

**TOMATO:** *Lycopersicon esculentum* Miller

**EVALUATION OF FUNGICIDES FOR EARLY BLIGHT AND TARGET SPOT CONTROL ON TOMATO, FALL 2009**

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*Alternaria solani* and *Corynespora cassiicola*

On 3 Sep 2009, field plots were established at the University of Florida's Gulf Coast Research and Education Center in Balm, FL to assess the effect of several fungicides on the severity of early blight (EB) and target spot (TS) caused by *Alternaria solani* and *Corynespora cassiicola*, respectively, on tomato. Fields consisted of raised beds, 300 ft in length, on 5 ft center-to-center spacing, covered with black virtually impermeable mulch and irrigated with a drip system. Transplants of the TYLCV resistant cultivar SecuriTY 28 were transplanted at 18" spacing to each plot, consisting of three adjacent 21 ft long bed sections with 6 ft buffers along beds to separate plots. Fungicide treatments were applied on 17 Sep, 25 Sep, 2 Oct, 9 Oct, 15 Oct, 23 Oct, 30 Oct, 6 Nov, and 20 Nov with a tractor sprayer calibrated to deliver 60, 90 & 120 gal/A at 200 psi. A water treated control was included to measure disease pressure (water was applied to keep the amount of spore dispersal by sprayer activity uniform across all plots). Treatments were arranged in a randomized complete block design with each treatment repeated 4 times. The lower plant canopy in the outer beds of each plot was inoculated 5 Oct with a suspension ( $3.5 \times 10^4$  spore/ml) of *Alternaria solani*, and 13 Oct with a suspension ( $4 \times 10^4$  spore/ml) of *Corynespora cassiicola*. On 5 Nov, 18 Nov and 1 Dec the center bed of each plot was monitored, and rated using the Horsfall-Barratt scale to assess the percentage of canopy affected by EB and TS; focusing on the larger developed EB & TS lesions to avoid confusion with symptoms of bacterial spot. Marketable yield was assessed from two separate harvests of the center 10 plants in each plot. Only large and extra large fruit were harvested on 20 Nov followed by a complete harvest of all fruit on 1 Dec.

Initial disease development in September and October was hindered by the dry, hot weather conditions. Weather conditions were favorable for rapid disease development from late-October through December with heavy morning dews, warm temperatures, and periodic heavy rains. Widespread epidemics of EB and TS were observed throughout southwest Florida. Since it is impractical to rate symptoms of EB and TS separately, the two diseases were scored together focusing on the larger, characteristic lesions to minimize the impact of bacterial spot symptoms on ratings. On 5 Nov, the water-treated plots and plots treated with Bravo Weatherstik alone (Trt 16) exhibited the highest level of disease, but did not differ significantly from the other treatments. All treatments conferred some level of protection based on 18 Nov and 1 Dec

ratings. Based, on AUDPC values, treatments with USF2018A (Trt 7), and Lem 17SC (Trts 8, 10, 14 & 15) gave the best level of control by reducing disease severity over 88%. No treatment effect was observed on any yield parameter.

**Table 1.** Effect of treatments on the LS Mean (95% confidence interval) tomato yield by market class, culled fruit.

TRT	Treatments, rates, and application timing <sup>y</sup>	Marketable Yield (lbs / plot):					% of Total Fruit by Weight: <sup>z</sup>	
		Total	Extra Large	Large	Medium	Small	Culled	Marketable
1	Actigard, 0.33 oz(1 - 6); Revus Top, 7 oz (1, 3, 5, 7); Quadris FL, 6.2 oz (1, 3, 5, 7); Bravo Weatherstik, 2 pt (4, 6, 8); Penncozeb 75DF, 2 lb (9); Cuprofix Ultra 40D, 3 lb (9)	127.5	32.4	60.1	11.2	3.4	12.3%	84.3%
2	Actigard, 0.33 oz(1 - 6);Bravo Weatherstik, 2 pt (4, 6); Penncozeb 75DF, 2 lb (1, 2, 3, 5, 7, 9); Cuprofix Ultra 40D, 3 lb (1-9)	125.4	33.1	54.3	15.7	5.5	11.2%	86.6%
3	Reason 500SC, 8.2 oz (1-9); Cuprofix Ultra 40D, 3 lb (1-9)	137.7	34.9	61.0	14.5	5.1	12.0%	83.9%
4	Reason 500SC, 4.0 oz (1-9); Bravo Weatherstik, 1.38 pt (1, 9); Cuprofix Ultra 40D, 3 lb (1-9)	141.6	29.5	70.2	16.4	5.5	11.5%	86.1%
5	Regalia SC, 1 Qt (1, 3, 5, 7, 9); Penncozeb 75DF, 2 lb (2, 4, 6, 8); Cuprofix Ultra 40D, 3 lb (2, 4, 6, 8)	117.4	24.9	55.0	13.9	4.9	12.3%	84.1%
6	Regalia SC, 1 Qt (1, 3, 5, 7, 9); Bravo Weatherstik, 2 pt (1, 4), 2.75 pt (6, 8); Cuprofix Ultra 40D, 3 lb (1, 3, 5, 7, 9)	140.5	35.2	64.2	13.6	6.0	11.9%	84.3%
7	USF2018A (EXPJC209), 11 oz (1-9); Cuprofix Ultra 40D, 3 lb (1-9)	147.1	34.8	68.9	10.3	2.4	16.4%	79.5%
8	Lem 17SC, 10 fl oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	130.9	33.6	53.5	18.2	5.7	10.2%	85.0%
9	Lem 17SC, 16 fl oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	129.3	30.5	56.9	16.8	5.8	11.8%	85.0%
10	Lem 17SC, 24 fl oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	128.3	37.1	52.2	14.6	6.8	11.2%	86.2%
11	Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	137.6	35.1	58.2	17.5	7.2	11.2%	86.0%
12	Endura 70WG, 2.5 oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	126.5	29.6	58.5	11.4	3.9	14.5%	81.7%
13	Lem 17SC, 10 fl oz (1 - 9)	120.0	25.5	58.5	13.5	5.3	12.0%	85.6%
14	Lem 17SC, 16 fl oz (1 - 9)	143.4	33.3	64.7	17.3	6.5	12.2%	84.8%
15	Lem 17SC, 24 fl oz (1 - 9)	133.3	32.1	59.7	14.1	6.0	13.4%	83.7%
16	Bravo Weatherstik, 2 pt (1 - 9)	139.3	29.2	65.1	16.1	5.5	14.2%	82.9%
17	Actigard, 0.33 oz(1 - 5), 0.50 oz (6 - 8), 0.75 oz (9); Penncozeb 75DF, 2 lb (1 - 9); Cuprofix Ultra 40D, 3 lb (1 - 9)	127.0	32.8	60.8	11.3	3.1	9.7%	85.5%
18	Water Treated Control	142.6	27.9	68.0	12.8	6.1	11.9%	80.7%
<i>P &gt; F</i>		0.3458	0.9258	0.4929	0.5775	0.9477	0.1641	0.4756

<sup>y</sup> Treatments (TRT) were applied on 17 Sep, 25 Sep, 2 Oct, 9 Oct, 15 Oct, 23 Oct, 30 Oct, 6 Nov, and 20 Nov corresponding with applications 1 to 9, using a tractor sprayer calibrated to deliver 60, 90 & 120 gal/A at 200 psi. Listed treatment rates are on a per acre basis unless noted otherwise. Seedlings were transplanted 3 Sep. Plots were harvested on 20 Nov and 1 Dec.

<sup>z</sup> Culled represents the % of total fruit weight discarded due to physical defects, while Marketable represents the % of total fruit weight free of physical defects and disease; acceptable for retail [% Marketable = ((Culled + Diseased) / Total)\*100]

**Table 2.** Effect of treatments on early blight and target spot as measured by disease severity, area under disease progress curves (AUDPC), and by the average number, weight and percentage of diseased fruit per plot.

TRT	Treatment <sup>x</sup>	Rating Dates: <sup>y</sup>			AUDPC	Diseased Fruit:		
		5 Nov	18 Nov	1 Dec		No.	Weight (lbs)	% of total
1	Actigard, 0.33 oz(1 - 6); Revus Top, 7 oz (1, 3, 5, 7); Quadris FL, 6.2 oz (1, 3, 5, 7); Bravo Weatherstik, 2 pt (4, 6, 8); Penncozeb 75DF, 2 lb (9); Cuprofix Ultra 40D, 3 lb (9)	6.0	6.8 e	83.9 bcd	269 cd	11 b	4.47	3.4%
2	Actigard, 0.33 oz(1 - 6);Bravo Weatherstik, 2 pt (4, 6); Penncozeb 75DF, 2 lb (1, 2, 3, 5, 7, 9); Cuprofix Ultra 40D, 3 lb (1-9)	2.3	4.9 e	74.4 def	117 cd	7 b	2.75	2.2%
3	Reason 500SC, 8.2 oz (1-9); Cuprofix Ultra 40D, 3 lb (1-9)	3.8	32.8 bc	92.8 abc	368 cd	16 b	5.75	4.1%
4	Reason 500SC, 4.0 oz (1-9); Bravo Weatherstik, 1.38 pt (1, 9); Cuprofix Ultra 40D, 3 lb (1-9)	2.3	32.8 bc	79.1 cde	313 cd	9 b	3.44	2.4%
5	Regalia SC, 1 Qt (1, 3, 5, 7, 9); Penncozeb 75DF, 2 lb (2, 4, 6, 8); Cuprofix Ultra 40D, 3 lb (2, 4, 6, 8)	6.8	36.6 bc	97.8 ab	506 bc	13 b	4.25	3.6%
6	Regalia SC, 1 Qt (1, 3, 5, 7, 9); Bravo Weatherstik, 2 pt (1, 4), 2.75 pt (6, 8); Cuprofix Ultra 40D, 3 lb (1, 3, 5, 7, 9)	3.0	20.9 d	74.4 def	257 cd	12 b	5.16	3.7%
7	USF2018A (EXPJC209), 11 oz (1-9); Cuprofix Ultra 40D, 3 lb (1-9)	0.8	6.0 e	56.3 g	70 d	14 b	6.34	4.1%
8	Lem 17SC, 10 fl oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	1.1	7.9 e	62.5 fg	97 d	17 b	6.38	4.8%
9	Lem 17SC, 16 fl oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	4.9	5.6 e	67.3 efg	220 cd	12 b	4.13	3.1%
10	Lem 17SC, 24 fl oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	1.1	4.9 e	67.3 efg	76 d	9 b	3.25	2.6%
11	Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	3.0	5.6 e	72.0 def	150 cd	11 b	3.94	2.7%
12	Endura 70WG, 2.5 oz (1, 3, 5, 7, 9); Tanos 50WG, 8 oz (2, 4, 6, 8); Kocide 3000, 1.3 lb (1-9)	1.5	9.1 e	61.0 fg	119 cd	12 b	4.59	3.7%
13	Lem 17SC, 10 fl oz (1 - 9)	2.3	13.8 de	76.8 de	180 cd	9 b	2.88	2.4%
14	Lem 17SC, 16 fl oz (1 - 9)	1.5	8.0 e	67.3 efg	112 d	11 b	4.31	3.0%
15	Lem 17SC, 24 fl oz (1 - 9)	1.5	3.8 e	72.0 def	82 d	9 b	3.75	2.9%
16	Bravo Weatherstik, 2 pt (1 - 9)	17.5	23.3 cd	92.1 abc	810 ab	11 b	3.88	2.9%
17	Actigard, 0.33 oz(1 - 5), 0.50 oz (6 - 8), 0.75 oz (9); Penncozeb 75DF, 2 lb (1 - 9); Cuprofix Ultra 40D, 3 lb (1 - 9)	3.8	6.8 e	76.8 de	186 cd	19 b	6.56	4.8%
18	Water Treated Control	13.8	62.5 a	98.5 a	946 ab	36 a	10.81	7.5%
<b>P &gt; F</b>		0.1332	<0.0001	<0.0001	0.0004	0.0700	0.2271	0.3124

<sup>x</sup> Treatments (TRT) were applied on 17 Sep, 25 Sep, 2 Oct, 9 Oct, 15 Oct, 23 Oct, 30 Oct, 6 Nov, and 20 Nov corresponding with applications 1 to 9, using a tractor sprayer calibrated to deliver 60, 90 & 120 gal/A at 200 psi. Listed treatment rates are on a per acre basis unless noted otherwise. Seedlings were transplanted 3 Sep.

<sup>y</sup> Trial was inoculated 5 Oct and 13 Oct with a 10<sup>4</sup> spores/ml suspension of *Alternaria solani* and *Corynespora cassiicola*, respectively. The severity of early blight and target spot was assessed as the percentage canopy showing symptoms. The Horsfall-Barratt scale was used for all ratings, but values were converted to mid-percentages prior to statistical analyses.