

Evaluation of alternating programs of fungicides for control of downy mildew on pickling cucumber, 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 and black plastic was laid on 8 Jul. Drip tape was established for irrigating the plot. Weeds were controlled with an application of Curbit at 3 qt/A, Command 1.2 qt/A, and Dual 0.8 qt/A on 17 Jul prior to planting. Cucumber 'Vlaspik' seeds were sown on 29 Jul into the raised beds. Treatment rows were spaced 5.5 ft apart and plants were spaced at 12 in. within the row. Treatments were arranged in a completely randomized block design with four replicates. Each treatment replicate consisted of a single row 20-ft 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. Foliar spray treatments were applied on 22 and 29 Aug; 5, 11 and 18 Sep (applications A, B, C, D, E, respectively) 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. Foliage was evaluated using a 0 to 100% scale for infection on 6, 9, 12, 16, 19 and 27 Sep. Data were analyzed using an analysis of variance (ANOVA), with means separation performed using Fisher's protected least significant difference (LSD).

Downy mildew was reported on cucumber in Ingham County on 21 Aug in research plots established at the Michigan State University Plant Pathology Farm. Foliar disease on control plants progressed from 6.3% (6 Sep) to 90.0% (27 Sep). For each observation date, all fungicide programs, with the exception of AgriLife, limited foliar disease compared to the control. As disease progressed, differences were noted among treatments. On 6 and 9 Sep, all programs containing Orondis Opti SC provided excellent downy mildew protection (<0.5% disease); Ranman SC + Activator 90 SL (applied alone) provided a level of control that was comparable. Three days later (12 Sep), the downy mildew had increased more than 35% in the untreated control. Several treatments limited disease incidence to < 4.0% on 12, 16, 19 Sep and included: Ranman SC + Bravo WeatherStik SC alternated with Zing! SC, alternated with Orondis Opti SC alternated with Gavel DF; Ranman SC + Activator 90 SL; Orondis Opti SC 2 alternated with Previcur Flex SL + Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC; and Orondis Opti SC alternated with Zampro SC + Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC. The last observation occurred on 27 Sep, 9 days after the last fungicide application. Disease in the untreated control nearly doubled from 19 to 27 Sep. Two especially effective treatments limited disease incidence to < 5.0 % on the final rating date and included: Orondis Opti SC alternated with Previcur Flex SL + Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC and Orondis Opti SC alternated with Zampro SC + Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC. Other effective fungicide programs that limited disease to 15% included Ranman SC + Bravo WeatherStik SC alternated with Zing! SC alternated with Orondis Opti alternated with Gavel DF and Bravo WeatherStik SC alternated with Ranman SC + Bravo WeatherStik SC alternated with Zampro SC 14 fl oz + Bravo WeatherStik SC.

Treatment ^z and rate/A, application schedule, applied at 7-day intervals	Leaf tissue with downy mildew lesions (%) ^y					
	6 Sep	9 Sep	12 Sep	16 Sep	19 Sep	27 Sep
Untreated control	6.3 a ^x	7.5 a	43.8 a	48.8 a	46.3 a	90.0 a
Ranman SC 2.75 fl oz + BWS 2 pt, apps A,E -alt- Zing! SC 2.25 pt, app B -alt- Orondis Opti SC 2.5 pt, app C -alt- Gavel DF 2 lb, app D	0.3 b	0.0 e	0.5 b	0.0 c	0.0 d	15.0 c
Ranman SC 2.75 fl oz + Activator 90 SL 8 fl oz, apps A-E AgriLife SL 1.6 pt, apps A-E	0.3 b	0.5 de	0.5 b	1.0 c	1.3 d	23.8 b
Orondis Opti SC 2 pt, apps A,D -alt- Previcur Flex SL 1.2 pt + BWS 2 pt, apps B,E -alt- Ranman SC 2.75 fl oz + BWS 2 pt, app C	6.3 a	6.0 ba	41.3 a	46.3 a	46.3 a	90.0 a
BWS 2 pt, apps A-E Orondis Opti SC 2 pt, apps A,D -alt- Zampro SC 14 fl oz + BWS 2 pt, apps B,E -alt- Ranman SC 2.75 fl oz + BWS 2 pt, app C	0.0 b	0.0 e	3.5 b	1.3 c	2.3 d	2.0 d
BWS 2 pt, app A -alt- Ranman SC 2.75 fl oz + BWS 2 pt, apps B,D -alt- Zampro SC 14 fl oz + BWS 2 pt, apps C,E	2.0 b	4.5 bc	11.3 b	18.8 b	20.0 b	28.8 b
P-value (treatment) ^w	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

^zBWS = Bravo WeatherStik SC. apps = applications. Foliar spray treatments were applied on 22 and 29 Aug; 5, 11 and 18 Sep (applications A, B, C, D, E, respectively). -alt- = alternate.

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

^xColumn means with a letter in common are not significantly different (LSD t-test; P<0.05).

^wANOVA test. Significant at P < 0.05.