

Efficacy of organic products for control of powdery mildew on moderately resistant acorn squash, 2022.

The trial was established at the Michigan State University Plant Pathology Farm in Lansing, MI, in a field of Capac loam soil previously planted to pumpkin. The field was plowed on 20 May and disced on 1 Jun. Preplant fertilizer (80 lb per acre N and 105 lb per acre of K) was applied and incorporated on 1 Jun. On 2 Jun, raised beds were formed in the field with black plastic mulch 12 ft apart, and drip tape (0.65 gpm/100 ft) was established for irrigation and in-season fertilization. Biweekly mechanical cultivation and hand weeding were used for weed control. Planting occurred 13 Jun via transplanting. The cultivar used for this experiment was 'Tiptop', which has intermediate resistance to powdery mildew. The treatments were arranged in a randomized complete block design with four replications. Each replication was 20 ft with a 5 ft buffer between each plot in a row. Each week during the growing season the trial was fertilized with urea ammonium nitrate (28% N) liquid fertilizer at 1 gal/A through the drip tape. Presidio (4 fl oz/A) was applied on 21 Jul for control of *Phytophthora* crown rot and Admire Pro was applied through the drip lines on 20 Jun for insect control. Spray treatments were applied on 29 Jul and 5, 12, 19, 26 Aug using a CO₂ backpack sprayer and a broadcast boom equipped with four XR8003 flat-fan nozzles spaced 18 in. apart, calibrated at 35 psi, and delivering 50 gal/A. Foliage was evaluated for infection (%) (both upper and lower sides) on 18, 24, 29 Aug and for necrosis on 5 Sep. Area under the disease progress curve was calculated using foliar infection for the upper side of the leaf and using foliar infection for the lower side of the leaf. Data were analyzed with SAS statistical software, version 9.4, using the PROC GLIMMIX procedure for a one-way ANOVA, with mean separation performed using Fisher's least significant difference test (LSD; $P=0.05$).

Disease on the lower side of the leaf progressed from 3.8% (18 Aug) to 51.3% (29 Aug) in the untreated control. A significant increase in disease occurred for all treatments between 18 and 24 Aug. On 24 Aug, all treatments had significantly less disease than the untreated control. On the final rating date (29 Aug), all treatments differed from the untreated control except MBI-121 and Theia + Activator 90 alternated with Microthiol Disperss. According to the area under the disease progress curve (AUDPC), all treatments differed from the untreated control but not each other. Disease on the upper side of the leaf progressed from 2% (18 Aug) to 45% (29 Aug) over the course of the trial. According to disease severity on the final rating date (29 Aug) and AUDPC only treatments that included Microthiol Disperss differed from the untreated control. According to foliar necrosis on 5 Sep, all treatments differed from the untreated control except Trillium, and treatments containing Microthiol Disperss had less necrosis overall. No phytotoxicity was observed. In general, programs with either Microthiol Disperss alone or in a program were the only treatments that consistently limited powdery mildew disease progress in our study.

Treatment ^z and rate/A, application schedule, applied at 7-day intervals	Foliar infection on lower leaf surface (%) ^y			
	18 Aug	24 Aug	29 Aug	AUDPC ^x
Untreated control	3.8 ^w	31.3 a	51.3 a	311.3 a
Microthiol Disperss WP 5 lb., <i>A-E</i>	0.3	8.8 b	21.3 d	102.0 b
MBI-121 EC 3 pt., <i>apps ACE</i> <i>-alt-</i> Microthiol Disperss WP 5 lb., <i>BD</i>	1.3	12.5 b	25.0 b-d	135.0 b
Theia WP 3 lb. + Activator 90 0.125% V/V, <i>A-E</i>	0.8	13.8 b	21.3 cd	131.0 b
Theia WP 3 lb. + Activator 90 0.125% V/V, <i>ACE</i> <i>-alt-</i> Microthiol Disperss WP 5 lb., <i>BD</i>	0.5	15.3 b	40.0 ab	185.4 b
MBI-121 EC 3 qt, <i>A-E</i>	2.8	16.3 b	38.8 a-c	194.5 b
Trillium EC 1% V/V, <i>A-E</i>	1.3	16.3 b	26.3 b-d	158.8 b
<i>P</i> -value	0.3259	0.0152	0.0112	0.0057

^z*-alt-* = alternate.

^yBased on visual estimation.

^xAUDPC = Area under the disease process curve.

^wColumn means with no letter or a letter in common are not significantly different (LSD t Test; *P*=0.05).

Treatment ^z and rate/A, application schedule, applied at 7-day intervals	Foliar infection on upper leaf surface (%) ^y				Foliar necrosis (%) ^y
	18 Aug	24 Aug	29 Aug	AUDPC ^x	5 Sep
Untreated control	2.0 ^w	22.8	45.0 a	243.6 a	57.5 a
Microthiol Disperss WP 5 lb., <i>A-E</i>	0.3	2.0	6.3 c	27.4 c	27.5 d
MBI-121 EC 3 pt., <i>ACE</i> <i>-alt-</i> Microthiol Disperss WP 5 lb., <i>BD</i>	0.3	5.3	10.0 bc	54.6 bc	30.0 cd
Theia WP 3 lb. + Activator 90 0.125% V/V, <i>A-E</i>	1.0	10.0	17.5 ab	101.8 ab	38.8 b-d
Theia WP 3 lb. + Activator 90 0.125% V/V, <i>ACE</i> <i>-alt-</i> Microthiol Disperss WP 5 lb., <i>BD</i>	1.5	10.0	15.0 bc	97.0 bc	42.5 bc
MBI-121 EC 3 qt, <i>A-E</i>	2.5	11.3	21.3 ab	122.5 ab	42.5 bc
Trillium EC 1% V/V, <i>A-E</i>	0.8	8.0	28.8 ab	118.1 ab	45.0 ab
<i>P</i> -value	0.3692	0.1097	0.0168	0.0218	0.003

^z*-alt-* = alternate.

^yBased on visual estimation.

^xAUDPC = Area under the disease process curve.

^wColumn means with no letter or a letter in common are not significantly different (LSD t Test; *P*=0.05).