Evaluation of foliar fungicide timing to manage white mold of potato in Michigan, 2020 and 2021.

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Montcalm Research Center (MRC): In 2021, a foliar fungicide timing trial was established at MRC in Lakeview, MI and managed by the Potato and Sugar Beet Pathology program (Bloomingdale and Willbur). The trial objective was to determine the most effective timing of fungicide applications for managing white mold in potato. A randomized complete block design, with four replicates, was used. Potato seed were cut from US#1 'Lamoka' tubers and allowed to suberize before planting. The trial was hand-planted 21 May. Plots were two rows wide (34-in. row spacing) by 20 ft long and a 10-in seed spacing was used. Standard grower practices were followed to manage non-target pests. Fluazinam applications (8 fl oz/A) were made 14 Jul (full bloom) and 28 Jul (14-d post-bloom); treatments of full bloom, post-bloom, and full followed by post-bloom applications were compared to a grower standard control. A CO_2 powered backpack sprayer, equipped with two TJ 8004XR flat fan nozzles and operating at a boom pressure of 38 psi, was used to apply fungicides at 20 gal/A. To control for late blight, weekly chlorothalonil or mancozeb applications were initiated 1 Jul and applied until vine kill. Apothecia data were collected weekly between 15 Jul and 23 Aug. Disease data were collected 18 Aug and 3 Sep. Twenty stems were arbitrarily rated from both rows and assigned a disease severity (0-3). The severity ratings were: 0 = no disease to 3 = infection girdling mainstem, resulting in wilting and/or death. The ratings were used to calculate a percent disease incidence (DI) and average disease severity of symptomatic plants (DS; 0-3). Disease index (DX) was calculated from the following equation: DX = DI x DS/3. The plots were harvested 22 Sep. On 28 Sep, potatoes were washed then graded for size, weight, specific gravity, and internal defects. A generalized linear mixed model procedure was used to conduct the ANOVA and mean separations at α=0.05.

Mean DX values ranged between 81 and 90% at the final rating. All treatments resulted in significantly lower DX values at 18 Aug ($P < 0.01$) but not at Sep 3 ($P > 0.05$) when compared to the grower standard control (Table 1). No significant differences in total or marketable yield were observed ($P > 0.05$). The trial experienced high-water levels because of frequent rain and poor drainage, thus resulting in poor yields. Apothecial observations also indicated that inoculum pressure remained high from full bloom to 28-d post-bloom, supporting the severe disease pressure observed in the trial. However, only the full bloom application appeared to numerically influence disease and yield. To validate these findings, additional timings and combinations may be investigated in the future to identify key growth stages for effective and economical management.

Table 1. White mold, yield, and marketable yield observations in treatments tested in small-plot research at the Montcalm Research Center in Lakeview, MI in 2021.

No.	Treatment, Rate[z], and Timing[y]	DX (%)[x] Aug 18	DX (%) Sep 3	Total Yield (CWT/A)	Marketable Yield (CWT/A)
1[w]	Grower standard treated control	66.7 a	90.0	190.6	119.6
2	Omega 500F (8 fl oz) full bloom	40.9 b	81.0	208.6	145.7
3	Omega 500F (8 fl oz) 14-d post-bloom	52.5 b	87.1	156.9	106.0
4	Omega 500F (8 fl oz) full bloom + 14-d post-bloom	48.4 b	85.4	184.6	118.1

[z] All rates, unless otherwise specified, are listed as a measure of product per acre, and all tank mixes contained MasterLock at a rate of 0.25 % v/v.

[y] Applications were made on the following dates: full bloom = 14 Jul and 14-d post-bloom = 28 Jul.

[x] Column values followed by the same letter were not significantly different based on Fisher's Protected LSD (α=0.05); if no letter, then the effect was not significant.

[w] Treated control.

Dale Johnson Farm, Sagola, MI: In 2020 and 2021, a foliar fungicide timing trial was conducted on the Dale Johnson Potato Farm in Sagola, MI, managed by the grower with guidance from MSU Extension (DeDecker). The trial objective was to determine the most effective timing of fungicide applications for managing white mold in potato. A completely randomized design with three replicates was used. A commercial potato field with a history of white mold was selected for the trial and planted to the variety Silverton using standard grower practices. Plots were thirty-six rows wide (34-in. row spacing), running the length of the field, to accommodate the grower's self-propelled sprayer. Standard grower practices were followed to manage non-target pests. A John Deere R4038 sprayer, equipped with air-induction flat fan nozzles, was used to apply fungicides at 40 gal/A. To control for late blight, weekly chlorothalonil applications (Bravo Ultrex at 1.25 lbs/A) were made until vine kill. Treatments of full bloom, 14-d post-bloom (2020), and full bloom + 14-d post-bloom (2021) were compared to the grower's standard treated control (chlorothalonil only). In 2020, fluazinam applications (8 fl oz/A) were made 20 Jul (full bloom) and 3 Aug (14-d post-bloom) as a tank mix with chlorothalonil. In 2021, fluazinam applications (8 fl oz/A) were made 28 Jul (full bloom) and 11 Aug (14-d post-bloom) as a tank mix with chlorothalonil. Disease data were collected 27 Aug, 2020 and 31 Aug, 2021. Fifty stems were rated (5 subsamples of 10 stems each) from the center twelve rows of each plot and assigned a disease severity rating (0-3). The severity ratings were: 0 = no disease to 3 = infection girdling main stem, resulting in wilting and/or death. The ratings were used to calculate a percent disease incidence (DI) and average disease severity of symptomatic plants (DS; 0-3). Disease index (DX) was calculated from the following equation: DX = DI x DS/3. A generalized linear mixed model procedure was used to conduct the ANOVA and mean separations at α=0.05.

In 2020, DI values ranged between 30.0 and 72.0% and DX values ranged between 12.7 and 38.7%. There were significant differences among mean DI (P = 0.0006) and mean DX (P = 0.01) values of the treatments (Table 1). The best performing single-pass treatment at 14 days post bloom led to a 67% reduction in average disease index over the control. In 2021, DI values ranged between 1.3% and 35.3% and DX values ranged between 0.44% and 16.7%. There were significant differences among mean DI (P = 0.016) and mean DX (P = 0.027) values of the treatments (Table 2). The two-pass treatment at full bloom + 14 days post bloom led to a 97% reduction in average disease index over the control. These results suggest that later fluazinam applications and/or multiple fluazinam applications may be helpful in managing potato white mold, particularly in longer flowering varieties. Possible confounding factors in this study included a) that our full bloom applications were slightly early in 2020 and late in 2021 (1-2 days), and b) wind events that removed many blossoms between the full bloom and post bloom applications. Additional research is needed to confirm our results, and to demonstrate the relationship between white mold control and potato yield and/or quality. The authors thank Dale Johnson for his collaboration on these two years of on-farm research and MPIC for their financial support.

Table 1. White mold observations in treatments tested on-farm in Sagola, MI in 2020.

No.	Treatment, Rate[z], and Timing[y]	DI (%)[x]	DX (%)
1[w]	Grower standard treated control	72.0 a	38.7 a
2	Omega 500F (8 fl oz) full bloom	50.0 b	25.1 b
3	Omega 500F (8 fl oz) 14-d post-bloom	30.0 c	12.7 c

[z] All rates, unless otherwise specified, are listed as a measure of product per acre.
[y] Applications were made on the following dates: full bloom = 20 Jul and 14-d post-bloom = 3 Aug.
[x] Column values followed by the same letter were not significantly different based on Student–Newman–Keuls multiple comparisons test (α=0.05); if no letter, then the effect was not significant.
[w] Treated control.

Table 2. White mold observations in treatments tested on-farm in Sagola, MI in 2021.

No.	Treatment, Rate[z], and Timing[y]	DI (%)[x]	DX (%)
1[w]	Grower standard treated control	35.3 a	16.7 a
2	Omega 500F (8 fl oz) full bloom + 14-d post-bloom	1.3 b	0.4 b

[z] All rates, unless otherwise specified, are listed as a measure of product per acre.
[y] Applications were made on the following dates: full bloom = 28 Jul and 14-d post-bloom = 11 Aug.
[x] Column values followed by the same letter were not significantly different based on Student–Newman–Keuls multiple comparisons test (α=0.05); if no letter, then the effect was not significant.
[w] Treated control.