Evaluation of table potato variety and fungicides to manage late blight of potato, 2018.

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Plots were established at the Michigan State University Plant Pathology Farm in Lansing, MI. A split plot design, replicated four times, was used to investigate the effects of potato variety and foliar fungicide on managing late blight. Three Russet varieties were used in this study: Burbank, Norkotah, and Payette. Potato seed was cut from US#1 tubers into 2 oz pieces, and allowed to suberize for 5 d before planting. To mitigate risk of late blight to commercial crops, planting was delayed until 6 Jun, to offset trial maturity for intended inoculation. Furrows were mechanically opened, so that seed could be hand planted. Plot dimensions were 12 ft (four rows on 36-in. row spacing) by 20 ft, and planted with 16-in seed spacing. Two spreader rows of the highly susceptible variety ‘Atlantic’ were planted as borders along the trial. After planting, furrows were mechanically closed. Standard grower practices were followed to manage the trial and non-target pests. The trial was split by variety, with each variety having plots with a non-treated or a Bravo Weather Stik treatment. First fungicide applications occurred on 24 Jul, and were repeated weekly until 13 Sep. A CO_2 powered backpack sprayer, equipped with two TJ 8004XR flat fan nozzles and operating at a boom pressure of 24 psi, was used to apply fungicides at 15 gal/A. Inoculations were postponed until 15 Aug, pending an earlier in-state detection. At sunset on 15 Aug, liquid *P. infestans* inoculum ($3.6x10^3$ spores/mL) was applied using the previously mentioned spray equipment. Disease progression was recorded daily for the first two weeks after inoculation, then recorded weekly. In-field sprinklers were run late morning and late afternoon daily to extend periods of leaf wetness. The trial was not irrigated for 24 hr after applying treatments. Vines were removed by hand 9 Oct, and the center 2 rows of each plot harvested 12 Oct. Potatoes were washed and the marketable yield (cwt/A) determined. A general linear mixed model procedure was used to conduct the ANOVA (α=0.05) and mean separations.

Plots were also monitored using hand-held (LC-RP Pro, Spectra Vista Corporation) leaf-clip reflectance probes with spectroradiometers and aerial hyperspectral cameras (Hyspex, NEO) mounted on a Cessna 180 aircraft. Spectral data collected by collaborators at the University of Wisconsin-Madison (Gevens, Townsend, and Gold). Hand-held reflectance data was collected daily from 15 Aug to 24 Aug. Visual late blight data was also recorded daily for this duration. Aerial data was collected on approximately 13 Aug, 18 Aug, 22 Aug, 30 Aug, and 12 Sep. Multispectral data was also collected through the Basso Lab using unmanned aerial vehicle with an onboard software development kit (SDK; Matrice, DJI Development). Drone flights were conducted on approximately 25 Jul, 17 Aug, and 12 Sep.

There was not a significant fungicide x variety treatment interaction (P>0.05) for any of the parameters analyzed, so fungicide treatments and variety were analyzed separately. No differences between non-treated and treated plants were detected in the lower or upper canopy (P>0.05), though treated plots had numerically lower index values than non-treated plots. The same can be said for the mean marketable yield of treatments. Variety used had no effect on disease (P>0.05), however there was a yield effect (P<0.01). Payette yielded the highest, with a mean value at least 80 CWT higher than Burbank or Norkotah. Spectral data will be analyzed by UW-Madison collaborators, and results will be provided to MSU when available. Samples of preliminary flight images are included. Despite regular irrigation before and after inoculation, the overall hot and dry Aug inhibited disease establishment. Disease ratings post inoculation showed relatively high late blight establishment, but disease levels declined with the hot, dry bouts. These overall unfavorable disease conditions limited the ability to assess interactions between these varieties and fungicide applications.

Table 1.

Treatment and Rate/A	Upper Canopy DX (%)$^{z, y}$	Lower Canopy DX (%)	Marketable Yield (cwt/A)
Non-treated Control	0.009	0.02	257.96
Bravo Weather Stik 1.5 pt	0.006	0.00	268.91

^{z} Disease Index (DX) was calculated by multiplying the disease incidence (0-100%) by the severity (0-100), then dividing by 100.
^{y} Column values followed by the same letter are not significantly different based on Fisher's Protected LSD (α=0.05); if no letter, then the effect is not significant.

Table 2.

Russet Variety	Upper Canopy DX (%)$^{z, y}$	Lower Canopy DX (%)	Marketable Yield (cwt/A)
Burbank	0.00	0.02	191.4 c
Norkotah	0.01	0.00	259.2 b
Payette	0.01	0.02	339.7 a

^{z} Disease Index (DX) was calculated by multiplying the disease incidence (0-100%) by the severity (0-100), then dividing by 100.
^{y} Column values followed by the same letter are not significantly different based on Fisher's Protected LSD (α=0.05); if no letter, then the effect is not significant.

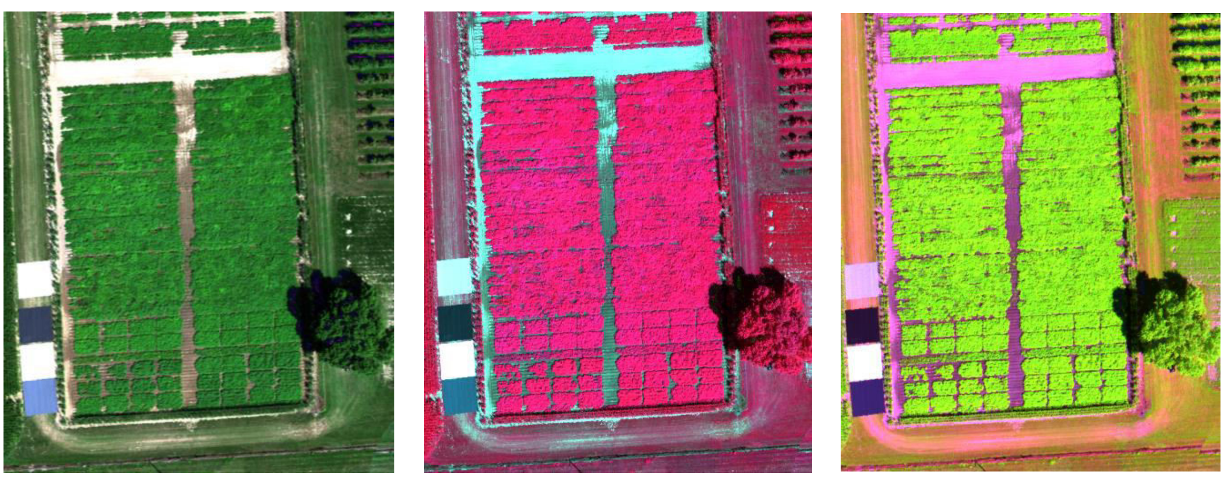

Figure 1. Preliminary images from aerial flights, differentially colored for contrast, data not analyzed.