

## PCAP TRIAL #4-SPRING NUFARM FOR THE MANAGEMENT OF *PHYTOPHTHORA CAPSICI*

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### **Introduction**

*Phytophthora capsici* is a soil borne disease that continues to cause serious losses in cucurbit, pepper and tomato crops. This trial is fourth in a series of trials at the Black Shank farm that was set up to evaluate the efficacy of various chemicals for management of *Phytophthora capsici*.

### **Methods and Materials**

The trial was conducted at the Black Shank Farm, CPES, Tifton Ga. in block 1240 of the *Phytophthora capsici* nursery area. The test area was fertilized on 26 March with a 10-10-10 formulation applied at 500lb/A. Fertilizer was applied and then rototilled into the soil. On 28 March, test area was prepared and beds were shaped and covered with 1 mil black polyethylene film mulch and plumbed with drip tape installed simultaneously in the center of the bed approximately 1-inch deep. The drip tape was Aquatraxx™ brand with a 12-inch emitter spacing, and a flow rate of .45 gal/min/100ft with a 12-PSI regulator. Plastic mulch covered plots were 30 inches wide, 26 feet in length with 5 foot alleys between plots. The plot design was a randomized complete block (RCBD) with 5 treatments and 5 replications.

Each plot was inoculated with *P. capsici* on 5 April and again on 27 April by placing 1/8 teaspoon of *P. capsici* infested beet seed (approximately 15-20 seed per location) just below the soil surface in three locations, beginning, middle and end of plot. Fungal inocula was produced by plating pure cultures of *Phytophthora capsici* on V8-agar plates and incubating for 7-10 days. Beet seed (Detroit Medium Top variety) was soaked in distilled water in aluminum pans for 24 hours. Soaked beet seed was decanted and then poured into 500ml

flasks to the 250-300ml mark, plugged with Identi-plug™ foam plugs, covering plugs with foil and securing with autoclave tape. Flasks were then autoclaved for 30 minutes. After autoclaving, flasks were allowed to cool and then inoculated with V8 agar plugs of *P. capsici* (approximately 1/4"x 1/4" plugs) under a laminar flow hood using aseptic techniques. Flasks were allowed to incubate at 26 degrees Celsius for 10-14 days before field inoculation.

Yellow squash cultivar 'Prelude II' transplants (Source: Lewis-Taylor Farms, Inc. Tifton, Ga.) were transplanted in plots on a 12-inch spacing on 12 April. Fertility, insects and weeds were managed according to standard University of Georgia Extension Service recommendations. Individual treatments were applied through drip irrigation beginning 13 April and every seven days (20, 27 April and 4, 11, 18, 25 May) thereafter as per application schedule. Treatment 5, Ridomil Gold was applied as the growers standard with only one drip application at plant. Treatments were applied to all plots simultaneously by utilizing an engineered multiple manifold injection system (Hickey Injection System) with Co2 gas as a method of pushing the candidate chemical through drip irrigation tape. The Hickey injection system was developed at the Black Shank Farm, Tifton, Ga. by farm manager Don Hickey and research coordinator Lewis Mullis in order to develop a more efficient and timely treatment application method for use in on-farm chemical trials. Rainfall amount for the period of April 1<sup>st</sup> through June 1<sup>st</sup> only amounted to 4.53 inches within a total of 11 days of rain. Therefore, all plots began receiving daily overhead irrigation (approximately 1-inch of water per irrigation run time) beginning 15 May until final harvest in order to stimulate disease progress and development.

<u>Treatments</u>	<u>Rate</u>	<u>Application Schedule</u>
1)Non-treated control	n/a	No field treatment
2)Admire Pro	10.4 oz/A	At plant drip application
3)NUP06024 2.0SC	24 oz/A	At plant drip application
4)NUP06024 2.0SC + Phostrol	24oz/A 5pt/A	At plant drip application Two foliar applications at 3 & 6 weeks
5)NUP06024 2.0SC + Ultra Flourish	24oz/A 4pt/A	At plant drip application At plant drip application
6)NUP06024 2.0SC + Ultra Flourish + Phostrol	24oz/A 4pt/A 5pt/A	At plant drip application At plant drip application Two foliar applications at 3 & 6 weeks
7)Ridomil Gold	1pt/A	At plant drip application

Stand counts were conducted on a weekly basis beginning one week after transplanting on 19 April and 4, 11, 18, 25 and 30 May. Stand counts included number of live plants and number of plants infected with *P. capsici* each week. Two vigor ratings were taken on 26 April and 10 May where plants were rated on a scale of 1-10, with 10= live and healthy plants and 1= dead and dying plants. All squash fruits of a marketable size were hand harvested. Each harvest was separated into marketable and cull fruits, then counted and weighed. Additionally, cull fruits were separated and the number of fruit exhibiting signs of *P. capsici* lesions were counted per plot. Four total harvests were taken on 16, 22, 26 and 30 May.

### Results and Conclusions

None of the treatments were significantly

different from the non-treated control for any of the parameters measured at 5% significance level of Duncan's Multiple Range test. However, all the treatments were numerically lower than the control for disease index, and percent disease. The year 2006 was a very dry year with very little rainfall in March, April, or May. To simulate an epidemic, we initiated a heavy irrigation schedule the last two weeks of the trial to ensure disease development. The heavy irrigation may have influenced the efficacy of the treatments since many of those treatments were applied when the disease was inactive early in the season. Treatment numbers 3 and 4 experienced phytotoxicity which resulted in stunting. Thus the yields were lower in those treatments. This test is being repeated this fall to determine if the stunting can be reproduced.

**Table 1. 2006 Pcap Trial # 4 Application of Candidate fungicides, NuFarm for management of *P. capsici***

Treatment	Marketable			Cull		Total Yield		
	Vigor <sup>2</sup>	Number <sup>3</sup>	Yield <sup>4</sup>	Number <sup>5</sup>	Yield <sup>6</sup>	Total Number <sup>7</sup>	Total yield <sup>8</sup>	% Difference of Total Yield over Control <sup>9</sup>
1-Non treated control	7.7aa	96a	41.2ab	54a	7.7a	150a	48.9ab	_____
2-Admire Pro @ 10.4oz/A	8.4a	78a	29.1bc	57a	7.1a	135a	36.2bc	-25.97
3-NUP06024 @ 24oz/A	3.9b	37b	13.2c	33b	2.9b	70b	16.1d	-65.4
4-NUP06024- Imidicloprid 2.0SC @ 24oz/A+ Phostrol 5pt/A	4.4b	44b	15.8c	31b	4.2b	75b	20.0cd	-59.1
5-NUP06024- Imidicloprid 2.0SC @ 24 oz/A + Ultra Flourish @ 4pt/A	9.0a	109a	49a	58a	8.2a	166a	57.1a	+16.8
6-NUP06024- Imidicloprid 2.0SC @ 24oz/A + Ultra Flourish @4pt/A +Phostrol @ 5pt/A	7.7a	105a	41.2ab	58a	7.4a	163a	48.6ab	-0.61
7-Ridomil Gold 1pt/A + Ridomil Gold Copper	9.1a	108a	50.4a	59a	8.4a	167a	58.8a	+20.25

<sup>1</sup> 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.

<sup>2</sup> 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 for 20 April and 04 May.

<sup>3</sup> The fruit collected from each individual plot that was considered to be marketable and showed no symptoms of disease was separated and counted on 16, 22, 26, and 30ay.

<sup>4</sup> The fruit was collected separately by each plot and the fruit considered marketable and non-diseased was weighed (in lbs.) on 16, 22, 26, and 30 May.

<sup>5</sup> The fruit collected from each individual plot that was considered diseased and non-marketable was separated and counted on 16, 22, 26, and 30 May.

<sup>6</sup> The fruit was collected separately by each plot and the fruit diseased and non-marketable was weighed (in lbs.) on 16, 22, 26, and 30 May.

<sup>7</sup> Equals total number of fruits harvested both marketable and culls. <sup>8</sup> Equals total yield (in lbs.) of fruits harvested both marketable and culls.

<sup>9</sup> Percent difference of total yield over control was calculated by subtracting the total yield per treatment from the control total yield, then dividing that number by the control number and multiplying by 100.

**Table 2. 2006 Pcap Trial # 4 Application of Candidate fungicides, NuFarm for management of *P. capsici***

<b>Treatment</b>	<b>Percent disease<sup>1</sup></b>	<b>Disease Index<sup>2</sup></b>	<b>Number infected fruit<sup>3</sup></b>	<b>Percent difference of disease incidence over control<sup>4</sup></b>
<b>1-Non treated control</b>	69bc	47.8c	21a	—————
<b>2-Admire Pro @ 10.4oz/A</b>	86.8ab	77.6ab	29a	+25.8
<b>3-NUP06024 @ 24oz/A</b>	96.6a	89.4a	18a	+40.0
<b>4-NUP06024- Imidicloprid 2.0SC @ 24oz/A+ Phostrol @ 5pt/A</b>	79.6abc	62.1abc	17a	+15.3
<b>5-NUP06024- Imidicloprid 2.0SC @ 24 oz/A + Ultra Flourish @ 4pt/A</b>	61.6c	40.3c	26a	-11.6
<b>6-NUP06024- Imidicloprid 2.0SC @ 24oz/A + Ultra Flourish @4pt/A +Phostrol @ 5pt/A</b>	68.4bc	49.3c	26a	-1.0
<b>7-Ridomil Gold 1pt/A + Ridomil Gold Copper</b>	58.1c	52.2bc	29a	-15.8

<sup>1</sup> Percent Disease was calculated by dividing the total dead plants by the initial stand count and multiplying by 100.

<sup>2</sup>Culled squash fruits that exhibited visible signs of *P.capsici* were seperated and counted per plot

<sup>3</sup> Percent Disease was calculated by dividing the total dead plants by the initial stand count and multiplying by 100.

<sup>4</sup> Percent difference of disease incidence over control was calculated by subtracting the number of infected fruit per treatment from the control number of infected fruit, then dividing that number by the control number and multiplying by 100.