

Ohio Vegetable & Small Fruit Research & Development Program

Final Report

2019

Project Title: Management of Plectosporium Blight of Pumpkins

Principle Investigator(s): Sally A. Miller

Phone Number: 330-263-3678

Fax: 330-263-3841

E-mail: miller.769@osu.edu

Cooperating Institution: The Ohio State University (OARDC) Department of Plant Pathology

Mailing Address: 1680 Madison Ave., Wooster, OH 44691

Other Key Personnel: Amilcar Vargas, Josh Amrhein, The Ohio State University – OARDC; Matt Hofelich, OARDC NCARS

Why was this project funded? Plectosporium blight has become a serious disease of pumpkins in Ohio and other states, and research on this topic was suggested by OVSFRDP member(s) in 2018. The disease must be managed using cultural practices like crop rotation, as well as fungicides. However, there is very little information available on the relative efficacy of fungicides labeled for use on pumpkins against Plectosporium blight.

Project outline: We established a field trial on the OSU OARDC North Central Agricultural Research Station (NCARS) in Fremont, OH with a pumpkin variety shown in a 2018 OVSFRDP-sponsored trial to be susceptible to Plectosporium blight. Treatments were arranged in a randomized complete block design with four replications. The trial was inoculated with the pathogen (*Plectosporium tabacinum*) to insure even distribution of the disease. The following fungicides were evaluated: Aprovia Top (difenoconazole + solatenol), Dexter Max (azoxystrobin + mancozeb), Dexter XCEL (azoxystrobin + mancozeb + tebuconazole), Flint Extra (trifloxystrobin), Inspire Super (cyprodinil + difenoconazole), Mural (azoxystrobin + benzofindiflupyr), Quadris Top (azoxystrobin + difenoconazole), Quadris Flowable (azoxystrobin), Tepera (fluoxastrobin), Tepera Plus (bifenthrin + fluoxastrobin), and TopGuard (azoxystrobin + flutriafol). Water-treated plots served as a non-treated control. Foliage was evaluated weekly after symptoms appeared for disease severity, and pumpkin fruits were assessed for disease at harvest.

Take-home messages: Although Plectosporium blight severity was low on foliage, disease incidence was relatively high on pumpkin handles. We found that Quadris

Top performed best in reducing Plectosporium blight symptoms on fruit (handles) and increasing the percentage of marketable fruit. A fungicide program including Microthiol Disperss, Topsin M, Trionic and Manzate Pro-Stick increased marketable yield and percentage marketable fruit.

Impacts: This research pinpointed the fungicides or fungicide program most effective in reducing Plectosporium blight symptoms on pumpkins. Although none completely controlled the disease, this information can guide growers in making fungicide application decisions.

What was discovered?

- Only Quadris Top significantly reduced the percentage of pumpkins with Plectosporium blight symptoms on the handle (33.1%) compared to the non-treated control (54.3%).
- Disease incidence on the handles was statistically similar for pumpkins treated with Quadris Top (33.1%), a program including Microthiol Disperss, Topsin M, Trionic and Manzate Pro-Stick (36.2%), Tepera (40.7%), Quadris Flowable (42%), Tepera Plus (46.8%), Dexter XCEL (47.3%) or Dexter MAX (49.5%).
- The highest marketable yield was obtained from plots treated with Tepera Plus or a program including Microthiol Disperss, Topsin M, Trionic and Manzate Pro-Stick, compared to the non-treated control.
- The highest percentage of marketable fruit was obtained from plots treated with Quadris Top (63.9%) or a program including Microthiol Disperss, Topsin M, Trionic and Manzate Pro-Stick (63.8%), compared to the non-treated control (44.0%).

Evaluation of fungicides for efficacy against *Plectosporium* blight of pumpkins, 2019.

The experiment was conducted at The Ohio State University's North Central Agricultural Research Station in Fremont, OH on Rimer loamy fine sand. The herbicides Roundup PowerMAX (40 fl oz/A) and Choice Weather Master (8 fl oz/A) were applied to the test field on 8 May. On 15 May, the fertilizers 46-0-0 (N-P-K; 100 lb/A), 10-52-0 (500 lb/A), and 0-0-60 (7 lb/A, 20% granular boron) were broadcast and the field was disked and tilled. On 17 May, beds were prepared on 5-ft centers. Pumpkin 'Orange Sunrise' seeds were sown into 72-cell plug trays with Baccto Professional Growers Mix. The herbicides Dual II Magnum (16 fl oz/A), Command 3ME (8 fl oz/A), Roundup PowerMAX (32 fl oz/A), and Choice Weather Master (8 fl oz/A) were applied with Compadre (2.7 fl oz/A; drift control agent) on 8 Jun. Pumpkin seedlings were transplanted on 12 Jun; the starter fertilizer (N-P-K 10-34-0; 0.7 qt/50-gal water) was applied in the transplant water. Plots were arranged in a randomized complete block design with four replications. Each plot consisted of 13 plants per row spaced 2 ft apart with 5 ft between rows. Treated rows were alternated with non-treated border rows. Insecticides were applied as needed: Assail 30 SG (5.3 oz/A; 19 Jun, 10 and 25 Jul, 9 Aug, and 6 Sep), Warrior II with Zeon Technology (1.92 fl oz/A; 27 Jun, and 13 Sep), Mustang Maxx (4 fl oz/A; 2 and 19 Jul), Asana XL (9.6 fl oz/A; 1 and 15 Aug), Arctic 3.2 EC (8 fl oz/A; 29 Aug), Actara (3 oz/A; 29 Aug), and Carbaryl 4L (32 fl oz/A; 20 Sep). Cover sprays were applied to manage powdery mildew and downy mildew including: Rally 40WSP (4 oz/A; 10 and 25 Jul, 9 and 29 Aug, and 13 Sep), Quintec (6 fl oz/A; 19 Jul, 1 and 15 Aug, and 6 Sep), Orondis Ultra (8 fl oz/A; 19 Jul and 20 Sep), Ranman (2.75 fl oz/A; 6 Sep) and Presidio (4 fl oz/A; 13 Sep). The field was hand weeded and hoed on 26 Jun, and 2 and 9 Jul. Foliar treatments were applied using a tractor-mounted CO₂-pressurized sprayer (55 psi, 42.3gal/A, 3 mph) beginning 1 Jul and ending 16 Sep for a total of 12 applications. On 8 Jul and 14 Aug, the pumpkin foliage was wetted with 75.7 gal of water/A and inoculated with approximately 10⁵ spores/mL of *Plectosporium tabacinum* using a CO₂-pressurized backpack sprayer. The severity of *Plectosporium* blight in each treatment row (all plants) was evaluated on 31 Jul, 7, 14, 21, and 27 Aug, and 5, 11, and 18 Sep using a scale of 0-100% foliage affected. On 27 Sep, all pumpkins were harvested from each treatment row. Weights and numbers of marketable pumpkins, pumpkin handles with *Plectosporium* blight, and other minor diseases were measured. Average maximum temperatures for 12-3 Jun, Jul, Aug, and 1-27 Sep were 79.5, 87.2, 81.7 and 79.9°F; average minimum temperatures were 61.4, 66.7, 61.5, and 58.6°F; and rainfall amounts were 1.8, 2.8, 4.2, and 1.1 in., respectively. Analysis of variance was performed using the GLIMMIX procedure and means were separated by Fisher's least significant difference test with SAS software.

Plectosporium blight severity was low on foliage, reaching only 4.8% in the non-treated control. However, disease incidence was relatively high on pumpkin handles. Only Quadris Top significantly reduced the percentage of pumpkins with *Plectosporium* blight symptoms on the handle (33.1%) compared to the non-treated control (54.3%). Disease incidence on the handles was statistically similar for pumpkins treated with Quadris Top (33.1%), a program including Microthiol Disperss, Topsin M, Trionic and Manzate Pro-Stick (36.2%), Tepera (40.7%), Quadris Flowable (42%), Tepera Plus (46.8%), Dexter XCEL (47.3%) or Dexter MAX (49.5%). The highest percentage of marketable fruit was obtained from plots treated with Quadris Top or the program including Microthiol Disperss, Topsin M, Trionic and Manzate Pro-Stick, compared to the non-treated control. The highest marketable yield was obtained from plots treated with Tepera Plus or the program including Microthiol Disperss, Topsin M, Trionic and Manzate Pro-Stick, compared to the non-treated control.

Treatment, rate (application timing) ^z	Plectosporium blight		Fruit with Plectosporium blight ^u		Total fruit	Marketable fruit	
	% ^{yv}	AUDPC ^{yx}	t/A	% ^w	t/A	t/A	% ^w
Aprovia Top, 13.5 fl oz (1-12)	2.8 d	153.0 cde	9.6 c	60.2 ab	16.2 e	6.4 e	38.0 dc
Dexter MAX, 3.2 lb/A (1-12)	3.3 cd	140.9 de	19.7 a	49.5 bcd	38.0 a	17.7 abc	48.7 abc
Dexter XCEL, 72 fl oz (1-12)	3.3 cd	153.0 cde	10.5 bc	47.3 bcd	21.8 de	10.4 de	49.7 abc
Flint Extra, 3.8 fl oz/A (1-12)	3.8 a-d	163.6 bcd	17.5 ab	52.0 abc	32.2 a-d	14.2 bcd	45.8 a-d
Inspire Super, 20 fl oz (1-12)	3.3 cd	124.3 e	14.8 abc	69.6 a	21.7 de	6.5 e	28.5 d
Mural, 6.96 oz (1-12)	2.8 d	145.8 cde	18.4 a	53.8 abc	33.5 abc	14.3 bcd	43.5 bcd
Quadris Top, 14 fl oz (1-12)	4.3 abc	201.4 ab	7.8 c	33.1 d	26.6 b-e	17.9 abc	63.9 a
Quadris Flowable, 15.5 fl oz (1-12)	3.5 bcd	163.8 bcd	11.9 abc	42.0 bcd	29.0 a-d	16.3 a-d	55.2 abc
Tepera, 12.6 fl oz (1-12)	3.3 cd	152.1 cde	7.8 c	40.7 cd	17.6 e	9.6 de	57.5 ab
Tepera Plus, 15.4 fl oz (1-12)	4.3 abc	184.6 bc	14.4 abc	46.8 bcd	33.0 abc	18.5 ab	53.1 abc
TopGuard EQ 8 fl oz (1-12)	3.5 bcd	160.0 cde	12.4 abc	54.4 abc	22.7 cde	9.6 de	41.8 bcd
Microthiol Disperss, 4 lb/A (1,3,5,7,9,11)							
Topsin M WSB, 3.2 oz/A (1,3,5,7,9,11)	4.5 ab	178.1 bcd	12.7 abc	36.2 cd	34.7 ab	22.0 a	63.8 a
Trionic 4 SC, 8 fl oz/A (2,4,6,8,10,12)							
Manzate Pro-Stick, 3 lb/A (2,4,6,8,10,12)							
Non-treated	4.8 a	226.1 a	14.4 abc	54.3 abc	25.9 b-e	11.0 cde	44.0 bcd
P-value	0.0067	0.0007	0.0604	0.0263	0.0032	0.0007	0.0298

^zApplication dates: 1= 1 Jun; 2= 8 Jul; 3= 15 Jul; 4= 23 Jul; 5= 29 Jul; 6= 5 Aug; 7= 12 Aug; 8= 20 Aug; 9= 26 Aug; 10= 3 Sep; 11= 9 Sep; 12= 16 Sep.

^yPlectosporium blight disease ratings and area under disease progress curve (AUDPC) values were based on the percent foliar disease. AUDPC was calculated according to the formula: $\sum [(x_i + x_{i-1})/2] \times (t_i - t_{i-1})$ where x_i is the rating at each evaluation time and $(t_i - t_{i-1})$ is the time between evaluations.

^wBased on t/A values.

^vValues are the means of four replicate plots; means followed by the same letter within a column are not significantly different at the indicated P value. Means were separated using Fisher's least significant difference test.

^uOnly fruit handles were evaluated for disease.