

**Evaluation of integrated management programs with biopesticides and a resistant cultivar for managing powdery mildew in muskmelon, 2007.**

The objective of this experiment was to evaluate on muskmelon 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 with 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 on a 14-day spray interval to a cultivar with resistance to powdery mildew. The experiment was conducted in a field with Haven loam soil. Fertilizer (400 lb/A of 10-10-10) was applied on 16 May. Black plastic mulch and drip tape were laid on 22 May. Additional fertilizer (N-P-K 46-0-0) at 30 lb/A was injected through the drip irrigation system on 9 and 30 Jul. Water was provided as needed through drip irrigation. Weeds were controlled between plastic mulch strips by applying Strategy (2 pt/A) on 31 May and RoundUp WeatherMax (1% solution) on 12 and 27 Jun between the rows of black plastic mulch with a shielded sprayer, and hand-weeding. Seeds were hand-planted on 8 Jun into holes cut into the plastic. Plots consisted of 3 rows of 5 plants each. Plants were at 24-in. spacing and rows were at 68-in. spacing. Plots were separated by 18 ft in the row. Cucumber beetles were managed with Admire 2F applied after transplanting as a soil drench around transplants (0.0007 fl oz/plant) on 19 Jun and with Asana XL (9.6 oz/A) applied to foliage on 16 Jul. The following fungicides were applied preventively for downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): Forum 4.16SC (6 oz/A) on 16 Jul, Curzate 60 DF (3.2 oz/A) on 22 Jul, Ranman 400 SC (2.75 fl oz/A) on 12 Aug, Acrobat 50 WP (6.4 oz/A) on 19 Aug, and Previcur Flex 6 F (1.2 pt/A) on 30 Aug. Neither disease was detected before the end of this experiment. All treatments were started after the IPM threshold of 1 affected leaf out of 50 older leaves (Plant Dis. 80:910-916) was reached in most plots scouted. 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). The same treatments were to be applied to the three crop types; however, the resistant and susceptible muskmelon cultivars were inadvertently switched at planting, which was not realized until after fungicide treatments were started. This caused the susceptible cultivar to be treated on a 14 day interval instead of 7 days. Upper and lower surfaces of 5 to 50 leaves in each plot were examined weekly for powdery mildew beginning on 17 Jul, which was the start of fruit production. Initially, 50 older leaves were examined in each plot. The examined leaves were selected from the oldest third of the foliage based on leaf appearance and position in the canopy. As disease progressed, the number of leaves examined was adjusted based on the incidence of affected leaves in a plot, and 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. A square root transformation was used when needed prior to analysis to achieve homogeneity of variance. Area under Disease Progress Curve (AUDPC) was calculated for severity from 25 Jul through 13 Aug. Mature fruit were harvested and weighed on 25 Aug and 3 Sep. Average monthly high and low temperatures (°F) were 79/61 in Jun, 82/66 in Jul, and 82/65 in Aug. Rainfall (in.) was 3.37, 3.63, and 2.60 for these months, respectively.

Powdery mildew was first seen on 25 Jul. Symptoms were found in only 4 of 27 cantaloupe plots examined on 25 Jul and in 28 of 36 plots on 3 Aug. Powdery mildew severity had increased substantially in the plots with the susceptible cantaloupe cultivar by 3 Aug. Fungicide treatments were started on 4 Aug. Powdery mildew was suppressed only with the integrated Fungicide Program (#3) applied to Diva, the susceptible cultivar, and only based on the AUDPC value for upper leaf surfaces. This is partly due to the fact the cultivars were inadvertently switched and thus the susceptible cultivar was sprayed on a 14-day interval, which is considered too long for powdery mildew control in a cultivar without genetic resistance. Additionally, the resistant cultivar provided a very high level of control thus there was not an opportunity to achieve visible improvement in disease severity. However, an integrated program with fungicides applied to a resistant cultivar will continue to be recommended for managing new pathogen races that might appear able to overcome the resistance in Athena, which is to races 1 and 2. A biopesticide applied on a 14-day interval could be a good tool for this task. None of the fungicide treatments affected yield.

Cultivar; Fungicide treatment (application date) <sup>x</sup>	Powdery mildew severity (%) <sup>z, y</sup>				No. fruit/ plant	Weight (lb/fruit)	
	Upper leaf surface		Lower leaf surface				
	3-Aug	AUDPC	3-Aug	AUDPC			
Diva (susceptible cultivar)							
Fungicide Program #3 (1, 3) <sup>v</sup> .....	0.396 a <sup>w</sup>	14.654 b	0.148 ab	15.468 a	3.9 a	6.0 cd	
Organocide 2 oz/gal (1, 3) <sup>v</sup> .....	0.167 ab	47.307 a	0.080 ab	24.761 a	3.6 a	5.9 d	
Milstop 3 lb/A (1, 3) <sup>v</sup> .....	0.314 a	62.505 a	0.202 a	30.980 a	3.8 a	6.2 cd	
Nontreated .....	0.497 a	93.432 a	0.388 a	32.376 a	3.9 a	5.8 d	
Athena (mildew resistant cultivar)							
Fungicide Program #1 (1, 2) <sup>v</sup> .....	0.000 b	0.000 c	0.000 b	0.003 b	2.7 b	8.7 ab	
Fungicide Program #2 (1, 2) <sup>v</sup> .....	0.000 b	0.002 c	0.000 b	0.009 b	3.0 b	7.3 bc	
Organocide 2 oz/gal (1, 2) <sup>v</sup> .....	0.000 b	0.001 c	0.000 b	0.004 b	2.8 b	8.9 a	
Milstop 3 lb/A (1, 2) <sup>v</sup> .....	0.000 b	0.002 c	0.000 b	0.006 b	2.7 b	7.9 ab	
Nontreated .....	0.000 b	0.003 c	0.000 b	0.000 b	2.8 b	8.7 ab	
<i>P</i> -value	0.0201	0.0001	0.0138	0.0001	0.0001	0.0001	

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

<sup>y</sup> Data were transformed from percentages by a square root transformation when needed to obtain normality of variance, analysis of variance was performed and means were detransformed back to the percentages presented in table.

<sup>x</sup> All treatments were on an IPM schedule with threshold of 1 affected leaf out of 50 older leaves. Application dates were 1=4 Aug, 2=12 Aug, and 3=17 Aug.

<sup>w</sup> Means followed by the same letter are not statistically different from each other (Fisher's Protected LSD, P=0.05).

<sup>v</sup> Fungicide Program #1: Organocide 2 oz/gal + Kocide 3000 0.5 lb/A (1, 2), Quintec 4 fl oz/A (1), Procure 480SC 8 fl oz/A (2).

Fungicide Program #2: Organocide 2 oz/gal (2), Kocide 3000 0.5 lb/A (1, 2), Pristine 38WG 18.5 oz/A (2).

Fungicide Program #3: Organocide 2 oz/gal + Kocide 3000 0.5 lb/A (1, 3), Quintec 4 fl oz/A (1), Procure 480SC 8 fl oz/A (3).