

Evaluation of fungicide programs for control of downy mildew of cucumber, 2016.

This trial was established at the Michigan State University Plant Pathology Farm in East Lansing, MI, in a field of Capac loam soil previously planted to rye. Roundup PowerMax 1 qt/A was applied for weed control prior to planting. Soil was prepared by plowing and discing, fertilizing with ammonium nitrate at 100 lb/A, forming raised plant beds, and covering them with black plastic. Drip tape was established for irrigating the plot. Cucumber 'Vlaspik' seeds were sown on 21 Jul into the raised beds. Treatment programs were arranged in a completely randomized block design with four replicates. Treatment rows were spaced 5.5-ft apart and plants were spaced 12 in. within the row. Each treatment replicate consisted of a single row 20-ft plot with a 2-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 2.5 lb/acre. One application of Admire Pro (8 fl oz/A) was applied via drip irrigation 4 weeks after transplanting for insect control. The plots were hand weeded. Foliar spray treatments were applied on 5, 12, 18, and 25 Aug; 2, 9, 16, and 22 Sep using a CO₂ backpack sprayer and a boom equipped with three XR8003 flat-fan nozzles calibrated at 50 psi and delivering 50 gal/A. Foliar disease severity was evaluated using the Horsfall-Barratt scale on 11, 19, 26 and 30 Sep. Only marketable fruit were harvested on 2, 7, 13 and 22 Sep and weighed (*only total marketable yields are shown in table*). Data were analyzed using an analysis of variance (ANOVA), with means separation performed using Fisher's protected least significant difference (LSD).

Downy mildew was first confirmed in East Lansing on 9 Aug. All fungicide treatments significantly limited disease in comparison to the untreated control on all rating dates. On the first rating date of 11 Sep, disease pressure was significant with a rating of 6 (>25 to 50%), in the untreated control, but remained at trace levels in most treatments. By 19 Sep, the untreated control plants were further diseased (7=>50 to 75%); treatments 3 and 5 limited foliar disease symptoms to a rating of ≤3.0 (=>3 to 6%). Treatments 6 and 7 allowed disease to develop to 5.8 (6=>25 to 50%) for the 19 Sep rating; a level of disease that would not be commercially acceptable. One week later (26 Sep), the untreated control was severely diseased (9=>87 to 94%) while the treatments remained limited compared to the previous week's rating. On the last evaluation date (Sep 30), the untreated control received a rating of 10 (>94 to 97%) and several fungicide treatments limited disease to ≤12% disease and included treatments 2, 3, 4, 5, 8, and 9. In some cases, disease severity ratings decreased between 26 and 30 Sep as warm and dry weather conditions stimulated healthy plant growth. Treatments including Koverall WG (treatments 6 and 7) limited disease in comparison to the untreated control but did not provide adequate foliar protection. The downy mildew disease significantly impacted yield. The yield from the untreated control plants was similar to treatments including Koverall WG (treatments 6 and 7). Treatments 3, 4, and 5 resulted in yields that were significantly greater than treatments 6, 7, and the untreated control.

Treatment Program ^z and rate/A, applied at 7-day intervals, <i>application schedule</i>	Disease severity ^y				Yield (lb)
	9/11	9/19	9/26	9/30	Total
1. Untreated control	6.0 a ^x	7.0 a	9.0 a	10.0 a	49.0 c
2. Zing! SC 36 fl oz, <i>apps A-H</i>	2.3 c	4.0 c	4.3 cd	3.5 cd	74.6 ab
3. Ranman SC 2.75 fl oz + Bravo WS SC 1.5 pt, <i>apps A,F</i> -alt- Orondis Opti A SC 4.8 fl oz + Orondis Opti B 2 pt, <i>apps B,G</i> -alt- Zing! SC 36 fl oz, <i>apps C,E,H</i> -alt- Zampro SC 14 fl oz + Bravo WS SC 1.5 pt, <i>apps D</i>	2.0 c	2.8 e	3.3 e	3.3 d	78.5 a
4. Ranman SC 2.75 fl oz + Bravo WS SC 24 fl oz, <i>apps A,D,G</i> -alt- Presidio SC 4.0 fl oz + Bravo WS SC 1.5 fl oz, <i>apps B,E,H</i> -alt- Zampro SC 14.0 fl oz + Bravo WS SC 1.5 fl oz, <i>apps C,F</i>	2.0 c	3.8 cd	4.5 c	3.8 cd	79.6 a
5. Ranman SC 2.75 fl oz + Bravo WS SC 24 fl oz, <i>apps A,C,E,G</i> -alt- Zampro SC 14 fl oz, <i>apps B,D,F,H</i>	2.3 c	3.0 de	3.8 de	3.8 cd	83.2 a
6. Koverall WG 1.5 lb, <i>apps A,C,D,F,G</i> -alt- Topguard EQ SC 8.0 fl oz, <i>apps B,E,H</i>	3.8 b	5.8 b	6.0 b	6.0 b	63.0 bc
7. Koverall WG 1.5 lb, <i>apps A,C,D</i> -alt- Topguard EQ SC 8 fl oz, <i>app B,E</i> -alt- Koverall WG 1.5 lb + Ranman SC 2.8 fl oz, <i>apps F,G</i> -alt- Ranman SC 2.8 fl oz + Topguard EQ 8 fl oz, <i>app H</i>	3.8 b	5.8 b	6.0 b	5.8 b	62.2 bc
8. Ranman SC 2.75 fl oz + Silwett SL 2.0 fl oz, <i>apps A,C,E,G</i> -alt- Zampro SC 14 fl oz, <i>apps B,D,F,H</i>	2.0 c	3.5 c-e	4.3 cd	4.0 c	78.3 a
9. Ranman SC 2.75 fl oz + Silwett SL 2.0 fl oz, <i>apps A-H</i>	2.0 c	4.0 c	4.8 c	4.0 c	76.6 ab

^zBravo WS=Bravo Weatherstik; alt=alternate.

^yRated 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.

^xColumn means with a letter in common or with no letter are not significantly different (Fisher's LSD Test; P=0.05).