

Efficacy of Fungicides to control *Phytophthora capsici* on Tropical Pumpkin (*Cucurbita moschata*)

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DISEASE: *Phytophthora capsici* on Tropical Pumpkin (*Cucurbita moschata*)

EXPERIMENTAL SITE: A field (Kendrick Loamy sand) at the University of Florida- IFAS Plant Science Research and Education Unit (PSEU) in Citra, Florida.

MATERIALS AND METHODS:

Tropical Pumpkin variety 'La Estrella' was germinated in the greenhouse and transplants were taken into the field and planted. Beds were spaced on 60 inch centers and plant spacing was on three foot centers along the length of a bed covered with reflective plastic mulch. Bed preparation including fumigation and fertilizer application will be completed prior to planting. Admire was applied after the plots have been planted.

Plots were arranged in a RCB design with 5 replications. Each replicated treatment consisted of eight non-inoculated plants with 2 inoculated plants, one at each end of the 30 foot plot. Treatments were applied with a CO₂ backpack sprayer at 30 psi and sufficient water to achieve 50gpa using Teejet 8004 flat fan tips. Initial applications were made using a single tip, and as the plants grow a boom of two tips was used to insure 100% coverage. Drench treatments were applied immediately after transplant where appropriate.

Donor plants were inoculated in the evening with a mixture of *Phytophthora capsici* isolates CP30, CP31 and 7962 prepared, using methods from "Methods for Research on Soilborne Phytopathogenic Fungi" (Singleton et al., 1992 p.34-35), adjusted to a final concentration of 3.3×10^5 zoospores per ml, applied as a drench onto the crown at the rate of 20ml per plant after the first fungicide application has been made. Due to the limited rainfall during the trial period overhead irrigation was carried out daily for 1- 1.5 hours and applied in the late afternoon to lengthen the daily moisture period.

RESULTS

In 2007 the average rainfall was significantly lower than the five year monthly averages (see Table 1- below). The rainfall events occurred such that the bulk of the rainfall occurred during one or two events per month. The lower than average rainfall required additional daily irrigation of two hours using overhead sprinklers. Diseased fruit and diseased plants were first observed on August 28, 2007 and foot of row diseased was recorded. After September 11, 2007 the plots were rated for disease incidence using the Barratt-Horsfall rating scale of 0-11. Diseased fruit were initially observed on August 28, 2007 with new and mature fruit becoming infected throughout the remainder of the test. When foot of row diseased was examined Treatment 4 (Drench of Ridomil Gold EC 16 oz/A at plant out followed by Revus 8 oz/A + Activator 90+ Kocide 3000 0.75lb/A applied (BCEF) alternated with Ridomil Gold Copper 2lb/A applied at D had significantly less disease than any other treatment. When examining the AUDPC values which describe the foot of row diseased over time had a significantly lower value indicating less disease over time. Similar data was collected for the plot disease ratings and the AUDPC of the plot disease ratings was also similar. Yield data was collected, however since only marketable fruit were recovered at the end of the test the data only reflects the apparently disease free fruit harvested at the end of the experiment and does not account for diseased fruit occurring during the test or remaining in the bed when the experiment ended.

When examining the foot of row diseased from September 11, 2007 treatments 3,4,11,12,13,14, and 15 had significantly less disease than the untreated check and when the AUDPC values were examined only treatments 9 and 10 were not significantly different from the untreated check. It should be noted that treatment had only two application of the test product which was then treated the same as treatment 2.

Examination of the plot disease ratings for October 23, 2007 shows only treatment 4 significantly different from the untreated check and examination of the AUDPC values show that all the test treatments had lower disease than the untreated check

Tropical Pumpkin Spray Schedule 2007

	Drench at planting 07/10/07	08/10/07- A	Inoculation 08/20/07	08/24/07- B	09/10/07- C	09/28/07- D	10/12/07- E	10/22/07- F
T1-untreated								
T2- Tanos @10oz +Manex @ 1.6 qt		X			X		X	
T2- Forum + Kocide Forum @ 6.2 oz+ Kocide @ 2 Lb				X		X		X
T3- Ridomil Gold EC 16 oz/A	X							
T3- Revus 8 oz/A + Activator 90+ Kocide 3000 1.5lb/A				X	X		X	X
T3- Ridomil Gold Copper 2lb/A						X		
T4- Ridomil Gold EC 16 oz/A	X							
T4- Revus 8 oz/A + Activator 90+ Kocide 3000 0.75lb/A				X	X		X	X
T4- Ridomil Gold Copper 2lb/A						X		
T5- Ridomil Gold EC 16 oz/A	X							
T5- Revus 8				X		X		X

oz/A + Activator 90+ Kocide 3000 2.0lb/A								
T5- Ridomil Gold Copper 2lb/A					X		X	
T6- Ridomil Gold EC 16 oz/A	X							
T6- Revus 8 oz/A + Activator 90				X		X		X
T6- Ridomil Gold Copper 2lb/A					X		X	
T7- NN (1456) 400ppm		X		X	X	X	X	X
T8- NN (1457)400ppm		X		X	X	X	X	X
T9- NN(1458) 400ppm		X		X	X	X	X	X
T10-NN (1459) 400ppm		X		X	X	X	X	X
T11- NN (1460) 400ppm		X		X	X	X	X	X
T12 Phyton 2 oz/A	X	X		X	X	X	X	X
T13 Phyton 3 oz/A	X	X		X	X	X	X	X
T14-Isk Ranman	X							
T14 Isk Ranman + silwet+ Kocide (3000)		X		X	X	X	X	X
T15 Isk	X							

Omega								
T15 Isk Omega		X		X	X			
T15 Isk Ranman + silwet+ Kocide (3000)						X	X	X

Application dates: July 10, 2007- plant out, A= August 10, 2007, B= August 24, 2007, C=September 10, 2007, D= September 28, 2007,
E=October 12, 2007, F=October 22, 2007

Inoculation date: August 20, 2007

Table 1. Rainfall (in inches) at PSEU Citra Florida

Month	5 Year Average at Citra	2007 actual
May	1.15	0.16
June	6.44	4.36
July	7.09	6.49
August	5.42	2.94
September	6.78	5.69
October	4.43	6.79

Table 2. Foot of row diseased and AUDPC.

Treatment	Foot of Row Diseased			AUDPC
	08/29/2007	09/04/2007	09/11/2007	
1	9.6ABC*	21.4AB	21.8A	259.7AB**
2	6.6BC	16.6ABC	17.2ABC	199.5CDEFG
3	7.6BC	14.0C	14.0BCD	173.6FG
4	4.2C	11.8C	10.4D	133.7H
5	9.8ABC	18.2ABC	16.0ABCD	217.7CDE
6	7.0BC	12.65C	16.8ABC	171.85G
7	12.2AB	17.2ABC	16.4ABC	220.5CD
8	6.4BC	17.8ABC	16.4ABC	204.4CDEF
9	14.4A	23.0A	19.6AB	280.0A
10	10.6ABC	18.6ABC	18.0ABC	230.3BC
11	10.4ABC	16.0BC	14.2BCD	198.1DEFG
12	11.4AB	17.4ABC	15.8BCD	217.0CDE
13	11.0AB	14.5BC	13.8BCD	188.3EFG
14	12.2AB	15.6BC	15.0BCD	204.4CDEF
15	8.0ABC	13.4C	13.4CD	168.7G

* Values under foot of row diseased are the mean number of feet diseased out of a thirty row plot. Data analysis conducted using SAS 9.1 to conduct ANOVA and mean separation was conducted using Fisher's LSD $P > 0.05$.

** Values under AUDPC are mean values and means separation was conducted using SAS 9.1 and Fisher's LSD. AUDPC values followed by the same letter are not significantly different $P > 0.05$.

Table 3 Tropical Pumpkin Plot Disease ratings and AUDPC

Treatment	Plot Disease Rating-Barratt-Horsfall (0-11)				AUDPC
	009/11/2007	09/24/2007	10/08/2007	10/23/2007	
1	10.1A*	9.0A	8.6A	9.9A (96.7)	386.4A**
2	9.1AB	6.2BCD	7.8AB	8.8AB (92.8)	321.3CDEF
3	7.8B	5.2CD	8.0AB	8.6AB(91.6)	299.6F
4	5.7C	3.9D	6.2B	6.6B(65)	227.5G
5	9.0AB	8.7AB	7.4AB	9.5A(95.5)	354.9B
6	8.7AB	4.9CD	8.6A	8.9A(93.4)	312.2F
7	9.4A	6.6ABCD	7.8AB	9.2A(94.6)	331.2BCDE
8	9.3A	7.2ABCD	7.8AB	8.7AB(92.2)	336.0BCD
9	10.1A	4.8D	8.0AB	9.4A (94.5)	315.7CDEF
10	9.4A	5.1CD	8.2AB	9.6A(95.8)	319.2CDEF
11	8.7AB	5.9CD	7.4AB	8.3AB(89.8)	305.2EF
12	9.4A	5.3CD	7.4AB	8.7AB(92.2)	304.5EF
13	8.7AB	6.2ABCD	8.0AB	9.6A(95.8)	326.9CDEF
14	9.5A	7.3ABC	7.6AB	9.6A(95.8)	342.3BC
15	8.7AB	6.1BCD	7.4AB	8.9A(93.4)	312.2DEF

* Values presented for plot ratings are the Barratt-Horsfall values collected in the field. The data was transformed to arcsine values and the analysis was conducted using the transformed data. Values followed by the same letter are not statistically significantly different $P < 0.05$. Means separation was conducted using Fisher's LSD. All analysis was conducted using SAS 9.1.

** Values under AUDPC are mean values and means separation was conducted using SAS 9.1 and Fisher's LSD. AUDPC values followed by the same letter are not significantly different $P > 0.05$.

*** Values under Yield are mean values and means separation was conducted using SAS 9.1 and Fisher's LSD. Yield values followed by the same letter are not significantly different $P > 0.05$.

Table 4. Tropical Pumpkin Harvestable fruit yield.

Treatment	Yield/ Lbs
1	4.85BC***
2	4.96BC
3	14.5AB
4	4.12BC
5	20.53A
6	10.05ABC
7	11.0ABC
8	11.36AB
9	7.65BC
10	4.99BC
11	9.90ABC
12	7.86BC
13	0.07C
14	4.7BC
15	6.67BC

*** Values under Yield are mean values and means separation was conducted using SAS 9.1 and Fisher's LSD. Yield values followed by the same letter are not significantly different $P > 0.05$.