SQUASH (*Cucurbita maxima* 'Taybelle')
Powdery mildew; *Podosphaera xanthii*
Downy mildew; *Pseudoperonospora cubensis*

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Evaluation of fungicides for the control of powdery and downy mildews of winter squash, 2006.

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 5.1. Fertilizer (18-17-17, 500 lbs/A) was incorporated into the test field on 1 May. Plots were disked, leveled and rolled on 1 Jun. 'Taybelle' squash seeds were sown on 12 May into 72-cell plug trays containing Scott's Metro seedling mix. Squash seedlings were transplanted on 1 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. Treatments were applied using a tractor mounted 3.0 hitch (hydraulic attach) motor driven sprayer (95 psi, 52.2 gal/A, 2 mph) on a 7-10 day schedule beginning 6 Jul and ending 18 Aug for a total of seven applications. The insecticides Sevin XLR Plus (1 qt/A), Admire Pro (15 fl oz/A), and Ambush 25W (12.8 oz/A) were applied on 6, 14, 20, and 28 Jun and 25 Jul; 14 Jun; and 7 Jul, respectively. Plants were overhead irrigated with 0.8 in. water on 7 Jun. The severity of downy and powdery mildew was evaluated on 27 Jul, 4, 10 and 18 Aug using a modified Horsfall-Barratt rating scale. Fruit were harvested from the entire row of each treatment on 24 Aug and the number and weight of marketable fruit, healthy cull fruit, and rotted fruit were determined. Average maximum temperatures for 1-30 Jun, Jul, and 1-18 Aug were 78.0, 83.3, and 85.3ºF; average minimum temperatures were 54.9, 63.1, and 59.7ºF; and rainfall amounts were 4.14, 4.31, and 0.17 in., respectively. Data were analyzed by ANOVA using SAS statistical software. Means were separated using Fisher's protected least significant difference test.

Powdery mildew disease pressure was high, with an average of 79.2% of winter squash foliage affected by the end of the season. Downy mildew appeared in the plots earlier in the season than in previous years, and pressure by the end of the evaluation period was also high. The Rubigan + GWN-6526 (spreader-sticker), GWN-4350 + GWN-6526, and Procure treatments were evaluated for powdery mildew control only and downy mildew disease ratings are not reported. The remaining treatments were primarily for downy mildew control, but contained tank mix partners with efficacy against powdery mildew, so severity ratings are shown for both diseases. The combination of Microthiol Special, Quintec, Nova, Gavel and Dithane was highly effective in reducing severity of both powdery and downy mildew, and was significantly better than all of the other treatments and the untreated control. Procure, Rubigan + GWN-6526, and GWN-4350 + GWN-6526 were moderately effective against powdery mildew. Procure was relatively less effective against powdery mildew compared to the control in 2006 than in 2004 in a similar trail at the same location. The fungicide combination containing Sonata was moderately effective against powdery mildew when it was alternated with Bravo + Manzate but not with Sonata plus Manzate. Both rates of V10161 + Bravo Weather Stik alternated with Quadris, Bravo Weather Stik alternated with Quadris, both rates of Ranman + Silwet (spreader-sticker) alternated with Bravo Weather Stik, and Sonata + Biotune (spreader-sticker) + Previcur Flex alternated with Sonata or Bravo Weather Stik plus Manzate significantly reduced downy mildew severity compared to the untreated control. Marketable yields ranged from 11.8 to 15.1 tons/A, but did not differ significantly among treatments and the untreated control (data not shown). There were also no differences between treatments and the control in the number of marketable fruit, the number or weight of culls or the yield of rotted fruit (data not shown).

Treatment and rate/A (application time[z])	Powdery mildew severity (%) 18 Aug		AUDPC[y]		Downy mildew severity	
	Upper	Lower	Upper	Lower	% 18 Aug	AUDPC
Rubigan EC 8 fl oz + GWN-6526 0.25% V/V (1-7)	44.3 bcd[x]	24.9 c	292.1bcd	147.0 cd	-	-
Rubigan EC 12 fl oz + GWN-6526 0.25% V/V (1-7)	40.3 bcd	23.8 cd	251.8 cd	136.2 cd	-	-
GWN-4350 F 8 fl oz + GWN-6526 0.25% V/V (1-7)	56.7 bc	38.8 bc	411.1 bc	244.3 bc	-	-
GWN-4350 F12 fl oz + GWN-6526 0.25% V/V (1-7)	53.5 bcd	37.1 bc	368.1bc	209.3 bc	-	-
Procure 50WS 6 oz (1-7)	34.8 d	25.7 c	216.3 cd	138.6 cd	-	-
Microthiol Special 80WS 4 lb (1-7) + Quintec 2.08SC 4 fl oz (2,4,6) + Nova 40W 4 oz (3,5,7) + Gavel 75W 2 lb (3-7) + Dithane 75WP? 1.2 lb (3-7)	11.9 e	7.4 d	69.7 d	36.7 d	8.1 d	43.8 d
V10161 4L 3 fl oz + Bravo Weather Stik 6SC 2.3 pt (1,3,5,7) alt Quadris 23F 11 fl oz (2,4,6)	38.8 cd	26.1 c	273.7 cd	150.9 c	28.5 bc	149.7 cd
V10161 4L 4 fl oz + Bravo Weather Stik 6SC 2.3 pt (1,3,5,7) alt Quadris 23F 11 fl oz (2,4,6)	55.9 bc	36.4 bc	405.1 bc	203.0 bc	40.3 b	225.8 bc
Bravo Weather Stik 6SC 2.8 pt (1,3,5,7) alt Quadris 23F 11 fl oz (2,4,6)	50.4 bcd	36.4 bc	363.3 bc	219.5 bc	34.0 bc	216.0 bc
Ranman 400SC 2.75 fl oz + Silwet L77 2 fl oz (1,3,5,7) alt Bravo Weather Stik 6SC 1.5 pt (2,4,6)	50.4 bcd	34.8 bc	523.5 b	265.2 bc	35.9 bc	273.4 bc
Ranman 400SC 2 fl oz + Silwet L77 2 fl oz (1,3,5,7) alt Bravo Weather Stik 6SC 1.5 pt (2,4,6)	44.3 bcd	26.1 c	385.8 bc	177.7 bc	39.5 bc	232.9 bc
Sonata 2 qt + Biotune 1 pt/100 gal + Previcur Flex 1 pt (1,3,5,7) alt Sonata 2 qt + Biotune 1 pt/100 gal + Manzate 75DF 1. 5 lb (2,4,6)	59.9 ab	44.9 b	422.4 bc	268.3 b	39.5 bc	253.4 bc
Sonata 2 qt + Biotune 1 pt/100 gal + Previcur Flex 1 pt (1,3,5,7) alt Bravo Weather Stik 6SC 2pt + Manzate 75DF 1.5 lb (2,4,6)	52.8 bcd	34.8 bc	410.7 bc	221.2 bc	37.1bc	198.3 bc
Untreated control	79.2 a	62.2 a	902.6 a	416.8 a	61.4 a	490.2 a
P value	0.0001	0.0001	0.0001	0.0001	0.0031	0.0002

[z]Application times were:1= 27 Jun-5 Jul; 2= 6-13 Jul; 3= 14-24 Jul; 4= 25 Jul-2 Aug; 5= 3-10 Aug; 6= 11-17 Aug; 7= 18-24 Aug.

[y]Disease rating 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% disease. AUDPC 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.

[x]Values 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.