MUSKMELON (*Cucumis melo* 'Diva' and 'Athena')
Powdery mildew; *Podosphaera xanthii*

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Integrated programs with biopesticides and a resistant cultivar evaluated for powdery mildew in muskmelon, 2009.

The objective of this experiment was to evaluate on muskmelon integrated programs with two biopesticides, Organocide (5% sesame oil) and Milstop (85% potassium bicarbonate) that effectively controlled powdery mildew in experiments conducted previously with pumpkin. This experiment was part of a study that included two parallel, adjacent field experiments conducted with pumpkin and butternut squash. Biopesticides were evaluated alone and in integrated programs with powdery mildew-resistant cultivars and/or conventional, mobile fungicides (Quintec, Pristine, and Procure). The integrated programs evaluated consisted of biopesticides plus conventional fungicides applied on a 7-day spray interval to a susceptible cultivar and to a cultivar with resistance to powdery mildew. The experiment was conducted in a field with Haven loam soil. The field was plowed on 28 Apr and tilled on 14 May, 21 May, and 1 Jun. Fertilizer (500 lb/A of 10-10-10) was applied on 19 May. Black plastic mulch and drip tape were laid on 27 May. Additional fertilizer (N-P-K 46-0-0) at 30 lb/A was injected through the drip irrigation system on 21 Jul and 11 Aug. Water was provided as needed through drip irrigation. Seeds were hand-planted on 10 Jun into holes cut into the plastic. Plots consisted of 3, 12-ft rows of 5 plants each and were separated by 18 ft in the row. Plants within each plot were at 24-in. in-row spacing and rows were at 68-in. spacing. Weeds were controlled between plastic mulch strips by applying Strategy (3 pt/A) and Sandea (0.5 oz/A) on 3 Jun and hand weeding. Cucumber beetles were managed with Admire 2F applied after plant emergence as a soil drench around seedlings (0.0007 fl oz/plant) on 23 Jun and with Asana XL (9.6 oz/A) applied to foliage on 24 Jun and 1 Jul. The following fungicides were applied preventively for downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): Fosphite (3 qt/A) on 24 Jun; Forum 4.16SC (6 oz/A) on 27 Jul, 8 Aug, 27 Aug, 12 Sep, and 23 Sep; and Ranman 400 SC (2.75 fl oz/A) on 17 Jul, 1 Aug, 15 Aug, 3 Sep, 17 Sep, and 30 Sep. Neither disease was detected before the end of this experiment. Treatment applications were made with a tractor-mounted boom sprayer operated at 100 psi and 96 gpa (D5-25 hollow cone nozzles spaced 17 in. apart). Upper and lower surfaces of 10 to 30 leaves in each plot were examined weekly for powdery mildew beginning on 15 Jul. Initially the examined leaves were selected from the oldest third of the foliage based on leaf appearance and position in the canopy. As disease progressed mid-aged and young leaves also were examined. Powdery mildew colonies were counted; severity was assessed when colonies could not be counted accurately because they had coalesced and/or were too numerous. Average severity for the entire canopy was calculated from the individual leaf assessments. Canopy condition including defoliation was assessed on 17 and 24 Sep. Average monthly high and low temperatures (^{o}F) were 73/58 in Jun, 80/64 in Jul, 83/68 in Aug, and 74/58 in Sep. Rainfall (in.) was 6.43, 4.82, 2.01, and 2.39 for these months, respectively.

Powdery mildew was first seen on 27 Aug; no symptoms were found on 12 Aug. Athena, which has resistance to pathogen races 1 and 2, did not suppress powdery mildew in this experiment, but it was effective in a near-by cultivar evaluation where it was compared to Superstar. Fungicide applications were started on 31 Jul because powdery mildew was found in adjacent parallel experiments with pumpkin and butternut squash that were being treated at the same time. Based on powdery mildew severity on 8 Sep, all fungicide treatments were providing effective control on upper leaf surfaces relative to non-treated control plots for both cultivars, and all but Organocide applied to the susceptible cultivar were effective on lower leaf surfaces. The two biopesticides provided high levels of control: 96-100% on upper leaf surfaces and 76-91% on lower surfaces. Tank-mixing Organocide with mobile fungicides improved control significantly only on lower surfaces of leaves on the susceptible cultivar. Degree of powdery mildew control was related to canopy condition, expressed as percentage of leaves that died.

Cultivar; Fungicide treatment (application date) [x]	Powdery mildew severity (%) [z, y]								Defoliation			
	Upper leaf surface				Lower leaf surface							
	2-Sep		8-Sep		2-Sep		8-Sep		16-Sep		23-Sep	
Diva (susceptible cultivar)												
Organocide (1-6), Quintec 4 oz/A (1,3,5), Procure 8 oz/A (2,6), Pristine 18.5 oz/A (4)…	0	b [w]	0.031	b	0.0001	b	0.003	d	35	d	90	
Organocide (1-6), Quintec (1), Procure (2)….	0	b	0.189	b	0.0001	b	0.469	cd	48	cd	95	
Organocide 2 fl oz/gal (1-6)……	0.0130	b	0.328	b	0.1295	b	3.946	bc	73	b	100	
Milstop 3 lb/A (1-6)……..	0.0003	b	0.031	b	0.0085	b	2.715	cd	45	cd	90	
Nontreated……	0.4065	b	13.906	a	0.0469	b	11.548	ab	76	ab	100	
Athena (mildew resistant cultivar)												
Organocide (1-6), Quintec (1), Procure (2)….	0	b	0.003	b	0.0005	b	0.314	cd	59	bc	90	
Organocide 2 fl oz/gal (1-6)……	0	b	0.524	b	0.0192	b	2.620	cd	56	bcd	90	
Milstop 3 lb/A (1-6)……..	0	b	0.046	b	0.0113	b	1.037	cd	65	bc	95	
Nontreated……	10.1330	a	18.318	a	1.9047	a	23.767	a	96	a	100	
P-value	0.0001		< .0001		0.0006		0.0001		0.0006		0.2845	

[z] Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%.

[y] Data were transformed from percentages by a square root transformation when needed to obtain normality of variance before analysis of variance was performed. The table has back-transformed means.

[x] Fungicides used in the programs were Organocide 2 oz/gal, Quintec 2.08SC 4 fl oz/A, Procure 480SC 8 fl oz/A, and Pristine 38WG 18.5 oz/A. Application dates were 1=31 Jul and 3 Aug, 2=10 Aug, 3=17 Aug, 4=24 Aug, 5=31 Aug and 6=9 Sep.

[w] Means followed by the same letter are not statistically different from each other (Tukey's HSD, P=0.05).