

TOMATO (*Lycopersicon esculentum* 'Peto 696')
Bacterial spot; *Xanthomonas campestris* pv. *vesicatoria*
Bacterial speck; *Pseudomonas syringae* pv. *tomato*
Early blight; *Alternaria solani*
Anthracnose; *Colletotrichum coccodes*

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Evaluation of fungicides and bactericides for the control of foliar and fruit diseases of processing tomatoes, 2004.

The experiment was conducted at the North Central Agricultural Research Station in Fremont, OH on Colwood fine sandy loam. Potassium (210 lb/A K₂O), phosphorous (69 lb/A P₂O₅) and nitrogen (96 lb urea/A) were incorporated into the test field on 22 Apr. Cover crop (wheat) was chiseled plowed on 7 Oct 03 and plowed under on 12 Apr. The test field and beds were prepared on 5 ft centers on 6 May. Dual II MAGNUM (1.25 pt/A), Sencor 75 DF (0.33 lb/A), and Roundup WEATHERMAX (1qt/A) were applied on 27 May. 'Peto 696' tomato seeds were hot water-treated (OSU Extension Bulletin 672, The Ohio State University, Columbus, OH) and sown on 13 Apr into 288-cell plug trays containing Metromix 360 seedling mix. Tomato seedlings were transplanted on 4 Jun; transplant water contained starter fertilizer (N-P-K 10-34-0) at 0.7 qt/50 gal water. Each plot was a double row of approximately 34 plants spaced 18 in. apart with 18 in. between rows. Treatments were arranged in a randomized complete block design with four replications. Treatment plots were alternated with untreated border plots. Asana XL (7 fl oz/A), tank mixed with Manex (2 qt/A) and alone was applied by aircraft on 18 Jun and 25 Jun, respectively. The field was cultivated on 24 Jun, Sencor DF (0.33 lb/A) was applied on 28 Jun and on 19 Jul the field was hand weeded. Plants were inoculated with approximately 10⁷ CFU/ml *Xanthomonas campestris* pv. *vesicatoria* strain 767, race T1P3 on 29 Jun in the evening using a tractor-mounted CO₂ sprayer (55 psi, 39.3 gal/A). Plants were misted with water using an FMC sprayer with a PTO-driven pump (200 psi, 32.6 gal/A) prior to inoculation. Amistar 80WG (2 oz/A) was applied in alternation with Bravo Weather Stik (1.67 pt/A) as a cover spray to plots treated with Cuprofix 40DF and Actigard 50WG on a 7-10 day schedule, beginning 28 Jun and ending 25 Aug. Treatments were applied on a 7-10 day schedule beginning 24 Jun and ending 25 Aug using a tractor-mounted CO₂-pressurized sprayer (55 psi, 42.9 gal/A) for a total of 10 applications. The surfactant Biotune (QRD602, 0.125 %) was added to Serenade Max WPB treatments. Severity of bacterial leaf spot and early blight on foliage was evaluated on 16 Jul, 25 Aug and 2 Sep using a modified Horsfall-Barratt rating scale. Disease ratings were converted to midpoints (% disease) prior to statistical analysis. Fruit were harvested from all plants in each plot on 20-22 Sep and total weights were recorded. Weights of healthy red and green fruit, fruit with anthracnose, and fruit with bacterial spot and/or speck were recorded from a 50 lb sub-sample from each plot. Data for fruit with anthracnose were analyzed using log transformed values; data for bacterial diseases were analyzed by adding one to each data point before log transformation; the remaining data were analyzed without transformation, by ANOVA using SAS statistical software. Means were separated using Fisher's protected least significant difference test. Average maximum temperatures for 4-30 Jun, Jul, Aug and 1-22 Sep were 78.0, 81.1, 78.5 and 78.9 °F; minimum averages were 54.9, 58.7, 54.0, and 51.5 °F; and total rainfall was 5.0, 2.7, 4.0, and 0.5 in., respectively.

Disease pressure was moderate to high for foliar bacterial spot, moderate for early blight and anthracnose, and low for bacterial spot on fruit. All treatments resulted in significantly less foliar bacterial spot than the untreated control, but Cuprofix 40DF in combination with cover spray, Actigard 50WG in combination with cover spray, and Tanos 50DF (high rate) plus Kocide 2000 plus Manzate 75DF alternated with Manzate 75DF plus Kocide 2000 were the most effective. Foliar early blight was significantly reduced compared to the untreated control by all treatments except Serenade Max WPB plus Kocide 2000 and the 1.9 pt/A rate of Airone SC plus Manzate 75DF. The amount of fruit (ton/A) with anthracnose was significantly reduced by all treatments except those containing Serenade Max WPB. There were no significant differences among treatments and the control in marketable yield, healthy green fruit (range 3.8-6.3 ton/A; not shown) or mature fruit with bacterial disease (range 0.2-1.8 ton/A; not shown). However, all treatments except Serenade Max WPB plus Kocide 2000 alternated with Kocide 2000 plus Manzate 75DF significantly increased the percentage of marketable fruit compared to the control.

Treatment and rate/A (application time ^z)	Foliar bacterial spot		Foliar early blight	
	% disease ^y	AUDPC ^y	% disease	AUDPC
Control.....	67.6 a ^x	1780.3 a	54.3 a	535.1 a
Kocide 2000 2 lb + ^w Manzate 75DF 2 lb (1-10).....	21.4 cd	439.9 c-f	16.6 cde	384.6 a
Cuprofix 40DF 2 lb (1-10) + cover spray ^v	7.3 f	407.8 cde	19.0 cde	314.8 a
Cuprofix 40DF 2 lb (1-10).....	28.5 bc	701.4 bc	16.6 cde	249.4 a
Serenade Max WPB (QRD 141) 1 lb + Kocide 2000 2 lb (1-8).....	28.5 bc	716.0 bc	38.0 ab	433.9 a
Serenade Max WPB (QRD 141) 1 lb + Kocide 2000 2 lb (1,3,5,7) <i>alt.</i> ^u Kocide 2000 2 lb + Manzate 75DF 2 lb (2,4,6,8).....	19.0 cd	804.3 b	23.8 bcd	282.8 a
Actigard 50WG ¹ (1-6) + cover spray.....	7.3 f	626.3 c-f	15.5 cde	409.4 a
Airone SC 2.5 pt + Manzate 75DF 2 lb (1-10).....	19.0 cd	801.6 bcd	21.4 b-e	423.2 a
Airone SC 1.9 pt + Manzate 75DF 2 lb (1-10).....	28.5 bc	471.3 cde	28.5 abc	393.8 a
Airone SC 1.3 pt + Manzate 75DF 2 lb (1-10).....	14.3 de	336.4 def	16.6 cde	275.9 a
Tanos (KP481) 50WG 8 oz + Kocide 2000 2 lb + Manzate 75DF 2 lb (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	17.9 de	249.6 ef	13.1 de	455.8 a
Tanos (KP481) 50DF 10 oz + Kocide 2000 2 lb + Manzate 75DF 2 lb (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	14.3 de	309.6 ef	14.3 cde	421.1 a
Tanos (KP481) 50DF 10 oz + ManKocide 2 lb (1,3,5,7,9) <i>alt.</i> ManKocide 61WDG 3 lb (2,4,6,8,10).....	44.3 b	769.3 bc	14.3 cde	256.6 a
Tanos (KP481) 50DF 12 oz + Kocide 2000 2 lb + Manzate 75DF 2 lb (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	10.8 ef	252.5 f	10.8 e	324.9 a
Quadris 2.08SC 6.2 fl oz (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	14.3 de	503.9 c-f	21.4 b-e	275.4 a
ManKocide 61WDG 3 lb (1-10).....	14.3 de	659.0 bcd	16.6 cde	266.1 a

^zApplication times were: 1= 24-30 Jun; 2= 1-7 Jul; 3= 8-14 Jul; 4= 15-21 Jul; 5= 22-28 Jul; 6= 29 Jul-4 Aug; 7= 5-11 Aug; 8= 12-16 Aug; 9= 17-24 Aug; and 10= 25-31 Aug.

^yDisease rating (2 Sep) and area under the disease progress curve (AUDPC) based on the midpoint values of a modified Horsfall-Barratt rating scale where 1=0%, 2= 1-3%, 3= 4-6%, 4=7-12%, 5= 13-25%, 6=26-50%, 7=51-75%, 8= 76-87%, 9=88-94%, 10= 95-97%, 11=98-99% and 12= 100% foliar bacterial leaf spot or early blight.

^xValues are the means of four replicate plots; means followed by the same letter within a column are not significantly different at p<0.05.

^wTreatments tank mixed.

^vAmistar 80WG (2 oz/A) alternated with Bravo Weather Stik (1.67 pt/A) on a 7-10 day schedule.

^uTreatment alternated with each other.

¹Three rates of Actigard were applied: first application, 0.33 oz/A; second and third application 0.5 oz/A; remaining applications 0.75 oz/A.

Treatment and rate/A (application time ^z)	Anthraco-nose (ton/A)	Marketable yield (ton/A)	% marketable fruit
Control.....	12.1 a ^y	24.3 a	49.3 e
Kocide 2000 2 lb + ^x Manzate 75DF 2 lb (1-10).....	5.6 bcd	28.8 a	64.7 a-d
Cuprofix 40DF 2 lb (1-10) + cover spray ^w	0.8 fg	31.4 a	74.0 ab
Cuprofix 40DF 2 lb (1-10).....	3.3 b-e	29.1 a	65.7 a-d
Serenade Max WPB (QRD 141) 1 lb + Kocide 2000 2 lb (1-8).....	4.6 abc	27.0 a	61.8 cd
Serenade Max WPB (QRD 141) 1 lb + Kocide 2000 2 lb (1,3,5,7) <i>alt.</i> ^v Kocide 2000 2 lb + Manzate 75DF 2 lb (2,4,6,8).....	5.4 ab	27.2 a	57.5 de
Actigard 50WG ¹ (1-6) + cover spray.....	0.6 g	29.0 a	65.1 a-d
Airone SC 2.5 pt + Manzate 75DF 2 lb (1-10).....	1.7 efg	32.2 a	71.6 abc
Airone SC 1.9 pt + Manzate 75DF 2 lb (1-10).....	2.7 b-e	27.3 a	61.3 cd
Airone SC 1.3 pt + Manzate 75DF 2 lb (1-10).....	2.9 b-e	27.6 a	64.5 a-d
Tanos (KP481) 50WG 8 oz + Kocide 2000 2 lb + Manzate 75DF 2 lb (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	1.9 c-f	31.7 a	70.0 abc
Tanos (KP481) 50DF 10 oz + Kocide 2000 2 lb + Manzate 75DF 2 lb (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	2.0 c-f	31.2 a	71.8 abc
Tanos (KP481) 50DF 10 oz + ManKocide 2 lb (1,3,5,7,9) <i>alt.</i> ManKocide 61WDG 3 lb (2,4,6,8,10).....	3.0 b-e	31.4 a	67.0 a-d
Tanos (KP481) 50DF 12 oz + Kocide 2000 2 lb + Manzate 75DF 2 lb (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	1.4 fg	31.5 a	75.2 a
Quadris 2.08SC 6.2 fl oz (1,3,5,7,9) <i>alt.</i> Manzate 75DF 2 lb + Kocide 2000 2 lb (2,4,6,8,10).....	1.5 d-g	29.0 a	64.1 bcd
ManKocide 61WDG 3 lb (1-10).....	1.6 c-f	26.4 a	63.0 cd

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