

PEPPER: *Capsicum annuum* L.

EVALUATION OF ACTIGARD, SERENADE MAX AND QRD 146 FOR THE CONTROL OF PEPPER BACTERIAL SPOT, FALL 2009

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Xanthomonas euvesicatoria

On 8 Oct. 2009, plots were established at the University of Florida's Gulf Coast Research and Education Center in Balm, FL to assess the effect of several copper-based fungicides on the severity of bacterial spot on tomato. Raised beds, 300 ft in length, were prepared on 5 ft center-to-center spacing, covered with black virtually impermeable mulch and irrigated with a drip system. Plots consisted of 3 adjacent 21 ft bed sections transplanted with the pepper cultivar Aristotle in two staggered rows with 14" spacing along beds, skipping a 6 ft section between plots as a buffer. Fungicide treatments were applied on 14 Oct, 22 Oct, 30 Oct, 13 Nov, 24 Nov, and 8 Dec with a tractor sprayer calibrated to deliver 40 and 60 gal/A at 200 psi. A water-treated control was included to measure disease pressure (water was applied to keep the amount of bacterial dispersal by sprayer activity uniform across all plots). Treatments were arranged in a randomized complete block design with each treatment repeated 4 times. The outer beds of each plot were inoculated 20 Oct with a suspension (10^6 cfu/ml) of *Xanthomonas euvesicatoria* Races 4, 5, and 6 using a backpack sprayer. Plots were monitored, and rated on 5 Nov, 1 Dec, and 14 Dec using the Horsfall-Barratt scale to assess the percentage of canopy affected by bacterial leaf spot. Fruit were harvested on 18 Nov, 3 Dec, and 17 Dec, and also assessed for disease.

Environmental conditions during the beginning of the trial were unusually hot and dry. However, conditions from mid-November through December were unusually warm and wet, with over 4 inches of rain and heavy morning dews leading to epidemic levels of bacterial spot. Based on AUDPC values, Actigard applied at several weekly and biweekly rates gave the best level of control. However, the improved disease control did not increase marketable yields. Serenade Max applied alone was statistically equivalent to applications of copper and mancozeb based on AUDPC, but did not statistically enhance control when tank-mixed with copper and mancozeb. QRD 146 did not differ statistically from the water-treated control in the suppression of bacterial spot during the course of the trial. Numerically, mixed applications of Serenade Max with copper and mancozeb resulted in the highest marketable yields, with the lowest percentage of total fruit culled due to physical defects and disease.

Table 1. Effect of conventional and biopesticides on the mean severity of bacterial spot on pepper during fall 2009 field trial at GCREC, Wimauma, FL.

TRT	Treatment, rate/acre ^x	Disease Severity ^y				Diseased Fruit ^z		% Diseased Fruit	
		5 Nov	1 Dec	14 Dec	AUDPC	No. fruit	Weight (lbs)	(of total weight)	(of total No.)
1	Serenade Max, 1 lb (2 - 6); Cuprofix 40D, 3 lb (2 - 6); Penncozeb 75DF, 2 lb (2 - 6)	28.0 ab	50.0 bc	88.6 cd	1386 b	21	7.3	0.427	0.447
2	QRD 146, 0.5 lb (2 - 6); Cuprofix 40D, 3 lb (2 - 6); Penncozeb 75DF, 2 lb (2 - 6)	29.5 ab	56.3 b	88.6 cd	1485 b	20	6.9	0.391	0.452
3	Serenade Max, 1 lb (2 - 6)	23.3 b	81.5 a	95.5 ab	1431 b	33	11.2	0.550	0.604
4	QRD 146, 0.5 lb (2 - 6)	37.5 a	88.6 a	97.0 a	2008 a	30	9.7	0.577	0.605
5	Cuprofix 40D, 3 lb (2 - 6); Penncozeb 75DF, 2 lb (2 - 6)	23.3 b	43.8 bc	92.1 bc	1167 bc	22	7.6	0.390	0.456
6	Actigard 50WG, 0.22 oz (1 - 3), 0.34 oz (4 - 6)	5.6 c	32.8 c	81.5 e	437 d	26	7.7	0.509	0.563
7	Actigard 50WG, 0.17 oz (1 - 3), 0.25 oz (4 - 6)	7.9 c	45.3 bc	86.3 d	608 d	54	5.0	0.420	0.570
8	Actigard 50WG, 0.11 oz (1 - 3), 0.17 oz (4 - 6)	10.3 c	50.0 bc	91.0 c	729 dc	23	8.3	0.529	0.522
9	Actigard 50WG, 0.45 oz (1, 3), 0.67 oz (5)	6.8 c	45.3 bc	81.5 e	567 d	26	8.4	0.549	0.583
10	Actigard 50WG, 0.22 oz (1, 3), 0.34 oz (5)	7.9 c	43.8 bc	91.0 c	598 d	27	8.5	0.632	0.632
11	Actigard 50WG, 0.17 oz (1, 3), 0.25 oz (5)	10.3 c	61.0 b	91.0 c	806 dc	20	6.9	0.440	0.477
12	Water Treated Control	37.5 a	86.3 a	98.5 a	1991 a	31	10.5	0.645	0.659
<i>P > F</i>		<i><0.0001</i>	<i><0.0001</i>	<i><0.0001</i>	<i><0.0001</i>	<i>0.8041</i>	<i>0.3337</i>	<i>0.4697</i>	<i>0.5867</i>

^x Treatments (TRT) were applied 14 Oct, 22 Oct, 30 Oct, 13 Nov, 24 Nov, and 8 Dec with a tractor sprayer calibrated to deliver 40 and 60 gal/A at 200 psi. A water-treated control was included to measure disease pressure (water was applied to keep the amount of bacterial dispersal by sprayer activity uniform across all plots). Listed treatment rates are on a per acre basis unless noted otherwise. Plots transplanted 8-Oct and harvested 18 Nov, 3 Dec, and 17 Dec.

^y The severity of bacterial spot was assessed as the percentage of canopy affected. The Horsfall-Barratt scale was used for all ratings, but values were converted to mid-percentages prior to statistical analyses. Area under disease progress curve (AUDPC) was calculated for each treatment using the trapezoidal method. Values followed by the same letter are not significantly different based on Fisher's protected LSD test ($\alpha = 0.95$).

^z Culled diseased fruit with symptoms typical of bacterial spot were not included in marketable yields.

Table 2. Effect of conventional and biopesticides on the mean marketable pepper yields during fall 2009 field trial at GCREC, Wimauma, FL.

	Treatment, rate/A ^y	Marketable Fruit ^z		Total Fruit		% Culled Fruit		% Marketable Fruit	
		No. fruit	Weight (lb)	No. fruit	Weight (lb)	(of total weight)	(of total No.)	(of total weight)	(of total No.)
1	Serenade Max, 1 lb (2 - 6); Cuprofix 40D, 3 lb (2 - 6); Penncozeb 75DF, 2 lb (2 - 6)	16	6.7	48	17.5	20.8%	21.2%	36.5%	32.4%
2	QRD 146, 0.5 lb (2 - 6); Cuprofix 40D, 3 lb (2 - 6); Penncozeb 75DF, 2 lb (2 - 6)	13	6.8	49	21.7	32.5%	30.1%	28.4%	24.7%
3	Serenade Max, 1 lb (2 - 6)	12	5.8	55	21.2	19.7%	18.4%	25.3%	21.2%
4	QRD 146, 0.5 lb (2 - 6)	10	3.7	50	17.3	22.0%	19.3%	20.3%	20.3%
5	Cuprofix 40D, 3 lb (2 - 6); Penncozeb 75DF, 2 lb (2 - 6)	11	4.9	48	20.3	37.3%	38.2%	23.7%	23.2%
6	Actigard 50WG, 0.22 oz (1 - 3), 0.34 oz (4 - 6)	8	2.6	44	13.9	28.2%	25.0%	19.6%	18.7%
7	Actigard 50WG, 0.17 oz (1 - 3), 0.25 oz (4 - 6)	13	4.7	82	15.6	33.2%	23.8%	24.8%	19.3%
8	Actigard 50WG, 0.11 oz (1 - 3), 0.17 oz (4 - 6)	8	2.9	45	15.8	28.2%	28.6%	18.9%	19.2%
9	Actigard 50WG, 0.45 oz (1, 3), 0.67 oz (5)	7	2.4	44	15.2	29.4%	27.3%	15.6%	14.3%
10	Actigard 50WG, 0.22 oz (1, 3), 0.34 oz (5)	6	1.9	43	13.5	23.6%	22.8%	14.3%	14.0%
11	Actigard 50WG, 0.17 oz (1, 3), 0.25 oz (5)	14	5.6	46	17.1	26.6%	24.9%	29.4%	27.4%
12	Water Treated Control	10	3.7	48	17.0	15.0%	13.6%	20.5%	20.5%
	<i>P</i> > <i>F</i>	0.6173	0.3123	0.916	0.8092	0.2256	0.1708	0.1311	0.1727

^y Treatments (TRT) were applied 14 Oct, 22 Oct, 30 Oct, 13 Nov, 24 Nov, and 8 Dec with a tractor sprayer calibrated to deliver 40 and 60 gal/A at 200 psi. A water-treated control was included to measure disease pressure (water was applied to keep the amount of bacterial dispersal by sprayer activity uniform across all plots). Listed treatment rates are on a per acre basis unless noted otherwise. Plots transplanted 8-Oct and harvested 18 Nov, 3 Dec, and 17 Dec.

^z 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]