgia. An additional 140 pounds/A N were applied through drip irrigation as 7-0-7 for a total of 200 pounds N, 60 pounds P and 200 pounds K. Fungicide and insecticide applications were made according to current University of Georgia recommendations. Drip irrigation was applied as needed.

Canteloupes were harvested at maturity on June 22, June 27, July 3 and July 13, 2007. Data were collected on fruit number and weight by size class. Results are summarized in Tables 1 and 2.

Results

A significant frost less than a week after transplanting resulted in damage on the leaves of most transplants. That combined with hot and dry conditions the remainder of the spring resulted in smaller than usual melon size overall.

There were no differences among varieties in total weight. Total fruit number was greater in ‘Athena’ and ‘Aphrodite’ at 18” than in ‘EXP 2’ and ‘EXP 3’. In the 4.5-6.0 pound class, there was no difference among varieties for fruit weight, although ‘Aphrodite’ was closer to ‘Athena’ in fruit weight at the closer spacing. Among 3.0-6.0 pound fruit, there were no differences in fruit number.

Table 1. Yield and number of various size classes of five cantaloupe varieties and one variety at two different spacings grown at Tifton, GA in 2007.

Variety	Fruit > 7.5 lbs.		Fruit 6.0-7.5 lbs.		Fruit 4.5-6.0 lbs.		Fruit 3.0-4.5 lbs.	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Athena	0 a	0 a	0 b	0 b	638 b	3120.0 b	4698 a	16,829 a
Aphrodite @ 24”	0 a	0 a	174 ab	1122.3 ab	1856 a	9408.0 a	4466 a	16,707 a
Aphrodite @ 18”	0 a	0 a	174 ab	1171.6 ab	1392 ab	6867.0 ab	5800 a	20,074 a
EXP 1	0 a	0 a	290 a	1914.0 a	2262 a	11,600.0 a	4466 a	16,695 a
EXP 2	0 a	0 a	0 a	0 b	1740 ab	9002.0 ab	4466 a	16,991 a
EXP 3	58 a	464.0 a	116 ab	754.0 ab	1914 a	9788.0 a	4524 a	16,078 a
Mean of Test	9.7	77.3	125.7	827.0	1633.7	8297.4	4736.7	17228.9
L.S.D. (0.05)	71.4	571.0	204.4	1363.5	1213.9	6142.3	1655.3	6112.4
C.V. (%)	489.9	489.9	107.9	109.4	49.3	49.1	23.2	23.5

One-row plot, 30 ft. long x 6 ft. wide.

Table 2. Yield and number of various size classes, total yield and number and average weight of various size classes of five cantaloupe varieties and one variety at two different spacings grown at Tifton, GA in 2007.

Variety	Fruit < 3.0 lbs.		Fruit 3.0-6.0 lbs.		Total All Sizes		Avg.	Avg.
	No.	Wt.	No.	Wt.	No.	Wt.	3-4.5 lb.	4.5-6 lb.
Athena	5684 a	12,740 a	5336 a	19,949 b	11,020 a	32,689 a	3.58 abc	4.85 a
Aphrodite @ 24”	2610 b	6803 b	6206 a	26,115 ab	9106 ab	34,040 a	3.73 ab	5.19 a
Aphrodite @ 18”	3596 ab	8500 ab	7192 a	26,941 ab	10,962 a	36,613 a	3.48 c	4.93 a
EXP 1	2320 b	5498 b	6728 a	28,295 a	9338 ab	35,708 a	3.74 ab	5.11 a
EXP 2	2726 b	6635 b	6206 a	25,993 ab	8932 b	32,628 a	3.78 a	5.23 a
EXP 3	1972 b	4797 b	6438 a	25,865 ab	8584 b	31,880 a	3.54 bc	5.00 a
Mean of Test	3151.3	7495.5	6370.3	25526.3	9657.0	33926.1	3.64	5.05
L.S.D. (0.05)	2469.7	5663.4	1911.2	8047.8	2027.1	6766.8	0.21	0.46
C.V. (%)	52.0	50.1	19.9	20.9	13.9	13.2	3.9	6.0

One-row plot, 30 ft. long x 6 ft. wide.

FUMIGANT RELEASE FOR CHLOROPICRIN SUMMARY OF RESULTS 2007

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Introduction

Liquid fumigants have been used in the production of vegetables in the Southeast for the past 20 years. The fumigant of choice has been methyl bromide. Once injected into the soil under plastic mulch forms a gas and interacts with soil giving effective control of nematodes, fungi, soil insects, and weeds. The high vapor pressure allows rapid and thorough distribution throughout the soil profile within the bed.

Methyl bromide usage has been found to be depleting the ozone layer. Production of this product is scheduled to cease in 2006. Alternative fumigants have been tested to give similar effects as methyl bromide. A combination of uniform concentrations of a fumigant mixture of 1,3-dichloropropene and chloropicrin across the bed had effective control of soil borne pests. The fumigants were applied into the soil in a closed system. EPA is currently proposing buffers for application of chloropicrin up to distances of 400 feet from the field. This buffer distance would eliminate the majority of commercial vegetable production in Georgia.

Objectives

A study was implemented to determine the amount of chloropicrin being emitted from above the plastic mulch in commercial vegetable production in the southeastern United States. The objectives of the study were to develop a technique to measure fumigant gases being emitted through the plastic mulches; compare low density polyethylene (LDPE) and virtual impermeable films (VIF) to the amount of fumigant being released and compare the effects of soil moisture on vitalization rate of the fumigant.

Methods and Materials

TVP Test - Plot land was prepared at the University of Georgia Tifton Vegetable Park for commercial pepper production on February 27, 2007. Soil type is Tifton sandy loam. LDPE (black on black) was used as mulch. Chloropicrin fumigant combinations were evaluated. The combinations were three way combination (1,3-Dichloropropene (Telone II), Chloropicrin and metam sodium (VAPAM), Telone II and Chloropicrin, Telone C-35, Chloropicrin and PicChlor 60. Soil moisture was estimated to be 40 percent with a Aquaterr M-300. All fumigants were applied to achieve 150 gallons chloropicrin per acre.

Ponder Spring Test - Plot land was prepared at the University of Georgia Ponder Farm for commercial pepper production on February 26, 2007. Soil type is Tifton sandy loam. Three mulch films were evaluated. They were LDPE (1.25 mil), LDPE (1.75 mil) and VIF Domestic (Cadillac). The three way combination (1,3-Dichloropropene (Telone II), Chloropicrin and metam sodium (VAPAM)) was the fumigant combination used in the test. Soil Moisture was 60 percent.

Ponder Fall Test – An additional area of plot land was prepared at the University of Georgia Ponder Farm for commercial pepper production on July 17, 2007. Soil type is Tifton sandy loam. Three mulch films were evaluated. They were LDPE (embossed), VIF Domestic (Cadillac) and VIF (Blockaide). The combination (1,3-Dichloropropene (Telone II) and Chloropicrin were the fumigants used in the test.

Both test at Ponder farm the fumigants were applied as follows: Telone II was applied at 12 gallons/acre and metam sodium was applied at 75 gallons/acre for all trials. Chloropicrin was delivered at 150 gallons/acre.

At all three locations chloropicrin gas was measured with a gas detector pump (GASTEC GV100S) and a detector tube (Sensidine #172S). An inverted HDPE funnel (1.9 L) with a rubber stopper measuring 16.5 cm in diameter fill opening by 22 cm high with a 2 cm drain was glued (silicon) to plastic mulch beds(Figure 1). Chloropicrin gas collected inside the funnels for a know period of time (1-20 minutes). After the known period, a 100 ml sample was drawn through the detector tube from the inside of the funnel by the gas detector pump (Figure 2). The chloropicrin detector tubes had a usable range of 0.05 – 16 ppm.

Figure 1. Plastic funnels installed to collect gas fumigants released through various mulches.

Figure 2. Detector tubes used to measure chloropicrin for a known sample period.

Results and Discussion

Fumigants were applied in 6 feet by 25-100 feet plots with 32 inch bed tops. Chloropicrin was applied with a supper bedder layer injecting fumigant 8 inches with injection three knives 11 inches apart. Telone II was applied with coulter injection knife at 12 inches depth 12 inches apart in the pre-bed. Vapam was applied 4inches deep with coulter knives 4 inches apart on the bed top.

Funnels were glued to the films immediately after fumigation. Samples of the accumulated gas inside the funnels were taken from 1 to 48 to 72 hours after application. Fumigant gas was measured every day in the funnels until no gases were detected.

Plot of gas emissions measured for test conducted at the TVP of different fumigant applications is shown figure 3. The chloropicrin released faster than normal. Soil moisture was measured with an Aquaterr M-300 at 40 percent. Telone II/chloropicrin and chloropicrin application had the higher gas emission rate. But they all had similar gas emission rates.

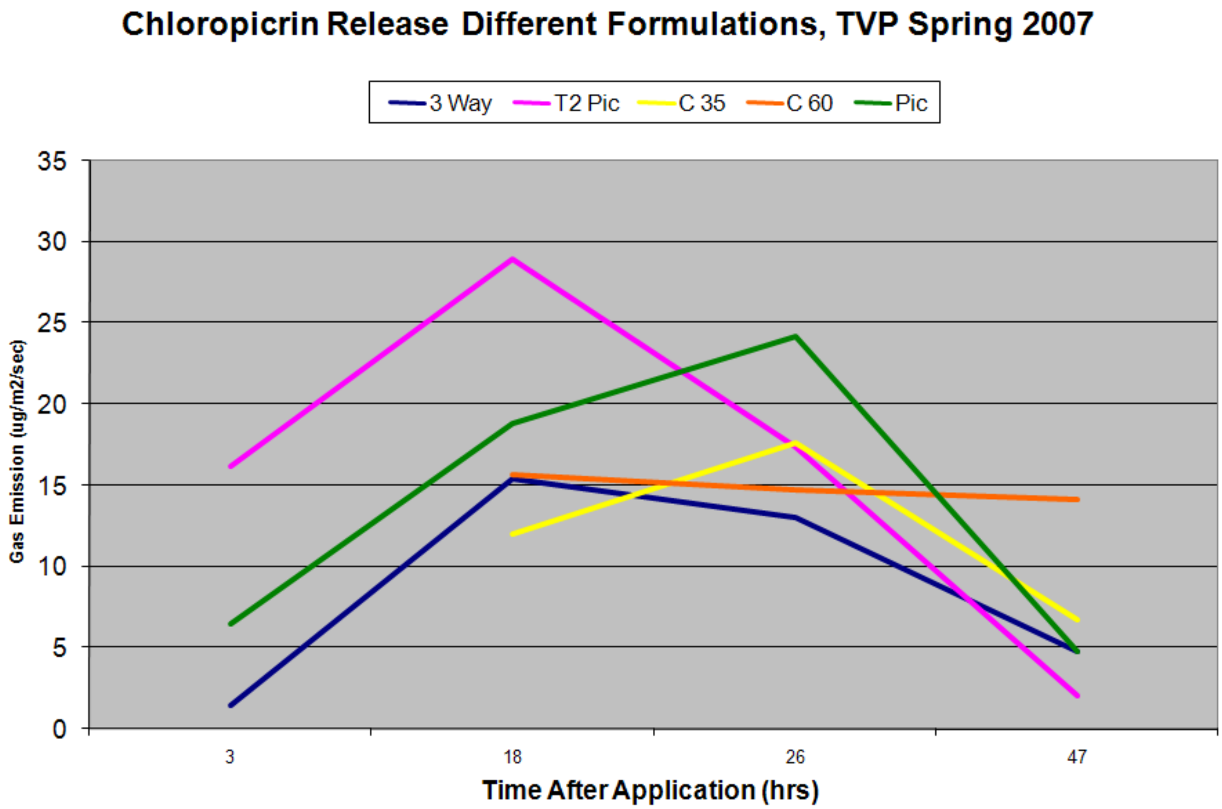


Figure 3. Gas emission release rate with different formulations of chloropicrin through LDPE (1.25 mil) over time. Tifton Vegetable Park Spring 2007.

Figure 4 and 5 shows the comparison of LDPE and VIF plastic mulches for application in spring and fall at the Ponder Farm. During the spring the VIF (Cadilac) reduced gas emissions from 35 to 88 percent depending on the time of day. The gas emission rate was the highest during the afternoon once the sunlight has warmed the mulch. Measurements were taken over three days with maximum occurring the days 1 and 2 in the afternoon. Overall gas emissions were reduced y VIF by 70 percent during the spring. During the fall the gas emissions peaked on day one. Daily temperatures were as high as 73°F. Gas emissions were reduced from 24 to 88 percent over the two day period with overall total reduction of 69 percent.

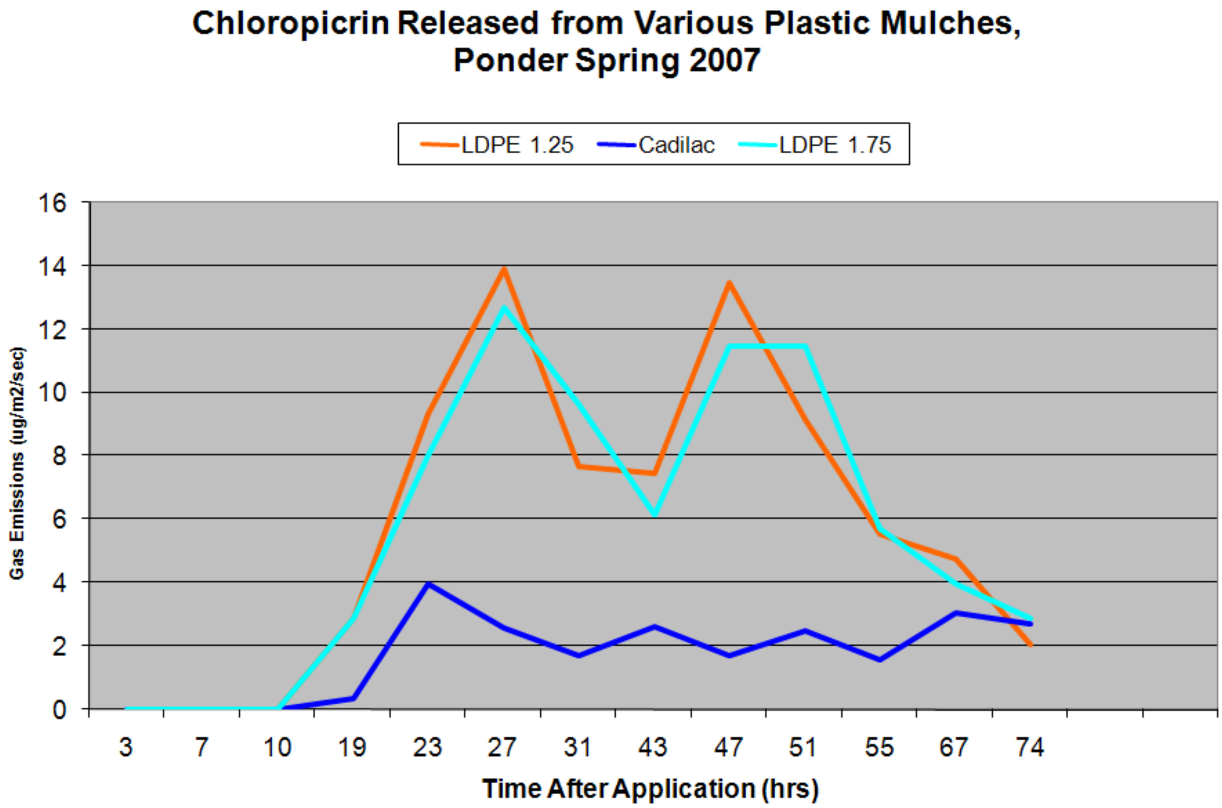


Figure 4. Gas emission rate of chloropicrin through LDPE (1.25 and 1.75) and VIF(Cadilac) mulches over time. Ponder Spring 2007.

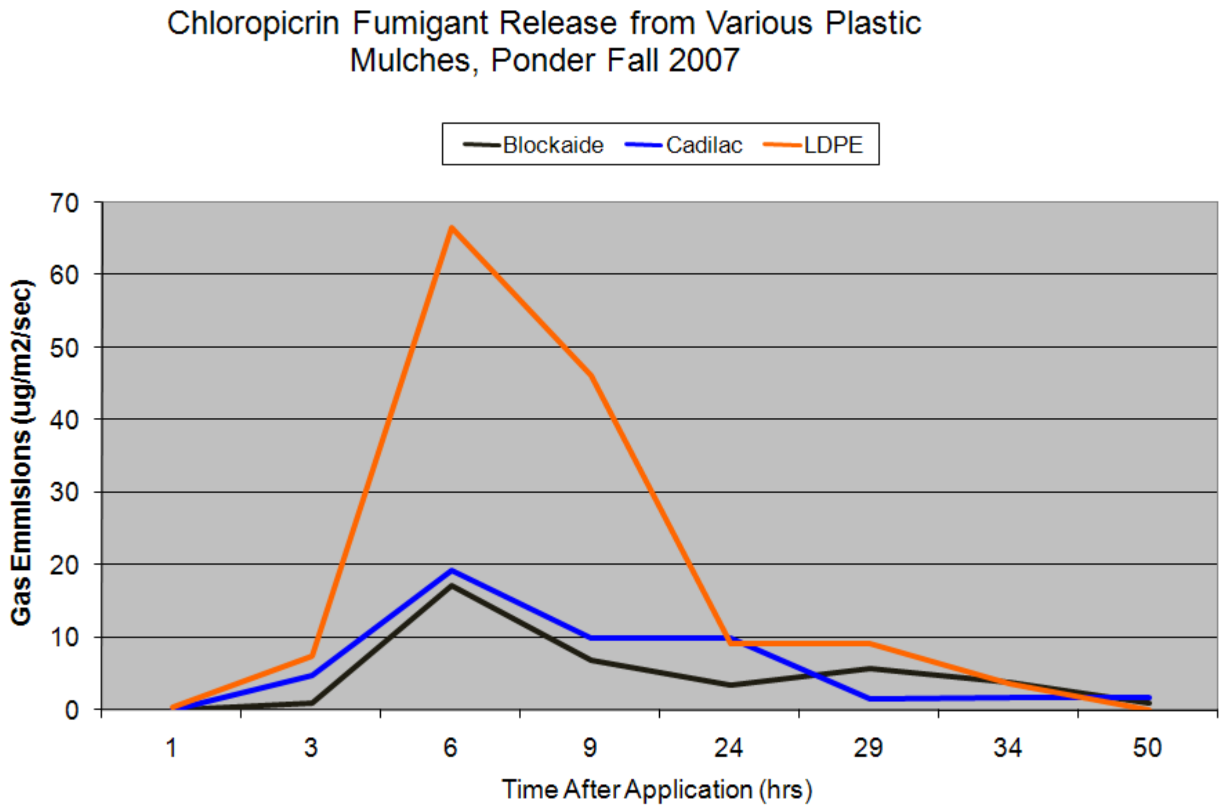
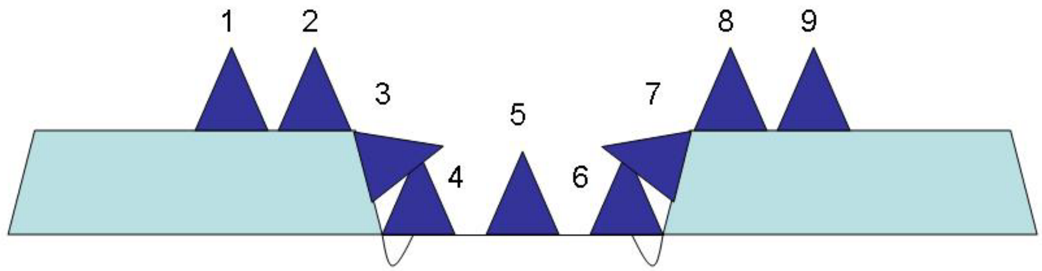


Figure 5. Gas emission of chloropicrin rates through VIF (Cadilac and Blockade) and LDPE mulches over time. Ponder Fall 2007.

Figure 6 shows the gas emissions measured between beds. As indicated there were no significant gas emissions between beds.

Plastic Mulch – Beds on 5 Foot – Chloropicrin Samples



Time after fumigation	Chloropicrin samples – funnel number								
	1	2	3	4	5	6	7	8	9
	ppm / hr / L								
8 hours	22.1	23.7	18.9	0.3	2.0	1.2	24.5	50.5	44.2
24 hours	7.9	9.5	6.3	3.2	1.6	11.8	18.9	19.7	19.7
32 hours	10.3	12.6	7.5	0	0	0.4	7.5	18.2	16.6
48 hours	3.6	3.2	2.8	0	0	0.8	12.6	10.3	9.5

Funnels have a 7 inch wide opening and 1900 mL volume – Not to Scale

Figure 6. Chloropicrin gas emissions measured between beds over time. 2007.

<u>Summary</u>

VIF plastic mulches reduce chloropicrin gas emissions by approximately 70 percent for the spring and fall application times.

RELEASE RATE OF CHLOROPICRIN FROM BARE SOIL

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Introduction

Soil compaction and soil moisture has some indication of the rate fumigants react in a soil profile. Previous work indicates that soil temperatures from morning to night will affect the rate of gas emission through plastic mulch.

Objectives

- Measure the gas emission rate for three different soil types typical for Georgia vegetable production.
- Measure the gas emission rate for two different moistures on a typical Georgia vegetable production soil type.

Methods and Materials

Soil was obtained from three different locations within the vegetable growing area of Georgia. Soil types were sandy loam, loamy sand and sand. HDPE buckets having a capacity of 9.5 litters were used for this test. Soil moisture was estimated with an Aquaterr M-300. A HDPE 1 mm diameter tube was placed with the end located in the bottom center of each bucket to dispense the chloropicrin fumigant. Soil was added to each bucket to the top and packed with a bucket to have a soil depth of 21 cm. Bucket diameter at the soil surface was 24 cm. Chloropicrin was released into each bucket to have an application rate of 150 gallons/acre. Chloropicrin gas escaping from the soil surface was measured with a gas detector pump (GASTEC GV100S) and a detector tube (Sensidine #172S). An inverted plastic funnel (1.9 L) with a stopper measuring 116.5 cm in diameter fill opening by 22 cm high with a 2 cm drain was placed on soil surface with a soil seal around the edges. Chloropicrin gas collected inside the funnels for a know period of time (0.5 - 6 minutes). After the known period, a 100 ml sample was drawn through the detector tube from the inside of the funnel by the gas detector pump (Figure 1 & 2). The chloropicrin detector tubes had a usable range of 0.05 – 16 ppm.

Figure 1. HDPE bucket and funnel used for the bare soil test.

Figure 2. Measuring gas emission rate of different soil types and moistures.

Results and Discussion

Average air temperature during the test was 62°F and soil temperature was 66°F. The tests were started at 10:00 am and gas emissions were measured during the following 24 hours. Figure 3 shows gas emission rates for three different soil type that are typical for Georgia vegetable production. Table 1 shows the classification of soils tested. Moisture content measured for the each soil was B(84%), LTF(51%) and SV(58%). Soil pore space is larger with the sand type soils. The gas emission rate was significantly higher with the sand type soil by 48.2 percent compared to sandy loam and 52.2 percent compared to loamy sand.

Table 1. Classification for soils tested.

Soil Type	Classification
B	Sand
SV	Loamy Sand
LTF	Sandy Loam

Table 2. Percent reduction of gas emissions for sandy loam and loamy sand as compared to sand soil type.							
Time After Application (hrs)	2	4	6	8	20	24	Overall
Sandy Loam	-34.1	43.5	55.9	53.9	53.9	12.5	48.2
Loamy Sand	-254.5	62.4	73.1	60.5	60.5	-37.5	52.2

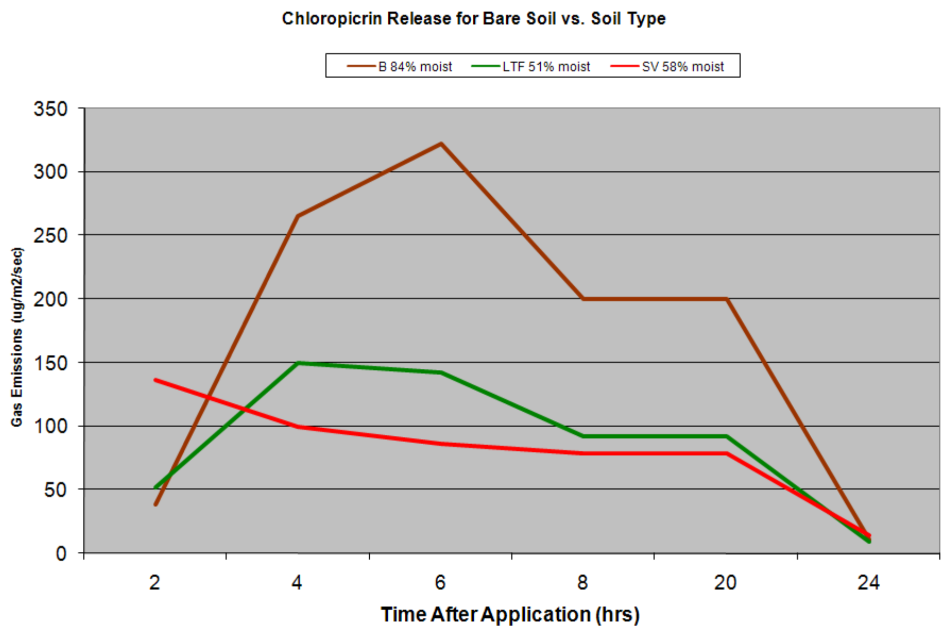

Figure 3. Gas emission rates for three different soil types with adequate soil moisture for bed formation. 2007.

Comparing moisture content for gas emissions is shown in figure 4. The soil type used was a sandy loam. Moisture profiles measured was 45 and 70 percent. Gas emission reduction ranged from 100 to 24 percent over time. The overall gas emission was reduced by 92 percent by having adequate moisture in the soil profile.

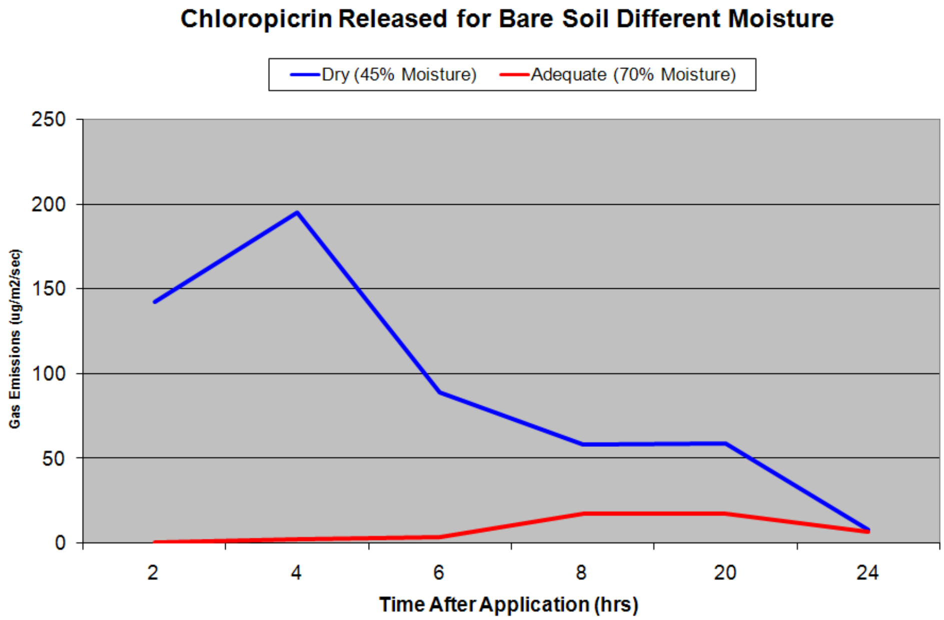

Figure 4. Gas emission rate for bare soil for dry and adequate soil moisture for a loamy sand soil type. 2007.

<u>Conclusion</u>

Moisture and soil type are very important factors that affect gas emission rate when chloropicrin is applied.

COMPARISON OF TWO TYPES OF TILLAGE SYSTEMS FOR VEGETABLE PRODUCTION YEAR II

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Introduction

Today's vegetable producers are faced with many challenges. Price instability requires growers to continue to lower production costs while maintaining yields. Wherever possible inputs must be reduced and at the same time, efficiency increased.

Moldboard ("bottom") plowing is common practice in much of the state for vegetable production. Deep turning to 8 inches prepares a smooth seedbed that is weed free and residue free for transplanting vegetables. Fertilizer and post incorporation of chemicals are applied. Then bed rows are laid off and subsequent fumigation for disease and weed control. Disking after moldboard plowing tends to re-compact the soil and should be avoided. Either plastic mulch is laid on the formed bed or left bare. One disadvantage to this system is the hard pans can develop. Root growth can be restricted if there is a hard pan, compacted layer or heavy clay zone. Vegetables such as pepper, eggplant, tomato, and etc. that are considered to be moderately deep rooted and under favorable conditions, roots will grow beyond 12 inches.

Subsoil and bed land preparation has been used for many years with row crop production in the Southeast. The single greatest benefit of row crop bedding is to allow planting into moisture; that is, pre-formed beds can be knocked down at planting to allow seed placement into moist soil. In addition, raised beds tend to be warmer and may offer a slight advantage when planting under marginally cool conditions. This also reduces the number of trips across the field.

Objective

The objective for this study was to evaluate the effects of yield and disease on cantaloupe and egg plant for moldboard plowing and subsoil shanks and bedding types of tillage.

Methods and Materials

The test was conducted at the Tifton Vegetable Park, University of Georgia, Tifton, GA spring and fall 2006. The test area was 0.19 acres divided into two sections. The area was disc twice and then a field cultivator was used to smooth off the field. One side was subsoil and bed rows laid out by the equipment in figure 1. Two subsoil shanks were spaced 24 inches apart on the center of a 72 inch plant bed. The chisel point of each shank was modified to have wings welded projecting 3 inches outward from the point. Depth of operation was approximately 12-14 inches to disrupt the hard pad. The other half of the plot was plowed with a moldboard as show in figure 2 to a depth of 8-10 inches. Bed rows were laid off with a tillovator with bed shapers. Fertilizer (10-10-10) at 300 lbs/acre and DAP at 200 lbs/acre was broadcast prior to bedding to both treatments. Beds were shaped and plastic applied with a methyl bromide applicator.

Figure 1. One pass subsoil and bed equipment.

Figure 2. Bottom plow and tillovator preparing row beds..

Cantaloupes (Athena) were transplanted on March 27, 2007. Plots consisted of one row of cantaloupes planted on raised beds that were spaced six feet apart (from center to center). In-row spacing was 24 inches per plant. Plots were each 90 feet long and were replicated 6 times. They plots were sprayed on weekly basis for insect and disease prevention. Additional fertilizer was applied through the drip irrigation system. Cantaloupe was harvested on June 15, 22, and 29, 2007 and data collected on yield.

Egg plants were transplanted on July 25, 2007. Plots consisted of one row of egg plants planted on raised beds that were spaced six feet apart (from center to center). In-row spacing was 24 inches per plant. Plots were each 90 feet long and were replicated 6 times. They plots were sprayed on weekly basis for insect and disease prevention. Additional fertilizer was applied through the drip irrigation system. Egg plants were harvested on November 14, 2007 and data collected on yield.

Results and Discussion

Results for spring cantaloupe year 2006 and 2007 are presented in tables 1 and 2. Yields show no significant difference based on yield for both years. But the moldboard plow treatment showed fruit to be 8.5 percent larger in 20065 but no difference in 2007.

When eggplants were planted the second season yield for the subsoil and bed showed an increase of 14.6 percent in 2006 (Table 3). But in 2007 there were no significant difference. The subsoil and bed treatment showed a slight increase in fruit size and also produced more fruit per acre by 8.7 percent in 2006. In 2007 the fruit size was larger with subsoil and bed but mold board produced more fruit per acre.

Summary

These tests showed that production of cantaloupe and egg plant are effected by tillage practices.

Table 1. Yield data for tillage comparison Cantaloupe Spring 2006

Tillage Method	Yield/Acre (lbs)	Fruit Count per Acre	Average Fruit Weight (lbs)
Subsoil and Bed	40303	10366	3.9
Moldboard Plow	40524	9532	4.3
Change (%)	-0.5	8.7	-8.5

Table 2. Yield data for tillage comparison Cantaloupe Spring 2007

Tillage Method	Yield/Acre (lbs)	Fruit Count per Acre	Average Fruit Weight (lbs)
Subsoil and Bed	29904	7650	3.91
Moldboard Plow	30394	7784	3.90
Change (%)	-1.6	-1.8	0.1

Table 3. Yield data for tillage comparison on Eggplant Fall 2006

Tillage Method	Yield (Cartons)*	Average Fruit Weight (grams)	Fruit Count per Acre
Subsoil and Bed	749	557	17101
Moldboard Plow	654	542	15340
Change (%)	14.6	2.8	11.5

Table 4. Yield data for tillage comparison on Eggplant Fall 2007

Tillage Method	Yield (Cartons)*	Average Fruit Weight (grams)	Fruit Count per Acre
Subsoil and Bed	85	908	1183.11
Moldboard Plow	87	754	1465.44
Change (%)	-2.8	17.0	-23.9

Author Index

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Scott Angle
Dean and Director

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