

**Evaluation of fungicides for control of downy mildew of cucumber when applied after pathogen establishment, 2016.**

The trial was established at the MSU Plant Pathology Farm in Lansing, MI, in a field previously planted to cucumber. Plots were prepared as raised plant beds. Drip tape was established on each bed, and the beds were covered with black plastic. Single rows spaced 5.5-ft at center were seeded with ‘Vlaspik’ cucumber on 25 Jul. Each treatment replicate was a 20-ft bed for each of four replicates with a 2-ft buffer between beds within a planting row. Treatments were arranged in a randomized complete block design. The plot was fertilized throughout the growing season with weekly applications of 20-20-20 via drip tape at 2.5 lb/acre. Weeds were removed mechanically on 2 Sep. Insects were controlled with Admire Pro 8 fl oz applied through the drip 4 weeks after plant emergence. Foliar fungicide sprays were applied to cucumber foliage with obvious symptoms of downy mildew with a CO<sub>2</sub> backpack boom sprayer equipped with two then three XR8003 flat-fan nozzles, operating at 40 psi, delivering 50 gal/A. Treatments were applied at 4-day intervals on 2, 7, 11, 15, 19, 23, and 27 Sep. Cucumber leaves were evaluated for downy mildew severity using the Horsfall-Barratt scale on 6, 19, 22, 26, 30 Sep, 4, 7, and 14 Oct. Yields were harvested from the entire 20-ft row on 9, 16, and 22 Sep and only total yield reported.

Disease was allowed to develop prior to the first fungicide application. On 6 Sep, all treatments including the untreated were uniformly diseased with a rating of 6.0-6.3 (6=25 to 50% disease). Applications of Orondis Opti SC or Orondis Ultra SC immediately limited disease development significantly compared to all other treatments and the untreated control on 19 and 22 Sep. By 26 Sep, the untreated plants received a rating of 9.8 (9=87 to 94% disease). Cueva SC, Previcur Flex SL, Presidio SC, and Forum SC allowed disease progression that was similar to the untreated control. From 19 Sep to 4 Oct, the plots treated with Orondis Opti SC or Orondis Ultra SC did not show any disease progression from the time that the sprays had begun as the ratings remained the same. While all other treatments were significantly better than the untreated plots, the level of disease development would be considered commercially unacceptable. On 7 Oct (10 days after last fungicide application), the Orondis-based treatments showed only limited disease progression from the original disease rating of 6.0 with ratings of 6.3 to 6.5; these treatments were the most effective fungicides. Plants treated with Ranman SC received a rating of 7.8 (7=50 to 75% disease). On 14 Oct (17 days after the last fungicide application), plots treated with either Orondis Opti SC or Orondis Ultra SC were similar to the V-10208 SC treatments and were the most effective treatments in limiting downy mildew disease. In comparison, the untreated plot was almost entirely diseased (11.8; 12=100% disease) on the last evaluation date; treatments of Cueva SC, Presidio SC, Previcur Flex SC, Revus SC, and Forum SC were similar to the untreated control. While all other treatments included in this study were better than the untreated control the disease ratings were high. The untreated plot yielded similarly to those treated with Cueva SC, Koverall DG, Bravo WS SC, Presidio SC, Previcur Flex SL, Gavel DF, Tanos DF, Curzate DF, Omega SC, Revus SC, and Forum SC. The highest yields (>30 lb/plot) were achieved with treatments of Ranman SC, Zampro SC, Orondis Opti SC, or Orondis Ultra SC. Although this trial provides helpful information to growers facing established downy mildew, fungicides are best applied preventively for maximum control and to delay the development of fungicide resistance to the downy mildew pathogen.

Treatment and rate/A, applied at 4-day intervals	Foliar ratings*								Total yield (lbs/20-ft row)
	9/6	9/19	9/22	9/26	9/30	10/4	10/7	10/14	
Untreated control	6.0 b**	8.0 a	8.5 ab	9.8 a	10.5 a	10.8 a	10.8 a	11.8 a	17.7 f
Bravo Weatherstik SC 2 pt	6.0 b	7.5 ab	7.5 c-e	7.8 e-h	7.8 gh	8.0 fg	8.8 d-g	9.0 c-e	23.2 b-f
Koverall DG 2 lb	6.0 b	8.0 a	8.0 a-d	8.5 c-e	8.5 e-g	8.5 e-g	8.8 d-g	9.3 cd	28.2 a-f
Cueva SC 1 qt	6.0 b	8.0 a	8.8 a	9.8 a	10.3 ab	10.5 ab	10.5 ab	11.5 a	19.0 ef
Presidio SC 0.25 pt	6.0 b	7.8 ab	8.3 a-c	9.0 a-c	9.5 b-d	9.5 b-e	9.8 a-d	11.0 ab	25.1 b-f
Previcur Flex SL 1.2 pt	6.3 a	7.8 ab	8.8 a	9.8 a	9.8 a-c	10.0 a-d	10.8 a	11.0 ab	22.2 c-f
Ranman SC 0.17 pt	6.0 b	7.3 bc	7.0 e	7.3 gh	7.5 h	7.5 g	7.8 g	9.3 cd	38.4 a
Zampro SC 0.88 pt	6.0 b	7.5 ab	7.3 de	7.5 f-h	7.5 h	8.0 fg	8.8 d-g	9.5 cd	31.3 a-d
Gavel DF 2 lb	6.0 b	7.8 ab	8.3 a-c	8.8 b-d	8.8 d-f	9.0 d-f	9.3 c-f	10.0 bc	22.9 b-f
Tanos DF 0.5 lb	6.0 b	7.3 bc	7.5 c-e	8.3 c-f	8.0 f-h	8.5 e-g	8.5 e-g	10.0 bc	26.9 b-f
Curzate DG 5 oz	6.0 b	6.8 cd	7.3 de	8.0 d-g	8.0 f-h	8.5 e-g	9.0 d-f	10.0 bc	25.5 b-f
Omega SC 1 pt	6.0 b	7.8 ab	7.8 b-e	8.3 c-f	7.5 h	8.0 fg	9.0 d-f	9.3 cd	21.9 c-f
Revus SC 8 fl oz	6.0 b	7.5 ab	7.5 c-e	8.3 c-f	9.0 c-e	9.3 c-e	9.5 b-e	10.8 ab	24.4 b-f
Forum SC 6 fl oz	6.0 b	7.8 ab	8.0 a-d	9.5 ab	10.0 ab	10.3 a-c	10.3 a-c	11.3 a	20.4 def
Orondis Opti SC 34.2 fl oz	6.0 b	6.0 e	6.0 f	6.0 i	6.0 i	6.0 h	6.3 h	8.0 ef	33.8 ab
Orondis Ultra SC 9.64 fl oz	6.0 b	6.5 de	6.0 f	6.0 i	6.0 i	6.0 h	6.5 h	7.8 f	32.5 a-c
V-10208 SC 8 fl oz	6.3 a	7.3 bc	7.0 e	7.0 h	7.3 h	7.5 g	8.3 fg	8.5 d-f	29.6 a-e

\*Rated on the Horsfall-Barratt scale of 1 to 12, where 1=0% plant area diseased, 2=>0 to 3%, 3=>3 to 6%, 4=>6 to 12%, 5=>12 to 25%, 6=>25 to 50%, 7=>50 to 75%, 8=>75 to 87%, 9=>87 to 94%, 10=>94 to 97%, 11=>97 to <100%, 12=100% plant area diseased.

\*\* Column means with a letter in common are not statistically different (LSD t Test; P=0.05).