BUTTERNUT SQUASH (*Cucurbita moschata* 'Ultra')
Powdery mildew; *Sphaerotheca fuliginea*

N.T. Lukasko, C.L. Engfehr, and M.K. Hausbeck
Michigan State University
Department of Plant, Soil and Microbial Sciences
East Lansing, MI 48824

Evaluation of fungicides for the control of powdery mildew on butternut squash, 2019.

This study was conducted at the Michigan State University Plant Pathology Research Farm located in Lansing, MI, in a field of Capac loam soil previously growing pumpkins. The plot area was prepped by plowing and disking, applying pre-plant fertilizer (Urea 46-0-0 100 lb/A) on 3 Jun and laying plastic 4 Jun. Butternut squash 'Ultra' were planted 18 in apart on 12-ft centers on 27 Jun. Thirteen plants were planted per 20-ft plot with a 5-ft buffer between replicates within a row. Treatments were arranged in a randomized block design containing four evaluated replicates per treatment. For each treatment, a replicate consisted of a single row plot. Weekly applications of 20-20-20 fertilizer at 5 lb/A were applied through the drip irrigation. Treatments were applied on 5, 14, 22 Aug and 5 Sep using a CO_2 backpack sprayer and a broadcast boom equipped with four XR8003 flat-fan nozzles spaced 18 in apart and calibrated at 50 psi delivering 50 gal/A. Plants were evaluated for foliar necrosis (%) on 26 Aug, 11 and 19 Sep. Squash were harvested from the full 20-ft plots and weighed on 10 Oct. Data were analyzed using an analysis of variance (ANOVA), with means separation performed using Fisher's Protected Least Significant Differences test (P=0.05).

Foliar necrosis as a result of powdery mildew progressed from 0.8 to 92.5% in the untreated control plants from 26 Aug to 19 Sep. Differences among treatments were observed for the second rating (11 Sep). On this date, several treatments limited disease compared to the untreated control including Quintec SC, Tebuzol 3.6F, and Bravo WeatherStik SC, each applied alone. Also on 11 Sep, the following three programs provided significantly better control compared to the untreated control and included: Bravo WeatherStik SC + Tebuzol 3.6F alternated with Rally WP + Bravo WeatherStik SC, Bravo WeatherStik SC + Torino SC alternated with Quintec SC + Bravo WeatherStik SC alternated with Aprovia Top SL + Bravo WeatherStik SC, Aprovia Top SL + Bravo WeatherStik SC alternated with Quintec SC + Bravo WeatherStik SC alternated with Torino SC+ Bravo WeatherStik SC. All fungicide programs resulted in significantly less foliar necrosis than the untreated control by the last rating date (19 Sep), with the exception of the following four products each applied alone: Torino SC, Merivon Xemium, Rally WP, and Tebuzol 3.6F. Three treatment programs effectively limited foliar necrosis to≤62.5% , with each consisting of products that were tank-mixed and applied in alternation. Only the treatment program of Bravo WeatherStik SC + Tebuzol 3.6F alternated with Bravo WeatherStik SC + Rally WP resulted in yield that was greater than the untreated control.

Treatment[z] and rate/A, *application schedule*, applied at 10-day intervals	Foliar necrosis (%)[y]			Yield
	26 Aug	11 Sep	19 Sep	(lb)
Untreated control	0.8 a[x]	52.5 c	92.5 c	73.3 a
Aprovia Top SL 13.5 fl oz, *apps A-D*	0.8 a	31.5 a-c	73.8 ab	92.8 ab
Merivon Xemium SC 5.5 fl oz, *apps A-D*	1.5 a	31.3 a-c	87.5 bc	82.5 ab
Quintec SC 6 fl oz, *apps A-D*	0.3 a	21.3 a	75.0 ab	97.1 ab
Rally WP 5 oz, *apps A-D*	0.5 a	32.8 a-c	80.0 bc	89.8 ab
Torino SC 3.4 fl oz, *apps A-D*	0.0 a	50.0 bc	93.8 c	93.0 ab
Tebuzol 3.6F 6 fl oz, *apps A-D*	0.5 a	28.8 ab	80.0 bc	91.2 ab
Bravo Weather Stik SC 2 pt, *apps A-D*	0.0 a	17.5 a	72.5 ab	96.1 ab
Bravo Weather Stik SC 2 pt + Tebuzol 3.6F 6 fl oz, *apps A,C* *-alt-* Rally WP 5 oz + Bravo Weather Stik SC 2 pt, *apps B,D*	0.3 a	10.3 a	60.0 a	109.9 b
Torino SC 3.4 fl oz + Bravo Weather Stik SC 2 pt, *apps A,D* *-alt-* Quintec SC 6 fl oz + Bravo Weather Stik SC 2 pt, *app B* *-alt-* Aprovia Top SL 13.5 fl oz + Bravo Weather Stik SC 2 pt, *app C*	0.0 a	11.3 a	62.5 a	96.3 ab
Aprovia Top SL 13.5 fl oz + Bravo Weather Stik SC 2 pt, *apps A,C* *-alt-* Quintec SC 6 fl oz + Bravo Weather Stik SC 2 pt, *app B* *-alt-* Torino SC 3.4 fl oz + Bravo Weather Stik SC 2 pt, *app D*	0.5 a	16.3 a	62.5 a	98.1 ab
P-value	0.8182	0.0082	0.0005	0.4646

[z]*apps* = applications. *-alt-* = alternate.
[y]Based on a mean visual estimation of the percentage of necrotic foliage.
[x]Column means with a letter in common are not significantly different (LSD t Test; P=0.05).