

Evaluation of nine alternating programs of fungicides for control of downy mildew on pickling cucumbers, 2019.

This trial was established at the Michigan State University Plant Pathology Farm in Lansing, MI, in a field of Capac loam soil previously planted to cucumber. Urea preplant fertilizer (100 lb/A) was applied on 7 Jul. The field was prepared by plowing and disking on 21 Jun and disking on 7 Jul. Raised beds were formed, plastic was laid, and drip tape established for irrigation on 8 Jul. Weeds were controlled with an application of Curbit 3 qt/A, Command 1.2 qt/A, and Dual 0.8 qt/A on 17 Jul prior to planting. Cucumber 'Bowie' seeds were sown on 29 Jul spaced 12 in. apart in rows that were spaced on 5.5-ft centers. Treatments were arranged in a completely randomized block design with four replicates. Each treatment replicate consisted of a single 20-ft row plot with a 3-ft buffer between treatments within the row. The trial was fertilized throughout the growing season with weekly applications of 20-20-20 via drip tape at 5 lb/A. Four 7-day treatments were applied on 22 and 29 Aug; 5 and 11 Sep using a CO₂ backpack sprayer and a broadcast boom equipped with three XR8003 flat-fan nozzles spaced 18 in. apart, calibrated at 50 psi and delivering 50 gal/A. Three 10-day treatments were applied on 22 Aug, 1 and 11 Sep. All fungicide treatments were tank mixed with Bravo WeatherStik SC (active ingredient chlorothalonil) with the exception of Orondis Opti (premix of oxathiapiprolin + chlorothalonil). The first foliar application was applied when the pathogen, *Pseudoperonospora cubensis*, was found in Ingham County, however, symptoms had yet to occur within the plot. Foliage across the plot was evaluated for disease severity (%) on 6, 9, 12, and 19 Sep.

Foliar disease progressed from 6.0% to 48.8% in the untreated control over a 2-week period (6 to 19 Sep). All treatment programs included in the study limited disease compared to the untreated control. Several of the treatment programs resulted in foliar disease incidence of <5.0%. One of these programs resulted in no discernable downy mildew symptoms being observed and included Ranman SC + Bravo WeatherStik SC alternated with Orondis Opti SC alternated with Zampro SC + Bravo WeatherStik SC. The fungicide program of Orondis Opti SC alternated with Elumin SC + Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC alternated with Zampro SC + Bravo WeatherStik SC was highly effective whether applied at 7- or 10-day intervals. Application of Bravo WeatherStik SC (alone) was the least effective fungicide treatment in this study according to the disease assessment on 19 Sep and the AUDPC data. The AUDPC data identified two other fungicides that were less effective than the other treatments and included Zampro SC + Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC and Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC alternated with Elumin SC + Bravo WeatherStik SC alternated with Orondis Opti SC alternated with Zampro SC + Bravo WeatherStik SC.

Treatment and rate/A, application schedule, applied at 7-day intervals except where indicated	Foliar disease (%) ^y				
	6 Sep	9 Sep	12 Sep	19 Sep	AUDPC
Untreated control	6.0 c ^x	5.5 c	52.5 c	48.8 c	444.3 d
BWS 2 pt, A-F	1.5 b	1.8 b	6.5 b	15.0 b	80.0 c
Zampro SC 14 fl oz + BWS 2 pt, A,C,E					
Ranman SC 2.75 fl oz + BWS 2 pt, B,D	0.3 a	0.3 a	2.0 a	4.8 a	24.0 b
BWS 2 pt, A					
Ranman SC 2.75 fl oz + BWS 2 pt, B					
Elumin SC 8 fl oz + BWS 2 pt, C					
Orondis Opti SC 2.5 pt, D					
Zampro SC 14 fl oz + BWS 2 pt, E	0.8 ab	0.8 ab	1.0 a	2.5 a	11.5 ab
Ranman SC 2.75 fl oz + BWS 2 pt, A,D					
Orondis Opti SC 2.5 pt, B,E					
Zampro SC 14 fl oz + BWS 2 pt, C	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Orondis Opti SC 2.5 pt, A,E					
Elumin SC 8 fl oz + BWS 2 pt, B					
Ranman SC 2.75 fl oz + BWS 2 pt, C					
Zampro SC 14 fl oz + BWS 2 pt, D	0.0 a	0.0 a	0.5 a	0.8 a	3.7 a
Orondis Opti SC 2.5 pt, A,E ^w					
Elumin SC 8 fl oz + BWS 2 pt, B ^w					
Ranman SC 2.75 fl oz + BWS 2 pt, C ^w					
Zampro SC 14 fl oz + BWS 2 pt, D ^w	0.0 a	0.0 a	0.0 a	0.5 a	0.4 a
Ranman SC 2.75 fl oz + BWS 2 pt, A,E					
Previcur Flex SL 1.2 pt + BWS 2 pt, B					
Orondis Opti SC 2.5 pt, C					
Zampro SC 14 fl oz + BWS 2 pt, D	0.0 a	0.0 a	0.0 a	0.0 a	0.8 a

Treatment and rate/ <i>A, application schedule,</i> applied at 7-day intervals except where indicated	Foliar disease (%) ^y				
	6 Sep	9 Sep	12 Sep	19 Sep	AUDPC
Ranman SC 2.75 fl oz + BWS 2 pt, <i>A,E</i>					
Elumin SC 8 fl oz + BWS 2 pt, <i>B</i>					
Orondis Opti SC 2.5 pt, <i>C</i>					
Zampro SC 14 fl oz + BWS 2 pt, <i>D</i>	0.0 a	0.3 a	0.0 a	0.0 a	0.3 a

BWS = Bravo WeatherStik SC.

^yBased on a visual estimation of the percentage of foliage diseased.

^xColumn means with a letter in common are not significantly different (LSD t-Test; $P=0.05$) using ANOVA, SAS.

^wApplied at 10-day intervals.