PUMPKIN (*Cucurbita pepo* 'Eagle City Gold')
Powdery mildew; *Podosphaera xanthii*
Phytophthora blight; *Phytophthora capsici*

M. T. McGrath and C. T. Downing
Plant Pathology & Plant-Microbe Biology Section
SIPS, Cornell University, LIHREC
3059 Sound Avenue, Riverhead, NY 11901

**Efficacy of a Phytophthora blight fungicide program for powdery mildew and Phytophthora blight, 2022.**

An experiment with field-grown pumpkins was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, in a field with Haven loam soil. The objective was to evaluate the efficacy of a Phytophthora blight fungicide program for controlling powdery mildew as well as Phytophthora blight. The impetus was observing that the severity of powdery mildew on upper leaf surfaces was lower than expected through Aug in previous evaluations of biopesticides (ex. PDMR 16:V110). The field was moldboard plowed on 12 Apr. Pumpkins were planted with a vacuum seeder at approximately 24-in. plant spacing on 21 Jun after disking. Controlled-release fertilizer (N-P-K, 19-10-9) was used at 525 lb/A (101 lb/A N) and applied with the seeder in two bands about 2 in. to the side of the seed. The herbicides Strategy 3 pt/A, Sandea 0.5 oz/A, and Curbit EC 1 pt/A were applied immediately after planting using a tractor-mounted sprayer. During the season, weeds were managed by cultivating and hand weeding as needed. Drip tape was laid along each row of pumpkin seedlings on 29 Jun. Irrigation was run as needed to supplement rainfall to achieve 1 in. water each week. Plots were three 25-ft rows spaced 68 in. apart with a 20-ft in-row untreated area between plots, except when there were two adjacent plots of the same treatment. The 20-ft area between plots was also planted to pumpkin. A randomized complete block design with four replications was used. The primary source of initial inoculum for powdery mildew in this area is considered to be long-distance wind-dispersed spores from affected plants. Phytophthora blight has occurred previously in most research fields at LIHREC including the one used for this experiment. The following fungicides with targeted activity for Phytophthora blight were applied throughout the season to foliage in treated plots (except the first application which was a directed spray to soil): Omega 24 fl oz/A was applied on 10 Jul, Omega 16 fl oz/A on 15 Jul, Ranman 2.75 fl oz/A on 20 Aug and 3 and 25 Sep, Orondis Ultra 7 fl oz/A on 13 and 27 Aug and 9 Sep, Presidio 4 fl oz/A on 23 Jul and 6 Aug, and Revus 8 fl oz/A on 30 Jul. The 11 applications were made on a preventive 7-day schedule using a tractor-mounted boom sprayer equipped with TeeJet D5 nozzles with 25B whirl plates spaced 17 in. apart that delivered 55 gal/A at 100 psi. The last application was unintentionally applied 14 days after the prior one was done. Plants were inspected for powdery mildew symptoms on upper and lower leaf surfaces. Initially only old leaves were examined: 20 in each plot on 26 Jul and 15 on 2 Aug. Old, mid-aged and young leaves (usually seven of each selected based on their physiological appearance and position in the canopy) were examined in each plot on 9, 16, 25 and 30 Aug, and 8 Sep. Colonies of powdery mildew were counted and severity was assessed by visual estimation of percent leaf area affected when colonies could not be counted accurately because they had coalesced and/or were too numerous to count. Colony counts were converted to severity values using the conversion factor of 30 colonies/leaf = 1% severity. Average severity for the entire canopy was calculated from the individual leaf assessments. Area under disease progress curve (AUDPC) values were calculated from 26 Jul through 8 Sep using the formula: $\sum n\ i=1[(Ri+1 + Ri)/2]\ [ti+1 - ti]$, where R = disease severity rating (% of leaf surface affected) at the *i*th observation, ti = time (days) since the previous rating at the *i*th observation, and n = total number of observations. Defoliation, which was mainly due to powdery mildew, was assessed on 8 and 14 Sep. Incidence of fruit with Phytophthora blight symptoms in each plot was evaluated on 8, 14, 19, and 28 Sep; and 10 and 12 Oct. Data were analyzed with one-way ANOVA and Student's t-test to separate means using JMP statistical software. Average monthly high and low temperatures (°F) were 85.3 and 68.9 in Jul, 85.4 and 68.7 in Aug, 76.3 and 60.3 in Sep, and 64.7 and 48.1 in Oct. Rainfall (in.) was 4.1, 2, 4.3 and 6.1 for these months, respectively.

Powdery mildew was first observed in this experiment on 26 Jul in 1 of the 8 plots on only 1 of the 160 leaves examined (0.6%), which was 11 days after the first foliar fungicide treatment. On 2 Aug symptoms were found in 7 of the 8 plots on 22 of 160 leaves examined (13.8%). The program with targeted fungicides for Phytophthora blight provided some control of powdery mildew on the upper leaf surface most notably during August, which corresponds with previous observations. The surfactants in these fungicides may be responsible for the control. AUDPC value for powdery mildew on the lower leaf surface was significantly lower for the fungicide treatment than control at *P*=0.06 (data not shown). The program provided 47% and 17% control on upper and lower leaf surfaces, respectively, based on AUDPC values. This degree of control is not adequate for commercial production, but it is sufficient to impact results of powdery mildew fungicide evaluations. The only Phytophthora blight symptom observed was fruit rot. First affected fruits were observed on 30 Aug, 1 week after favorable conditions were created by 1.3 in. of rain on 22-23 Aug, which was the first rainfall exceeding 0.3 in. since 18 Jul. At every assessment there was a lower percentage of fruit affected by Phytophthora blight in the treated than control plots which was significant at *P*=0.05 at the last assessment and at *P*=0.10 at the previous 3 assessments. Photographs are posted at https://blogs.cornell.edu/livegpath/research/evaluation-of-a-phytophthora-blight-fungicide-program-for-powdery-mildew-and-phytophthora-blight-2022/. This report includes work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Hatch under 7000429.

| | Powdery mildew severity on upper leaf surface (%) * | | | | Phytophthora rotted fruits (%) * | | | |
|---|---|---|---|---|---|---|---|---|
| Treatment | 25 Aug ** | 30 Aug | 8 Sep | AUDPC | 8 Sep | 19 Sep | 7 Oct | 12 Oct |
| Untreated control | 15 a | 43 a | 64 a | 730 a | 19 | 61 | 79 | 88 a |
| Fungicide treated | 2 b | 17 b | 55 b | 389 b | 11 | 25 | 46 | 63 b |
| *P-value (treatment)* | 0.0159 | 0.0001 | 0.0165 | 0.0014 | 0.2282 | 0.0541 | 0.0654 | 0.0323 |

* Numbers in each column with a letter in common or no letters are not significantly different from each other (Student's t-test, *P*=0.05).

** Values were square root transformed before analysis because raw data were not distributed normally. Table contains de-transformed values.