

PEPPER (*Capsicum annuum* 'Patriot')
Bacterial spot; (*Xanthomonas campestris* pv
vesicatoria)

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Evaluation of compounds for the suppression of bacterial spot in peppers, fall 2008. Pepper seedlings were transplanted on 26 Sep into Immokalee fine sand at the Southwest Florida Research and Education Center, Immokalee, FL. Treatments were arranged in a randomized complete block design with four replications. Each plot consisted of 20 plants at 9 in. spacing within a 15 ft plot with 6 ft between each plot and 6 ft between each row. Guidelines established by the University of Florida/IFAS were followed for land preparation, fertility, irrigation, weed management and insect control. Sprays were applied with a CO₂-pressurized backpack sprayer at 40 psi with a single hollow-cone nozzle at 24 gal/A. Plants were inoculated with a suspension of bacterial spot (*Xanthomonas campestris* pv. *vesicatoria* pepper race 4 and 6) at 1×10^8 CFU/ml on 17 Oct, 31 Oct and 13 Nov with hand pump sprayer to apply an equal amount of inoculum per plant (approximately 20 ml/plant). Disease severity ratings were estimated as the percentage of foliage exhibiting symptoms of bacterial spot at 1 to 2 week intervals. Plants were harvested on four dates and the number of fruit and weight for marketable (sufficient size and quality) and non-marketable (blemished, misshapen) were recorded. The yield and disease ratings were subject to one-way ANOVA or GLM for AUDPC and significant differences between means were separated using LSD. Separation with letters is included if P value was 0.10 or less. Average monthly high and low temperatures (°F) were 89 and 74 in Sep, 84 and 66 in Oct. 78 and 52 in Nov, and 77 and 54 in Dec. Rainfall totals for Sep, Oct, Nov and Dec were 5.4, 2.9, 0.4 and 1.2 in., respectively.

Bacterial spot disease severity ratings for all dates in October were extremely low (less than 1%) and data is not shown. Despite multiple applications of inoculum, disease severity of bacterial spot remained relatively unchanged throughout the trial for most treatments. Severity ratings for most treatments decreased for the 26 Nov rating compared to the ratings taken on 21 Nov and this was most likely due to increased plant growth and dilution of the leaf area affected and not because of defoliation as commonly seen on pepper plants with heavy infections of bacterial spot. Significant differences were detected in disease severity among treatments on several dates however these differences were not reflected as highly significant for the AUDPC. Several treatments showed interesting results; treatment 7 with Serenade and Cuprofix Ultra showed a decline in bacterial spot severity throughout season and the Actigard treatments had plants with low ratings of the disease although no applications of any material were made past mid-October. Yield also did not have any significant differences when summed although some significant difference were detected in various categories on individual harvest dates.

Treatment/Rate (Date of application) ^z	Disease Severity				AUDPC ^y
	10 Nov	21 Nov	26 Nov	12 Dec	
1 Untreated control.....	7.6 abc ^x	13.1	10 ab	17.5 a	391.9 a
2 Cuprofix Ultra 40 Disperss 3 lb/A (1,2,3,4,5,6,7,8,9,10)..... Maneb 75DF 3 lb/A (1,2,3,4,5,6,7,8,9,10).....	7.4 abcd	10.6	6.7 bcd	9.8 b	273.8 abcd
3 Actigard 1/3 oz/A (1,2,3).....	4.0 cd	7.6	4.6 d	7.8 b	193.6 bcd
4 Actigard 1/3 oz/A (1,2,3)..... Induce 0.25 % (1,2,3)	3.8 cd	7.6	5.3 cd	9 b	208.8 bcd
5 Actigard 1/6 oz/A (1,2,3).....	2.5 c	6.4	4.9 cd	6 b	164.6 d
6 Actigard 1/6 oz/A (1,2,3)..... Induce 0.25 % (1,2,3)	3.9 cd	6.4	4.6 d	6.3 b	170.2 cd
7 Serenade Max 1 lb/A (1,2,3,4,5,6,7,8,9,10)..... Cuprofix Ultra 40 Disperss 1.5 lb/A (1,3,5,7,9)	11.0 a	10.6	6.7 bcd	6.3 b	265.7 abcd
8 Serenade Max 1.5 lb/A (1,3,5,7,9)..... Cuprofix Ultra 40 Disperss 1.5 lb/A (1,3,5,7,9) Cuprofix Ultra 40 Disperss 3 lb/A (2,4,6,8,10) Maneb 75DF 3 lb/A (2,4,6,8,10)	7.1 abcd	7.3	6.7 bcd	8.8 b	237.4 bcd
9 Experimental	5.3 bcd	7.9	5.8 cd	8.3 b	218.9 bcd
10 Manex 1.6 qt/A (1,2,3,4,5,6,7,8,9,10)..... Kocide 3000 46 DF 1 lb/A (1,2,3,4,5,6,7,8,9,10)	7.4 abcd	8.8	5.7 cd	5.8 b	216.3 bcd
11 Manzate ProStik 75 DG 2.2 lb/A (1,2,3,4,5,6,7,8,9,10)..... Kocide 3000 46 DF 1 lb/A (1,2,3,4,5,6,7,8,9,10)	5.6 bcd	9.3	5.8 cd	8.3 b	232 bcd
12 Untreated control.....	9.1 ab	9.8	11.0 a	7.5 b	303.7 ab
13 Kasumin 2L 100 ppm (1,2,3,4,5,6,7,8,9,10).....	6.6 abcd	11.4	7.6 abcd	10.3 b	289.5 abcd
14 Kasumin 2L 100 ppm (1,2,3,4,5,6,7,8,9,10)..... TransFix 6 fl oz/100 gal (1,2,3,4,5,6,7,8,9,10)	4.1 cd	11.0	6.8 bcd	10.5 b	266.2 abcd
15 Kasumin 2L 100 ppm (1,2,3,4,5,6,7,8,9,10)..... Cuprofix Ultra 40 Disperss 0.5 lb/A (1,2,3,4,5,6,7,8,9,10)	4.3 bcd	6.8	4.3 d	5.5 b	166 d
16 Kasumin 2L 100 ppm (1,3,5,7,9)..... Cuprofix Ultra 40 Disperss 0.5 lb/A (1,,3,5,7,9) Cuprofix Ultra 40 Disperss 3 lb/A (2,4,6,8,10) Maneb 75DF 3 lb/A (2,4,6,8,10)	6.5 abcd	10.4	7.3 bcd	8 b	259.5 bcd
17 Tanos 50DF 8 oz/A (1,2,3,4,5,6,7,8,9,10)..... Maneb 75DF 1.5 lb/A (1,2,3,4,5,6,7,8,9,10) Kocide 3000 46DF 1 lb/A (1,2,3,4,5,6,7,8,9,10)	6.9 abcd	7.8	6.2 cd	9 b	236.8 bcd
18 Oxidate 1/300 (1,2,3,4,5,6,7,8,9,10)..... Kocide 3000 46DF 1.25 lb/A (1,2,3,4,5,6,7,8,9,10) Maneb 75DF 2 lb/A (1,2,3,4,5,6,7,8,9,10)	4.6 bcd	5.1	4.4 d	9.3 b	186.4 bcd
19 Actinovate 6 oz/A (1,2,3,4,5,6,7,8,9,10).....	8.0 abc	12.5	6.4 cd	10.5 b	294.9 abc
20 Cuprofix Ultra 40 Disperss 3 lb/A (1,3,5,7,9)..... Maneb 75 DF 3 lb/A (1,3,5,7,9) Actinovate 6 oz/A (1,2,3,4,5,6,7,8,9,10)	11.4 a	10.0	8.1 abc	9.5 b	303.2 ab

P = 0.03 0.17 0.013 0.05 0.08

^z 1=6 Oct; 2=13 Oct; 3=20 Oct; 4=27 Oct; 5=3 Nov; 6=10 Nov; 7=17 Nov; 8=24 Nov; 9=1 Dec; 10=8 Dec

^y Area under the disease progress calculated from the four disease severity ratings

^x Means followed by the same letter or by no letter are not significantly different at the P value indicated in table.

Trt No.	14 Nov ^z				25 Nov			
	Number of marketable fruit ^y	Weight marketable fruit (lb)	Number of non-marketable Fruit	Weight non-marketable fruit (lb)	Number of marketable fruit	Weight marketable fruit (lb)	Number of non-marketable Fruit	Weight non-marketable fruit (lb)
1	2.3 bcd ^x	0.8 cd	0	0	29.5 abcd	9.6 abcd	2.3	0.6 abc
2	6.5 a	2.4 a	0.3	0.1	26.8 bcde	8.2 bcdef	1.3	0.3 bc
3	1.8 cd	0.6 d	0	0	35.3 a	11.2 a	1.5	0.5 abc
4	1.3 d	0.5 d	0.3	0.1	29.0 abcd	9.2 abcd	1.0	0.2 c
5	2.3 bcd	1.0 bcd	0	0	33.3 ab	10.5 ab	1.0	0.2 c
6	2.8 bcd	1.2 abcd	0	0	29.8 abcd	9.3 abcd	1.5	0.3 bc
7	5.3 ab	2.0 abc	0	0.1	27.3 bcde	8.6 bcde	2.0	0.7 abc
8	1.8 cd	0.7 cd	0	0	24.8 de	7.5 def	2.8	0.9 ab
9	2.0 cd	0.8 cd	0	0	32.5 ab	10.2 abc	1.3	0.4 abc
10	1.3 d	0.4 d	0	0	20.8 e	6 f	2.3	0.6 abc
11	3 bcd	1.2 abcd	0.5	0.2	25.0 cde	8.1 cdef	1.5	0.4 abc
12	3 bcd	1.1 bcd	0	0	30.5 abcd	9.9 abc	1.5	0.4 abc
13	1.3 d	0.4 d	0	0	31.8 abc	9.9 abc	2.0	0.7 abc
14	5.3 ab	2.2 ab	0	0	30.0 abcd	10 abc	1.0	0.4 abc
15	3.5 abcd	1.3 abcd	0	0	29.8 abcd	9.8 abcd	3.0	1.0 a
16	4.5 abc	1.7 abcd	0	0	24.8 de	8.1 cdef	2.5	0.7 abc
17	2.0 cd	0.7 cd	0.3	0.1	26.8 bcde	8 cdef	1.3	0.5 abc
18	3.0 bcd	1.2 abcd	0	0	22 e	6.6 ef	2.0	0.5 abc
19	3.3 bcd	1.2 abcd	0.3	1.0	30.5 abcd	9.6 abcd	1.5	0.5 abc
20	3.8 abcd	1.6 abcd	0	0	27.3 bcde	8.1 cdef	2.8	1.0 a
P =	0.07	0.10	0.40	0.42	0.008	0.007	0.367	0.267

^z Date of harvest.

^y Fruit were rated as marketable (sufficient size and quality) or non-marketable (blemished, misshapen)

^x Means followed by the same letter or by no letter are not significantly different at the P value indicated in table.

Trt No.	4 Dec ^z				22 Dec			
	Number of marketable fruit ^y	Weight marketable fruit (lb)	Number of non-marketable Fruit	Weight non-marketable fruit (lb)	Number of marketable fruit	Weight marketable fruit (lb)	Number of non-marketable Fruit	Weight non-marketable fruit (lb)
1	53.3 ^x	13.6 ab	3.3	0.8	44.8 bc	12.0	3.5	1.0
2	41.0	9.6 c	1.0	0.1	46.3 bc	13.5	2.5	0.5
3	45.0	11.6 bc	1.0	0.2	48.0 bc	14.4	4.3	1.1
4	58.5	13.5 ab	2.0	0.5	51.3 bc	14.0	2.5	0.8
5	61.5	15.1 a	1.5	0.4	46.5 bc	13.1	4.5	1.1
6	51.3	13.1 ab	0.8	0.3	54.0 bc	14.6	1.0	0.4
7	45.0	11.7 bc	2.0	0.5	42.5 c	12.8	4.3	1.0
8	52.8	12.6 abc	1.5	0.3	51.8 bc	14.7	2.5	0.5
9	58.0	13.7 ab	0.8	0.1	41.8 c	12.5	1.3	0.4
10	57.5	13.4 ab	2.3	0.5	55.0 bc	17.1	2.0	0.7
11	54.3	13.3 ab	2.8	0.6	60.0 ab	14.8	4.0	0.9
12	50.3	13.2 ab	1.3	0.3	50.5 bc	14.3	2.8	0.8
13	50.8	12.6 abc	1.5	0.3	46.5 bc	12.7	1.8	0.5
14	58.0	15.2 a	1.0	0.2	51.8 bc	14.9	0.8	0.2
15	53.0	14.1 ab	1.3	0.3	46.8 bc	13.4	1.0	0.5
16	51.5	13.2 ab	0.8	0.2	40.5 c	11.1	2.5	0.6
17	45.3	12.0 abc	1.8	0.4	52.8 bc	15.5	2.5	0.7
18	53.8	13.8 ab	0.5	0.1	71.0 a	19.1	3.5	0.8
19	50.8	12.7 abc	1.5	0.3	47.0 bc	13.7	3.3	0.8
20	39.0	9.6 c	2.0	0.4	53.5 bc	15.6	1.5	0.5
P =	0.25	0.086	0.80	0.73	0.099	0.16	0.26	0.64

^z Date of harvest.

^y Fruit were rated as marketable (sufficient size and quality) or non-marketable (blemished, misshapen)

^x Means followed by the same letter or by no letter are not significantly different at the P value indicated in table.

Total harvest ^x				
Trt No.	Number of marketable fruit ^y	Weight marketable fruit (lb)	Number of non-marketable Fruit	Weight non-marketable fruit (lb)
1	129.8 ^x	35.8	9.0	2.4
2	120.5	33.7	5.0	1.0
3	130	37.8	6.8	1.8
4	140	37.2	5.8	1.6
5	143.5	39.7	7	1.6
6	137.8	38.1	3.3	1.0
7	120	35.0	8.5	2.3
8	131	35.5	6.8	1.7
9	134.3	37.2	3.3	0.9
10	134.5	36.9	6.5	1.8
11	142.3	37.4	8.8	2.1
12	134.3	38.4	5.5	1.5
13	130.3	35.6	5.3	1.5
14	145	42.3	2.8	0.8
15	133	38.6	5.3	1.7
16	121.3	34	5.8	1.4
17	126.8	36.2	5.8	1.7
18	149.8	40.6	6	1.4
19	131.5	37.1	6.5	1.6
20	123.5	34.9	6.3	1.8
P =	0.46	0.38	0.39	0.51

^z Mean of all harvests (14 and 25 Nov and 4 and 22 Dec) summed.

^y Fruit were rated as marketable (sufficient size and quality) or non-marketable (blemished, misshapen)

^x Means followed by the same letter or by no letter are not significantly different at the P value indicated in table.