

SQUASH (*Cucurbita maxima* 'Taybelle PM')
Downy mildew; *Pseudoperonospora cubensis*
Phytophthora blight; *Phytophthora capsici*

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Evaluation of fungicides for the control of downy mildew and Phytophthora blight of winter squash, 2007.

The experiment was conducted at the Ohio Agricultural Research and Development Center's Muck Crops Agricultural Research Station in Celeryville, OH on Linwood muck soil, pH 5.2. Fertilizer (18-17-17, 500 lb/A) was incorporated into the test field on 2 May. Plots were disked, leveled and raised beds on 6 ft centers were prepared on 11 Jun. 'Taybelle PM' (resistant to powdery mildew) squash seeds were sown on 25 May into 72-cell plug trays containing Scott's 360 Metro seedling mix. Squash seedlings were transplanted on 12 Jun. Plots were arranged in a randomized complete block design with four replications. Each plot consisted of one row with 15 plants spaced 2 ft apart on 6 ft centers. Treatment rows were alternated with untreated guard rows. Treatments were applied using a tractor mounted 3.0 hitch (hydraulic attach) motor driven sprayer (95 psi, 56.3 gal/A, 2 mph) on a 7 day schedule beginning 2 Jul and ending 28 Aug for a total of eight applications. Ranman 400SC (2.75 fl oz/A) and Omega 500F (1.5 pt/A) treatments were drenched at transplanting by applying 50 ml of fungicide solution within a 6 in.-diam circle around the base of each plant using a backpack CO₂-pressurized sprayer. The insecticide Sevin XLR Plus (1 qt/A) was applied on 25 Jun, 3, 12, 18, and 31 Jul. To control powdery mildew, Procure 480SC (8 fl oz/A) was applied to the entire test field on 7, 17, and 30 Aug. Plants were overhead irrigated with 0.5 in. water on 12, 14, and 22 Jun. The severity of downy mildew was evaluated on 16, 23, and 30 Aug using a scale of 0-100 percent foliage affected. Fruit were harvested from seven plants from the center of each treatment row on 6 Sep, and the number and weight of marketable fruit and fruit with Phytophthora blight were determined. Average maximum temperatures for 12-30 Jun, Jul, Aug, 1-6 Sep were 82.8, 80.9, 82.4 and 85.3°F; average minimum temperatures were 58.2, 57.6, 62.9 and 55.0°F; and rainfall amounts were 0.55, 4.50, 6.33 and 0.00 in., respectively. Data were analyzed by ANOVA using SAS statistical software.

Downy mildew appeared late (mid-Aug) and pressure was moderate in this trial. Season-long disease severity was most suppressed by treatment with Gavel 75W + Dithane 75W (+ Previcur Flex 6SL in the first two applications). Since the disease appeared late in the season, the Previcur Flex applications probably had little effect on disease development. Treatment with the high rate of Presidio 4.00SC (4 fl oz) + Bravo Weather Stik alternated with Ridomil Gold Bravo also significantly reduced downy mildew severity compared to the untreated control, but significantly less than the best treatment. None of the other treatments significantly suppressed downy mildew compared to the untreated control. Phytophthora blight appeared naturally in the plots after 3 days of rainfall (3.1 in.) between 19 and 21 Aug. The number of Phytophthora blighted fruit/plot was significantly lower than the untreated control in plots treated with the high rate of Presidio 4.00SC (4 fl oz) + Bravo Weather Stick alternated with Ridomil Gold Bravo, Revus 2.09SC + Dithane F-45 Rainshield 4SC + NIS alternated with Dithane F-45 Rainshield 4SC, Ridomil Gold Bravo 3.67SC then Revus 2.09SC + NIS alternated with Quadris Opti 5.5SC, Tanos 50DF + Manzate Pro-Stick alternated with Curzate 60DF (both rates) + Bravo Weather Stik, or Omega drench then Omega foliar alternated with Ranman + Silwet L-77 + Kocide 2000. When Phytophthora blighted fruit were measured by weight (ton/A), Revus Opti 3.67SC, + NIS alternated with Previcur Flex 6SL + Dithane F-45 Rainshield 4SC, and Ranman 400SC drench then Ranman 400SC + Silwet L-77 + Kocide 2000 also significantly suppressed disease compared to the untreated control. Marketable yield was higher in plots treated with the high rate of Presidio 4.00SC (4 fl oz) + Bravo Weather Stick alternated with Ridomil Gold Bravo, Tanos 50DF + Manzate Pro-Stick alternated with Previcur Flex 6SL + Bravo Weather Stick, Revus 2.09SC + Dithane F-45 Rainshield 4SC+ NIS alternated with Quadris Opti 5.5SC, Revus Opti 3.67SC + NIS alternated with Previcur Flex 6SL + Dithane F-45 Rainshield 4SC, Ridomil Gold Bravo 3.67SC then Revus 2.09SC + NIS alternated with Quadris Opti 5.5SC, Omega drench then Omega foliar alternated with Ranman + Silwet L-77 + Kocide 2000, or Gavel 75W + Dithane 75W (+ Previcur Flex 6SL in the first two applications) than the untreated control.

Treatment and rate/A (application timing ^z)	% downy mildew ^y (30 Aug)	AUDPC ^{yx}	Phytophthora blighted fruit		Marketable yield (ton/A)
			no./plot	ton/A	
Presidio 4.00SC 2 fl oz + Bravo Weather Stik 2.5 pt (1,3,5,7) alt Ridomil Gold Bravo 3.67SC 2.5 pt (2,4,6,8).....	23.1 ab ^w	72.2 ab	2.0 a-d	0.7 abc	11.5 abc
Presidio 4.00SC 3 fl oz + Bravo Weather Stik 2.5 pt (1,3,5,7) alt Ridomil Gold Bravo 3.67SC 2.5 pt (2,4,6,8).....	25.6 a	72.2 ab	3.5 a-d	1.0 abc	11.1 a-e
Presidio 4.00SC 4 fl oz + Bravo Weather Stik 2.5 pt (1,3,5,7) alt Ridomil Gold Bravo 3.67SC 2.5 pt (2,4,6,8).....	16.3 d	39.4 d	0.8 cd	0.2 c	14.1 a
Tanos 50DF 8 oz + Manzate Pro-Stick 3 lb (1,3,5,7) alt Previcur Flex 6SL 0.6 pt + Bravo Weather Stik 1.5 pt (2,4,6,8).....	25.0 a	76.6 a	1.0 bcd	0.4 abc	12.5 ab
Revus 2.09SC 8 fl oz + Dithane F-45 Rainshield 4SC 4 pt + NIS 0.125% v/v (1,3,5,7) alt Quadris Opti 5.5SC 3.2 pt (2,4,6,8).....	25.0 a	76.6 a	1.5 a-d	0.5 abc	14.0 a
Revus 2.09SC 8 fl oz + Dithane F-45 Rainshield 4SC 4 pt + NIS 0.125% v/v ((1,3,5,7) alt Previcur Flex 6SL 0.6 pt + Dithane F-45 Rainshield 4 SC 4 pt (2,4,6,8).....	22.5 abc	59.1 a-d	0.3 d	0.0 c	11.4 a-d
Revus Opti 3.67SC 3 pt + NIS 0.125% v/v (1,3,5,7) alt Previcur Flex 6SL 0.6 pt + Dithane F-45 Rainshield 4SC 4 pt (2,4,6,8).....	16.9 cd	48.1 cd	1.0 bcd	0.3 bc	12.6 ab
Ridomil Gold Bravo 3.67 SC 2.5 pt (1) then Revus 2.09SC 8 fl oz + NIS 0.125% v/v (2,4,6,8) alt Quadris Opti 5.5 SC 3.2 pt (3,5,7).....	23.1 ab	65.6 abc	0.8 cd	0.3 bc	14.0 a
Tanos 50DF 8 oz + Manzate Pro-Stick 3 lb (1,3,5,7) alt Curzate 60DF 3.2 oz + Bravo Weather Stik 1.5 pt (2,4,6,8).....	20.0 a-d	61.3 abc	0.8 cd	0.2 c	11.4 a-d
Tanos 50DF 8 oz + Manzate Pro-Stick 3 lb (1,3,5,7) alt Curzate 60DF 5 oz + Bravo Weather Stik 1.5 pt (2,4,6,8).....	22.5 abc	65.6 abc	0.3 d	0.1 c	12.3 abc
Ranman 400SC 2.75 fl oz drench + 2.75 fl oz foliar + Silwet L-77 2 fl oz + Kocide 2000 0.81 lb (1-8).....	20.0 a-d	61.7 abc	1.5 a-d	0.3 bc	11.4 a-d
Omega 1.5 pt drench + 1 pt foliar (1-3) then Ranman 2.75 fl oz + Silwet L-77 2 fl oz + Kocide 2000 0.81 lb (4-8).....	23.1 ab	67.8 abc	0.8 cd	0.2 c	12.7 ab
Gavel 75W 2 lb + Dithane 75W 1.225 lb (1-8) + Previcur Flex 6SL 1.2 pt (1,2).....	5.6 e	13.7 e	1.3 bcd	0.4 abc	12.7 ab
QRD 800 2.5 lb (1-8).....	18.8 bcd	53.8 bcd	4.8 ab	1.4 ab	7.1 e
QRD 800 1.25 lb (1-8).....	21.3 a-d	63.4 abc	4.5 abc	1.1 abc	7.3 de
QRD 800 0.63 lb (1-8).....	21.3 a-d	63.4 abc	5.3 a	1.5 a	9.3 b-e
Untreated control.....	21.3 a-d	64.8 abc	4.8 ab	1.5 a	8.3 cde
<i>P</i> value	0.0001	0.0001	0.0177	0.0001	0.0134

^zApplication dates were: 1= 2 Jul; 2= 9 Jul; 3= 16 Jul; 4= 23 Jul; 5= 30 Jul; 6= 6 Aug; 7= 14 Aug; 8=28 Aug.

^yDisease ratings and area under the disease progress curve (AUDPC) were based on percent foliar disease.

^xAUDPC values were calculated according to the formula: $\sum[(x_i+x_{i-1})/2](t_i-t_{i-1})$ where x_i is the rating at each evaluation time and (t_i-t_{i-1}) is the time between evaluations.

^wValues are the means of four replicate plots; treatments followed by the same letter within a column are not significantly different at $P \leq 0.05$. Means were separated using Fisher's protected least significant difference test.