



# THE OHIO STATE UNIVERSITY

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## **Pumpkin Powdery Mildew Fungicide Demonstration Trial Report - 2023**

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### **Introduction**

A powdery mildew (PM) fungicide evaluation trial was conducted on pumpkin at the Western Ag Research Station in South Charleston, OH at 39.857672, -83.667513. All treatments were applied to a powdery mildew susceptible hybrid (Baby Pam, Rupp Seeds) to determine the impact of compounds on foliage health. No yield data was taken.

This goal of this powdery mildew demonstration trial is to evaluate fungicide programs and assess the effectiveness of a primary fungicide when used in combination with recommended rotational fungicides.

These fungicide programs have been designed to primarily manage powdery mildew and have inherent weaknesses against specific diseases such as downy mildew, bacterial and soil borne diseases.

The upper leaf surface is easier to protect with fungicides and typically has lower levels of powdery mildew infestation, therefore this report focuses primarily on how well the lower leaf surface is protected by each treatment.

In the 2023 trial, precipitation totals for June, July, August and September were 3.1", 5.2", and 4.0" and 0.3" respectively.

### **Plot Installment**

The trial was direct seeded May 25 using a Monosem vacuum planter. Each treated plot consisted of one 85' long row of Hybrid Pam pumpkin (PM susceptible) with a final stand of 3-4' within the row. Fifteen feet on the east side of each plot was not sprayed and served as an "untreated check" section to confirm the presence of PM. Mouse and vole pressure in the plot caused excessive stand reduction requiring a series of reseeding and transplanting events. In the end, the original plant spacing was achieved but plot length was reduced to ca. 65'.

Treated plots were separated by a 15' drive lane on each side with a 20' fallow buffer between the header and end of each plot to minimize spray drift between plots. The seeds were treated

with FarMore FI400 to limit striped cucumber beetle feeding on seedlings and minimize transmission of bacterial wilt.

Weeds were managed by spraying Strategy (4.5 pints/A) plus Dual Magnum (1.3 pints/A) plus glyphosate (48 oz/A) pre-emerge May 28. Any major weed escapes were hand pulled or hoed out weekly. Strips of spring oats were drilled on March 21 between the treated plots and mowed off periodically throughout the season. The prior crop was soybean.

Based on soil test results, no P or K was added to the field. On June 20, 70 pounds of nitrogen in the form of liquid 28-0-0 was side dressed six inches away from each row, approximately two inches deep in the soil.

## Treatments

The fungicide programs (Table 1) were evaluated for powdery mildew control and will be referenced by their main attributes throughout the report. Treatment 9 was created by examining two leaves from each untreated plot area, for an average of 16 leaves per rating.

**Table 1.** Powdery mildew fungicide trial treatments, rates per acre, FRAC and manufacturer.

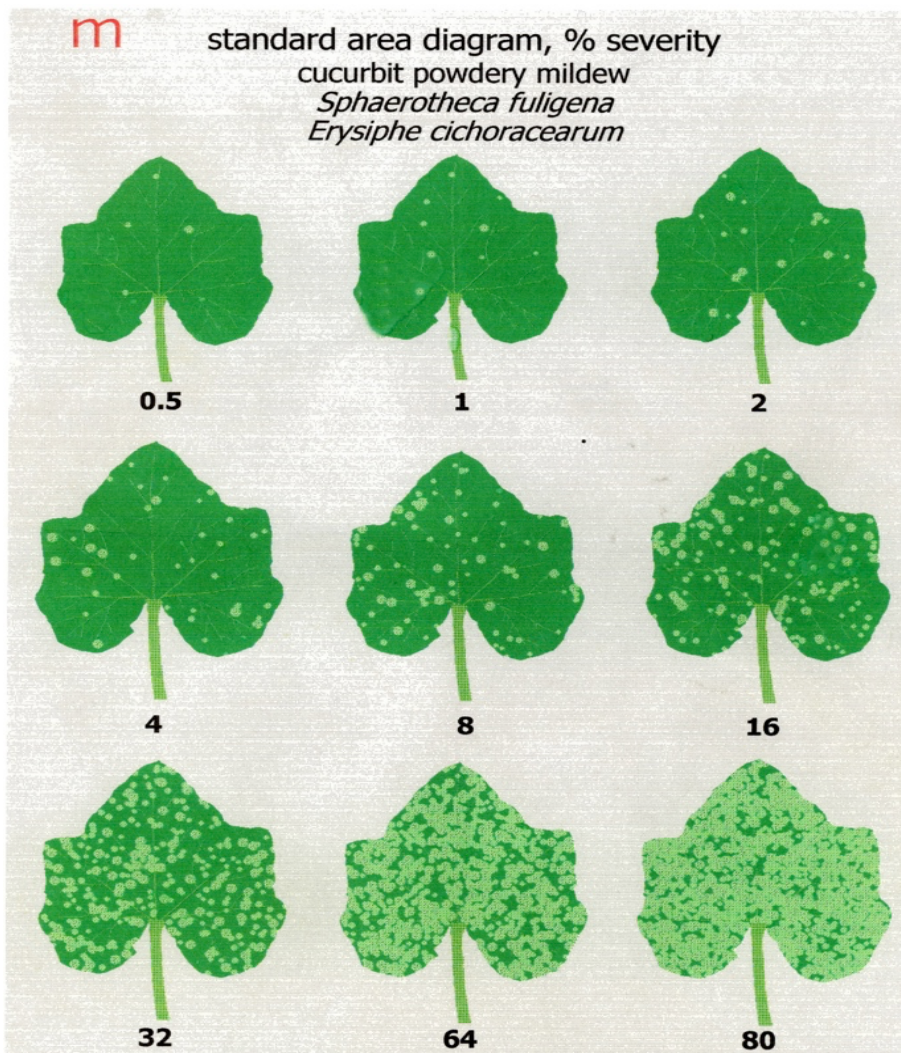
TRT	Product, Rate, FRAC Sprays 1, 3, and 5	Product, Rate, FRAC Sprays 2, 4, and 6
1*	Theia 1.5 lb [FRAC BM02] (AgBiome)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
2*	Theia 1.5 lb + Cevya 3 fl oz [FRAC BM02 + 3] (AgBiome, BASF)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
3*	Gatten 6.4 oz [FRAC U13] (Nichino)	(skip this spray, only every 14 days)
4*	Gatten 6.4 oz + Manzate Pro 2.5 lb [FRAC U13 + M] (Nichino, UPL)	Quintec 6 oz + Manzate Pro 2.5 lbs [FRAC 13 + M] (Gowan, UPL)
5*	Theia 1.5 lb + Gatten 6.4 fl oz [FRAC BM02 + U13] (AgBiome, Nichino)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
6*	SiGuard L 32oz (ISP Technologies)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
7*	SiGuard L 32oz + Theia 1.5 lb [FRAC BM02] (ISP, AgBiome)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
8*	Procure 8 fl oz + Manzate Pro 2.5 lbs + Vacciplant 14 fl oz (FRAC 3 + M + P4) (UPL)	Quintec 6 oz + Manzate Pro 2.5 lbs + Vacciplant 14 fl oz [FRAC 13 + M + P4] (Gowan, UPL)
9	Untreated check	

\* All sprays include NIS Chemsurf 90 @ 0.125% (0.00125 v/v)

## Ratings & Application

Powdery mildew was first detected in the trial July 31. Plot treatment ratings were conducted between 10am and noon on August 9, 18, 28, September 5, 13 and 20. Fungicide treatments were applied between 1-4pm on August 1, 10, 18, 28, September 5 and 13. All treatments were applied using a hydraulic boom sprayer at 37 GPA using hollow cone nozzles at 65 PSI.

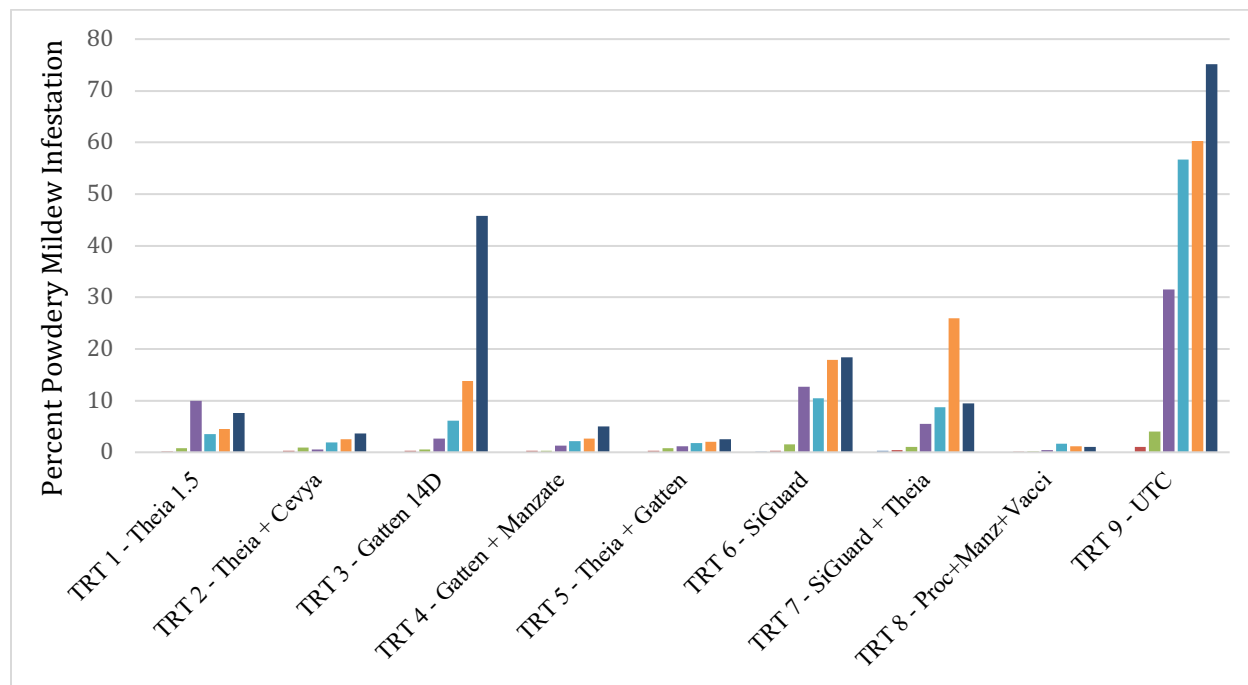
Each treatment plot rating was evaluated using six randomly chosen leaves, inspecting the upper and lower leaf surface for powdery mildew colonies and assigning a percent infestation rating value based on the established pictorial reference guide (**Figure 1**).



**Figure 1.** Percent powdery mildew infection chart.

## Results

Season long powdery mildew infestation mean ratings for each treatment based on lower leaf surface only (Figure 2). Upper leaf surface ratings would show a lower level of PM infestation. Looking at the disease accumulation of the untreated check (TRT 9 -UTC), PM was present late in July and increased continuously on this treatment throughout the summer season.



**Figure 2.** Powdery mildew infestation (%) on the lower leaf surface only from July 25 through September 9.

In addition to weekly percent disease infestation ratings comparing treatment performance over the season, the Area Under the Disease Progress Curve was calculated for each treatment as an accepted method to quantify disease accumulation throughout the season (Table 2).

**Table 2.** The Area Under the Disease Progress Curve (AUDPC) for powdery mildew infestation based on lower leaf surface data only between July 31-September 20. Lower AUDPC values reflect lower overall disease accumulation and higher treatment efficacy.

Treatment	AUDPC	Efficacy Rating '23
TRT 8 - Proc+Manz+Vacci	31.6	Excellent
TRT 5 - Theia + Gatten	59.4	Excellent
TRT 2 - Theia + Cevya	61.4	Excellent
TRT 4 - Gatten + Manzate	70.8	Excellent
TRT 1 - Theia 1.5	190.8	Very Good
TRT 3 - Gatten 14D	338.9	Very Good
TRT 7 - SiGuard + Theia	351.6	Very Good
TRT 6 - SiGuard	411.8	Very Good
TRT 9 - UTC	1485.2	NA

## Conclusions

Overall, PM infestations were lower in 2023 compared to other recent seasons. Differences may have been influenced by some pumpkin plants in each treatment being up to two weeks older due to a mixture of direct seeded and transplants caused by early season mouse damage. Drier conditions throughout the late summer likely curtailed disease development. Lastly, a new susceptible hybrid was used in the trial which despite being labeled susceptible to PM, appeared to have some PM tolerance. When this trial continues in 2024, the previous susceptible hybrid will be used.

All treatments had 3-5 modes of action (MOAs) that were alternated during the season consistent with recommended FRAC rotation rules to delay the onset of disease resistance (Table 1). The only exception to this rule was TRT 3 - Gatten 14D, which had only a single MOA applied every 14 days throughout the season. This would not be a recommended treatment schedule but used here for research purposes only.

The eight fungicide treatment programs broke into two main categories this year and all outperformed the untreated check significantly, offering various levels of control. The highest performing treatments (TRT 8, 5, 2, 4) did an **excellent** job of controlling PM on the upper and lower leaf surface all season. The next group of treatments (TRT 1, 3, 7, 6) were close behind and rated **very good** at controlling PM on both leaf surfaces all season.

The biological Theia and non-pesticide silicon based SiGuard were both evaluated this year for the first time as novel entries. Interesting to note that SiGuard + Theia performed better than SiGuard alone, but both not as good as Theia alone or Theia + Gatten or Theia + Cevya. When SiGuard was mixed with Theia in a pre-slurry prior to being added to the tank, a thick gel resulted which may have impacted the overall performance of the treatment. Gatten applied with either Theia or Manzate performed better than Gatten alone, though there is a cost savings associated with three fewer applications overall.

As you review this report remember this trial was designed as a large plot demonstration without randomization and replication, therefore no statistical analysis of these treatments is possible, but these observations may reveal a pattern of efficacy worth future exploration.

If you have any questions about the trial results, please contact me.

Respectfully,

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