

Evaluation of foliar fungicides for control of potato early blight in Wisconsin, 2012

Jordan, S.A.¹, Cleveland, K.M.², and Gevens, A.J.³

1. Associate Researcher, UW-Madison
2. Undergraduate Research Assistant, UW-Madison
3. Assistant Professor & Extension Plant Pathologist, UW-Madison

Potatoes were planted 2 May to initiate a field trial at the Hancock Research Station in central WI to evaluate fungicide programs for control of foliar potato blights. Treatments were included for both early blight (*Alternaria solani*) and late blight control, but no late blight (caused by *Phytophthora infestans*) symptoms were observed during the course of the trial. Approximately 2 oz seedpieces were cut mechanically on 27 Apr from US#1 'Russet Burbank' tubers. Seedpieces were allowed to heal prior to planting. A randomized complete block design with four replications was used for the trial, and treatment plots consisted of four 24-ft-long rows spaced 36 in. apart with 15 in. spacing in the row. To minimize soil compaction and damage to plants in rows used for foliar and yield evaluations, drive rows for pesticide application equipment were placed adjacent to plots. Fungicide treatments were initiated on 20 Jun after the P-day value reached 300. Subsequent applications were applied on a weekly basis to all four rows of each plot on the following dates: 27 Jun, 2 Jul, 11 Jul, 18 Jul, 25 Jul, 1 Aug, 8 Aug, 15 Aug, 22 Aug, (30 Aug and 4 Sep vine kill), for a total of ten fungicide applications. Treatments were applied with a plot sprayer consisting of a tractor-mounted boom, pressurized with an air compressor, using Tee Jet Hollow Disc Cone D3-23 nozzles (16 nozzles at 8-in. spacing). Fungicides were applied at a rate equivalent to 35 gal water/A at 40 psi. Plots were not inoculated but relied on natural dispersal of inocula for disease establishment. Late blight (*Phytophthora infestans*), while present in the growing area, was not observed in the trial. Early blight severity for 20 ft. of the two center rows was rated on 22 Jun, 20 Jul, 31 Jul, 11 Aug, 20 Aug and 29 Aug, using the Horsfall-Barratt rating scale (0-11 rating with 0=no disease, 11=100% disease severity). Plots were harvested on 2 Oct. A subset of 12 tubers from each plot were tested for specific gravity at time of grading. Precipitation in Hancock during the potato production season was 12.38 in. Supplemental irrigation was applied 42 times during the potato production season for an additional 29.15 in.

Early blight pressure was moderate and progressed later than typical for the production region due to the unusually hot and dry weather. Brown spot, caused by *Alternaria alternata*, was observed later in the season on newer growth and was evaluated. Late blight, while present in the growing region, was not observed in the trial. Rhizoctonia was problematic at emergence, resulting in a reduced plant stand and low yields across all plots. Tuber early blight was not noted at harvest.

Due, in part, to high variability between replications, there were no significant differences in total yield, or in yield of US-1 graded potatoes, across treatments and including the untreated control. Numerically, however, mean total yield was greatest (>480 cwt/acre) for the following 7 treatments (as numbered in table below): 4, 6, 8, 9, 12, 15, and 28. While the trial did not result in a clear separation of programs based on the statistical analysis of yield results, we did see significant control of disease (AUDPC) with most treatments when compared to the untreated control. Of the treatments that did not significantly limit disease, most were individual experimental compounds that were not integrated into a standard season-long fungicide program and 2 were season-long copper applications. The average specific gravity across treatments was 1.072 with no significant differences between treatments. The efficacy of newer compounds provides a toolbox of additional fungicides for use in resistance management programming in Wisconsin potato systems.

Treatment and rate/acre	Application Timing ^w	Yield (cwt/ton)				RAUDPC ^x	Brown Spot Rating ^y
		Culls	B Grade	US #1	Total		
1.Untreated Control.....	NA	23.7	59.7	302.2	385.6	0.270 fg ^z	2.50 ef
2.Echo Zn 4.17 F 2.0 pt.....	1-10	32.2	72.5	304.6	409.3	0.177 abcd	1.75 cd
3.Quadris 2.08 SC 6 fl oz	1,3,5						
Echo Zn 4.17 F 2.0 pt.....	2,4,6,7-10	37.8	90.5	318.0	446.3	0.167 abcd	1.00 ab
4.Moncoat seed trt							
Echo Zn 4.17 F 2.0 pt	1,2,4,						
Headline SC 10 fl oz Echo Zn 4.17 F 2.0 pt	3,6						
Endura WG 3.5 oz + Echo Zn 4.17 F 2.0 pt	5,7						
Dithane DF 2 lb + Super Tin 80 WP 2.5 fl oz.....	8-10	56.6	52.2	377.5	486.3	0.191 bcde	1.00 ab
5.Echo Zn 4.17 F 2.0 pt	1,2,4,						
Headline SC 10 fl oz + Echo Zn 4.17 F 2.0 pt	3,6						
Endura WG 3.5 fl oz + Echo Zn 4.17 F 2.0 pt	5,7						
Dithane DF 2 lb + Super Tin 80 WP 2.5 fl oz.....	8-10	37.1	70.0	313.3	420.4	0.187 abcde	0.75 a
6.Echo Zn 4.17 F 2.0 pt	1,3,7,9						
Reason 4.0 fl oz + Echo Zn 4.17 F 1.5 pt	2,5						
Luna Tranquility 8 fl oz + Manzate DF 24 oz	4,6						
Scala 7 fl oz + Manzate DF 24 oz	8,10						
Previcur Flex 1.2 pt.....	7	27.9	100.3	356.5	484.7	0.138 a	1.00 ab
7.Echo Zn 4.17 F 2.0 pt	1,2,4,8,10						
Reason 4.0 fl oz + Echo Zn 4.17 F 1.5 pt	3,6						
Luna Tranquility 11 fl oz + Manzate DF 24 oz	5,7						
Previcur Flex 1.2 pt	8						
Scala 7 fl oz + Manzate DF 24 oz.....	9,	27.9	91.2	343.9	463.4	0.161 abc	0.75 a
8.Echo Zn 4.17 F 2.0 pt	1,2,4						
Headline SC 6 fl oz + Echo Zn 4.17 F 1.5 pt	3,6						
Luna Tranquility 11 fl oz+ Echo Zn 4.17 F 1.5 pt	5,7						
Manzate DF 24 oz	8						
Scala 7 fl oz + Manzate DF 24 oz	9						
Super Tin 80 WP 2.5 fl oz.....	10	32.2	78.1	385.7	496.0	0.184 abcde	1.00 ab

9.Vertisan 1.67EC 1.0 pt + NIS 0.25%	1,3,5,7,9						
Tanos 50WG 6 oz + Manzate 75WG 24 oz.....	2,4,6,8,10	32.4	94.7	363.0	490.1	0.178 abcde	1.25 abc
10.Tanos 50WG 6 oz + Manzate 75WG 24 oz	1,3,5,7,9						
Vertisan 1.67EC 1.0 pt + NIS 0.25%.....	2,4,6,8,10	31.1	69.6	310.8	411.5	0.210 cdef	2.00 de
11.Echo Zn 4.17 F 2.0 pt	1,3,5,9,10						
Priaxor 4.0 fl oz + Echo Zn 4.17 F 2.0 pt	2,4,6						
Dithane DF 2.0 lb + Super Tin 80 WP 2.5 fl oz.....	7,8	20.1	85.3	344.0	449.4	0.153 ab	1.00 ab
12.Echo Zn 4.17 F 2.0 pt	1,3,5,9,10						
Priaxor 4.0 fl oz + Echo Zn 4.17 F 2.0 pt	4						
Endura 3.5 oz + Echo Zn 4.17 F 2.0 pt	2,6						
Dithane DF 2.0 lb + Zampro 14 fl oz.....	7,8	33.4	99.1	396.5	529.0	0.164 abc	1.00 ab
13.Echo Zn 4.17 F 2.0 pt	1,3,5,9,10						
Priaxor 4.0 fl oz + Echo Zn 4.17 F 2.0 pt	2,6						
Endura 3.5 oz + Echo Zn 4.17 F 2.0 pt	4						
Dithane DF 2.0 lb + SuperTin 80WP 2.5 fl oz.....	7,8	47.4	80.2	331.7	459.3	0.191 abcde	0.75 a
14.Echo Zn 4.17 F 2.0 pt	1,3,5,9,10						
Endura 3.5 oz + Echo Zn 4.17 F 2.0 pt	4,8						
Priaxor 4.0 fl oz + Echo Zn 4.17 F 2.0 pt	2,6						
Dithane DF 2.0 lb + SuperTin 80WP 2.5 fl oz.....	7	27.5	66.8	340.3	434.5	0.199 bcde	1.00 ab
15.Echo Zn 4.17 F 2.0 pt	1,3,5,9,10						
Priaxor 4.0 fl oz + Echo Zn 4.17 F 2.0 pt	2,6						
Endura 3.5 oz + Echo Zn 4.17 F 2.0 pt	4						
Quash WDG50 2.5 oz + Dithane DF 2.0 lb	7						
Dithane DF 2.0 lb + SuperTin 80WP 2.5 fl oz.....	8	36.7	115.6	348.0	500.3	0.181 abcde	1.00 ab
16.Echo Zn 4.17 F 2.0 pt	1,2,4						
Quadris Opti 1.6 pt	3,6						
Revus Top 7.0 fl oz + Echo Zn 4.17 F 2.0 pt	5,7						
Dithane DF 2.0 lb + SuperTin 80WP 2.5 fl oz	8						
Dithane DF 2.0 lb.....	9,10	56.6	44.6	369.5	470.6	0.180 abcde	1.25 abc
17.Champ Formula II 2.0 pt.....	1,3,5,7,9	30.6	68.1	296.0	379.2	0.219 cdef	1.50 bcd
18.Champ Formula II 2.0 pt.....	1-10	30.4	84.3	341.4	440.1	0.213 cdef	1.25 abc
19.Echo Zn 4.17 F 2.0 pt	1,2,4						

Headline SC 10 fl oz Echo Zn 4.17 F 2.0 pt	3,6						
Quash WDG50 2.5 oz + Echo Zn 4.17 F 2.0 pt	5,7						
Dithane DF 2.0 lb + SuperTin 80WP 2.5 fl oz.....	41496	27.0	73.5	348.6	463.3	0.204 bcde	1.00 ab
20.MANA 040611 0.5 pt	1,2,4						
MANA 040611 0.5 pt + Endura 3.5 oz + Equus 720SST 1.0 pt	3						
Headline SC 10 fl oz	5,7						
MANA 040611 0.5 pt + Equus 720SST 1.0 pt	6,8						
Equus 720SST 1.0 pt.....	9,10	37.7	65.2	326.0	426.5	0.209 cde	1.50 bcd
21.MANA 040611 1.0 pt	1,2,4						
MANA 040611 1.0 pt + Endura 3.5 oz + Equus 720SST 1.0 pt	3						
Headline SC 10 fl oz	5,7						
MANA 040611 1.0 pt + Equus 720SST 1.0 pt	6,8						
Equus 720SST 1.0 pt.....	9,10	25.2	87.7	356.9	459.8	0.198 bcde	1.25 abc
22.MANA 040611 1.5 pt	1,2,4						
MANA 040611 1.5 pt + Endura 3.5 oz + Equus 720SST 1.0 pt	3						
Headline SC 10 fl oz	5,7						
MANA 040611 1.5 pt + Equus 720SST 1.0 pt	6,8						
Equus 720SST 1.0 pt.....	9,10	33.7	100.8	297.3	410.1	0.183 abcde	1.50 bcd
23.Gavel 75DF 2.0 lb.....	1-10	31.6	49.8	336.8	471.3	0.175 abcd	1.00 ab
24.GWN-4700 3.4 oz.....	1-10	34.0	62.1	333.2	414.6	0.273 g	2.75 f
25.Zoxium 240SC 11.0 fl oz.....	1-10	28.0	65.6	282.5	378.6	0.263 efg	2.75 f
26.Echo 720SC 22.0 fl oz.....	1-10	41.2	79.0	301.9	395.4	0.189 abcde	1.50 bcd
27.GWN-10043 17.6 oz.....	1-10	35.1	94.6	326.1	446.3	0.231 defg	1.25 abc
28.GWN-10126 32.0 fl oz.....	1-10	22.3	76.4	355.1	484.8	0.218 cdef	2.00 de
29.GWN-10127 24.0 oz.....	1-10	27.2	72.8	302.5	401.2	0.230 defg	1.75 cd
30.Zoxium 240SC 11.0 fl oz + Echo 720SC 22.0 fl oz.....	1-10			323.8	423.8	0.195 bcde	1.00 ab
31.GWN-4700 3.4 oz + GWN-10043 17.6 oz.....	1-10	34.4	81.3	290.2	405.9	0.202 bcde	1.25 abc
32.Echo Zn 4.17 F 2.0 pt	1,2,4						
Headline SC 10 fl oz Echo Zn 4.17 F 2.0 pt	3,6						
Endura 3.5 fl oz+ Echo Zn 4.17 F 2.0 pt	5,7						
GWN-10126 32.0 fl oz.....	1-10	27.2	108.5	335.1	470.8	0.171 abcd	1.00 ab
33.Echo Zn 4.17 F 2.0 pt	1,2,4						

Headline SC 10 fl oz + Echo Zn 4.17 F 2.0 pt	3,6						
Endura 3.5 oz + Echo Zn 4.17 F 2.0 pt	5,7						
GWN-10127 24 oz.....	1-10	24.3	84.8	315.4	424.5	0.196 bcde	1.50. bcd

^zRAUDPC= Relative Area Under the Disease Progress Curve.

^yColumn numbers followed by the same letter are not significantly different at $P=0.05$ as determined by Fisher's Least Significant Difference (LSD) test.

^xBrown Spot Rating (0=no disease, 1<10%, 2=10-50%, 3=50-100% leaf area infected).

^wFungicide applications; : 1=20 Jun, 2 = 27 Jun, 3= 2 Jul, 4 = 11 Jul, 5 = 18 Jul, 6 = 25 Jul, 7 = 1 Aug, 8 = 8 Aug, 9 = 15 Aug, 10 = 22 Aug.