

Effective use of fungicides for the control of early blight and other leaf spotting diseases of potato.

Client: Keystone Potato Producers Association
Manitoba Agriculture, Food and Rural Initiatives

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Background: Early blight, caused by the fungus *Alternaria solani*, is a common disease of potatoes throughout Manitoba. For many years, control of this disease was accomplished by a protectant fungicide program largely targeted at late blight prevention. Control appeared to be adequate for most of the season, but early blight levels typically increased late in the season in spite of continued protectant fungicide applications. In the last few years, newer fungicide chemistries with improved early blight control have been developed. There are currently six of these products registered for use on potato. In addition to *A. solani*, there are other leaf spotting fungi that infect potato and have the potential to impact yield. The economic significance of black dot (*Colletotrichum coccodes*) and brown spot (*Alternaria alternata*) is not known, but in the field these diseases are often confused with early blight. Because of the potential for incorrect diagnosis, potato growers are often unsure of the fungicide to select, and how to assess the performance of the chosen product.

Objective: To evaluate the performance of fungicides registered for the control of early blight of potato and to identify the causal agents responsible for leaf spotting.

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Procedure:

Plot size: 4 rows by 12 m (Assessments conducted on 2 centre rows)
Trial design: RCB 4 replicates
Plot location: CMCDC Carberry, irrigated
Soil type: Wellwood Clay Loam
Crop: Potatoes
Variety: Shepody
Row spacing: 1 metre

Planting Date: May 28th

Treatments: Table 1

Table 1 List of fungicide treatments

Treatment Number	Fungicide Program	Product Rate	Application Schedule ^a
1	Untreated EB Check Allegro Tattoo	0.40 L/ ha 2.69 L/ ha	1-3, 5-7, 9, 10 4, 8,
2	Bravo 500	2.0 L/ ha	1-10
3	Polyram DF	2.25 kg/ ha	1-10
4	Bravo Quadris + Bravo	2.0 L/ ha 0.50 L/ ha + 2.0 L/ha	1,2,5, 6-10 3, 5
5	Bravo Quadris + Bravo	2.0 L/ ha 0.50 L/ ha + 2.0 L/ha	1-3,5-10 4
6	Polyram Headline Lance + Polyram	2.25 kg/ ha 0.45 L/ha 0.175 kg/ha + 2.25 kg/ ha	1, 3, 5-7, 9,10 2 ^b , 8 4
7	Polyram Headline Lance + Polyram	2.25 kg/ ha 0.45 L/ha 0.175 kg/ha + 2.25 kg/ ha	1, 3, 5-10 2 ^b 4
8	Dithane Reason + Dithane	2.25 kg/ ha 0.20 L/ ha + 1.25 kg/ha	1, 3, 5, 7, 9, 10 2, 4, 6, 8
9	Dithane Scala + Bravo	2.25 kg/ ha 0.75L/ ha + 1.73 L/ha	1, 3, 4, 6-10 2, 5
10	Manzate Tanos + Manzate	2.25 kg/ ha 0.56 kg/ ha + 1.73 kg/ ha	1, 3, 5-10 2, 4

^a Fungicide treatments were applied on a 7-day schedule commencing on July 4th and ending on September 5th

^b Fungicide was applied at tuber initiation

Foliar Application Method:

Equipment: Tractor mounted CO₂ sprayer
Nozzle Type: TurboDrop TD 015 venturi and a 110-04 nozzle
Nozzle Spacing: 50 cm
Nozzle Height: 45 cm
Pressure: 80 psi (550 kPa)
Volume: 225 L/ha

Top Kill: September 26th
Harvest: September 26th

Assessments:

1. The disease assessments were based on an assessment key developed for late blight of potato (Canadian Plant Disease Survey 1971 Vol. 51(2): 59-60). The rating scale is described below.

Rating	% leaf area blighted
0	0
1	<1%
2	1-10%
3	11-25%
4	26-50%
5	>50%

Disease assessments to determine the severity of leaf lesions within the plots were conducted starting mid-August and repeated twice at two week intervals. During each plot disease assessment, 10 leaves per plot were randomly collected. The disease incidence and severity of each leaf was rated according to the severity scale described above. A maximum of 12 lesions from each 10-leaf sample were randomly selected for further analysis (see #2 below).

2. A tissue section was cut from each of the lesions selected for analysis. The tissue was surface sterilized in 70% ethanol for 15 seconds, rinsed in sterile water, and plated onto potato dextrose agar (PDA). After approximately seven days of growth, standard microscopy was used to identify the fungal colonies present on the PDA plates.
3. Yield (total, marketable).

Results Severity Disease Analysis (Table 2):

Disease was first detected in mid August. Disease infection levels were moderate when compared to disease levels of previous years in the same location. On September 12th, all fungicide treatments (2-10) had a lower disease severity level than the untreated check. Treatment 5, which only received a single application of Quadris had similar disease severity levels as the standard fungicides (treatments 2 & 3). Treatments 6-10 had lower disease severity levels than the standard fungicides (treatments 2 & 3). Treatments 6 & 7 (Headline and Lance) had lower disease severity levels than all other fungicide treatments.

Table 2 Disease Severity

Trt #	Treatment Name	EB Severity Rating		
		16-Aug	28-Aug	12-Sep
1	Untreated Check	1.25	2.00 a	3.00 a
2	Bravo	1.00	1.50 ab	2.00 b
3	Polyram	1.00	1.50 ab	2.00 b
5	Quadris Reactionary / Bravo	1.00	1.00 bc	2.00 b
4	Quadris x 2 / Bravo	0.75	1.00 bc	1.75 bc
8	Reason x 4 / Dithane	0.75	1.00 bc	1.50 c
9	Scala x 2 / Bravo	0.50	1.00 bc	1.50 c
10	Tanos x 2 / Manzate	0.75	0.75 c	1.50 c
6	Headline x 2 / Lance / Poly	0.25	0.75 c	1.00 d
7	Headline / Lance / Poly	0.50	1.00 bc	1.00 d
Prob		0.1077	0.0006	<0.0001
CV%		57.03	30.86	19.56
LSD 0.05		NSD	0.51	0.52

Results Identification of Causal Agents of Leaf Lesions:

At the time of writing this report analysis of leaf lesion data was not complete.

Results Yield and Grade (Table 3):

There were no significant differences in yield between treatments.

Table 3 Yield and Grade

Trt #	Treatment Name	Yield cwt/acre		
		Undersize	Marketable	Total
1	Untreated Check	22.7	305.7	328.4
2	Bravo	19.3	339.8	359.1
3	Polyram	34.8	314.3	349.1
4	Quadris x 2 / Bravo	25.8	327.1	352.8
5	Quadris Reactionary / Bravo	27.3	330.3	357.6
6	Headline x 2 / Lance / Poly	23.4	336.2	359.6
7	Headline / Lance / Poly	23.2	343.3	366.5
8	Reason x 4 / Dithane	27.8	310.8	338.5
9	Scala x 2 / Bravo	22.7	342.5	365.2
10	Tanos x 2 / Manzate	24.6	318.9	343.5
Probability		0.1337	0.0994	0.1028
CV%		25.4	6.1	5.1
LSD 0.05		NSD	NSD	NSD

Summary:

The newer fungicides (Headline/Lance, Reason, and Scala) provided better control of leaf lesions than the standards Bravo and Polyram. A single application of Quadris (#5) did not perform better than the standard fungicides (bravo and Polyram).

In 2007, disease symptoms occurred too late in the season and disease severity was too low to affect yield.