FUNGICIDES AND POTATO LATE BLIGHT

by
D. A. Inglis, Assistant Plant Pathologist
Washington State University-Mount Vernon Research & Extension Unit

Late blight continues to be an important disease of Washington potatoes, particularly as our region addresses Ridomil resistance. This problem, also called metalaxyl insensitivity, was detected in Washington in 1990 and presently occurs in many areas of the United States. Migration of a new P. infestans type from Mexico is probably one of the ways metalaxyl-insensitivity was introduced into Washington since the new population is unlike any population previously identified in the United States or Canada. Using Ridomil products curatively (after blight infections) instead of preventively (before blight infections) and without integration into protectant fungicide spray programs possibly provided some of the selection pressure that helped the new population establish in Washington once it was introduced. Although at this time it is not known for certain what proportion of Washington's total P. infestans population actually consists of metalaxyl-insensitive types and what proportion of those overwinter, fungicides and fungicide spray programs appropriate for controlling this new population need to be indentified.

Such control was investigated in 1993 experimental field trials planted to White Rose on May 24 at WSU-Mount Vernon. In one trial seven fungicide treatments (Table 1) were compared in three-row plots replicated four times as a randomized complete design. In another trial three season-long spray programs (Table 2) replicated six times were compared. The plots, 20 ft long (9 in seed- and 42 in row spacing) were planted with 2.5 oz seedpieces immediately after cutting. Plots were separated by 10 ft-wide alleys to minimize interplot interference and to provide adequate access for an irrigation gun and ground-rig sprayer when needed.

Blight first was noted in the vicinity (on volunteer potatoes in pea fields) the last week in June, and in an adjoining trial on station July 2. To insure late blight infections, plots were inoculated July 5 with 2 g of rye seed, half of which had been artificially infested with a metalaxyl-insensitive, and the other half with a metalaxyl-sensitive, P. infestans isolate. Seeds were placed in the center of the middle row in the plant canopy and watered several times with 1 L water. For the fungicide trial, applications began on July 7 and continued at 7 day intervals for the first 3 wk, and then at 14 day intervals for the last 4 wk. Altogether, five applications were made July 7, 13, and 21, and August 5 and 18. For spray treatments in the blight management trial see Table 2.

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Table 1. Spray program followed for 1993 blight fungicide study.

Treatments
1. Nontreated control
2. Aliette 80WG (2 lb/A) + Maneb 80W (2lb/A)
3. Experimental 1
4. Experimental 2
5. Experimental use of Fluazinam 500F (.166 qt/A)
6. Bravo 720 (.584 qt/A) with Bond (1 pt/A)
7. Experimental 3
8. Experimental 4

Table 2. Spray program followed for 1993 blight management study.

Trt	7/2	7/7	7/13	7/21	7/30	8/6	8/13	8/17
1	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
2	BRV	DTH	MZ58	BRV	DDF	BRV	DTH	BRV
3	NONE	MZ58	MZ58	BRV	DDF	BRV	DTH	BRV
4	NONE	BRV	DTH	BRV	DDF	BRV	DTH	BRV

1 = nontreated control. 2 = P-R-P [early use of protectant fungicides Bravo 720 (.75 pt/a) and Dithane DF (2 lb/a)] on July 2 and July 7, respectively, followed by one application of Ridomil MZ-58 (2 lb/a) July 13 and then Bravo (1.5 pt/a) alternating with Dithane on a weekly basis through August 17].
3 = R2x-P [two applications of Ridomil MZ-58 July 7 and July 13 followed by Bravo (1.5 pt/a) alternating with Dithane on a weekly basis through August 17]. 4 = P's only [Bravo (.75 pt/a first application, 1.5 pt/a thereafter) alternating with Dithane on a weekly basis beginning July 7 and continuing weekly through August 17].

The 1993 growing season in western Washington was favorable for late blight. Total rainfall April through August was about 10 in. An additional 3 in water was applied during the growing season through overhead irrigation. At the end of the study plants in all the nontreated control plots were dead. Beginning on July 13 and continuing weekly through August 24 the record row of each plot was rated for percent foliage affected by late blight. On the last three dates each row was divided into five equal parts so five ratings could be made and then averaged. Percent infection was plotted against time so treatment comparisons could be made (Figures 1 & 2). P. infestans isolates obtained from the trial at the end of the season were metalaxyl-insensitive as determined by a qualitative laboratory culture assay, and were probably representative of the blight population in western Washington in 1993.

Vines were chopped and sprayed with Diquat (1 pt/A) August 25, and sprayed again August 31. Hand harvesting and grading was done September 8 (see Table 3 & 4 for pack-out). Forty tubers were randomly removed from each plot at the time of harvest, and twenty were washed and rated for tuber blight. Only a few blighted tubers were detected in the entire trial at harvest, probably because blighted tubers already had decomposed during the 3 wk interval between vine kill and harvest; also, there may have been limited infections initially because hills were not shallow or cracked and did not allow for entry of sporangia onto the tubers. The other twenty tubers that were put into high humidity storage for 3 mo also had negligible blight.

Blight Fungicide Study. Weekly fungicide sprays initiated early (when plants were 6 to 8 in tall and leaves in the same row touched) significantly reduced blight development (Table 5). Even though the spray schedule was extended to 14 days at the end of the season (when blight pressure still was high), the impact on yield was not significant for most of the treatments. Aliette/Maneb and experimental materials 2 & 3 had the lowest incidence of blight as compared by areas under disease progress curves. Aliette/Maneb had slightly lowered yield compared to these other two materials. The nontreated control and experimental 4 had the most blight in the trial--many plants died by the end of the season and yield was lower than for the other treatments. Experimental 1, Fluazinam and Bravo had low levels of blight until the end of the season; but, when the spray schedule was extended to 14 days disease levels increased. Yield for these treatments and materials 2 & 3 was similar, however. Work needs to continue on the efficacy of new materials and timing for metalaxyl-insensitive P. infestans control.

Blight Management Study. Metalaxyl-insensitive late blight obviously had a significant negative impact on yield, and the three spray programs (one early Ridomil application sandwiched between protectant fungicides and then protectants thereafter, two Ridomil applications initially and then protectants thereafter, and protectants only) resulted in a significant reduction in disease and increase in yield compared to the nontreated control (Table 6). Sandwiching one early (when plants were 6 to 8 in tall and leaves in the same row touched) Ridomil-MZ58 application between protectant fungicide applications reduced disease severity compared to spray programs where protectants were used later (AUDPC = 58.63 versus 99.8 and 86.96).

AUDPC values and yield were not significantly different (p=0.01) between the three programs tested, however. The sandwiching technique early in the season may be beneficial, though, especially in areas where metalaxyl-insensitive blight overwinters and is present at the beginning of the season. It allows for the control of metalaxyl-insensitive P. infestans early before the fungus reproduces.

Using Ridomil preventively, early in the season, for only a limited number of times, and integrated into spray programs consisting of regular protectant fungicide applications that continue for the duration of the season appears to be satisfactory for managing blight populations that are insensitive to metalaxyl but also have a sensitive component. It also allows for use where there is metalaxyl-insensitivity, but Pythium leak and pink rot storage rots are of additional concern.

References:

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Table 3. Effect of fungicide treatments on pack-out (expressed as g/20 ft) in 1993 blight fungicide study. *Note: 1 g/20 ft = .0137 cwt/A.*

Treatments	U.S. No. 2's	U.S. No. 1's 2-4 oz	U.S. No. 1's 4-10 oz	U.S. No. 1's >10 oz
1 Check	2204	9539	10181 c	725
2 Al-MB	1971	7232	15576 b	3269
3 Exp 1	1619	8364	17668 ab	2723
4 Exp 2	1954	7349	19767 ab	2773
5 Fluaz.	2152	8094	19691 ab	3390
6 Bravo	1937	7861	19160 ab	3468
7 Exp 3	1904	6145	21671 a	3347
8 Exp 4	1754	9714	15777 b	976
LSD	1039NS	2502.5NS	5209.5*	2498.7NS

Table 4. Effect of fungicide treatments on pack-out (expressed as g/20 ft) in 1993 blight management study. *Note: 1 g/20 ft = .0137 cwt/A.*

Treat-ments	U.S. No. 2's	U.S. No. 1's 2-4 oz	U.S. No. 1's 4-10 oz	U.S. No. 1's >10 oz
Check	2256.7	6562.7	11184	819
PRP	1703.7	6204.7	17137	2511
RP	2090.3	5743.7	15320	4780
P	2345.7	5520.8	17329	2631
LSD	658.67	1383.7	3664**	3905.2

Table 5. Effect of fungicide treatments on AUDPC (area under disease progress curve) and total yield in 1993 blight fungicide study.

1993 Blight Fungicide Test

WSU-Mount Vernon

Treatment (White Rose)	AUDPC	CWT/A
Ck	1096 a	341 c
Aliette/Maneb	50 d	430 b
Exp I	235 c	454 ab
Exp II	54 cd	481 ab
Fluazinam	215 cd	499 a
Bravo	193 cd	486 ab
Exp III	52 d	500 a
Exp IV	526 b	420 b
LSD	181.05**	65.79**

Table 6. Effect of fungicide treatments on AUDPC (area under disease progress curve) and total yield in 1993 blight management study.

1993 Blight Management Study

Treatment (White Rose)	AUDPC	CWT/A
1. Check	882.51a	314.73 a
2. Early protectants/Ridomil once/protectants	58.63 b	415.78 b
3. Ridomil twice/protectants	99.80 b	418.74 b
4. Protectants only	86.96 b	420.25 b
LSD	41.981**	59.106*

Figure 1. Effect of fungicide treatments on disease progress during the season for 1993 blight fungicide study.

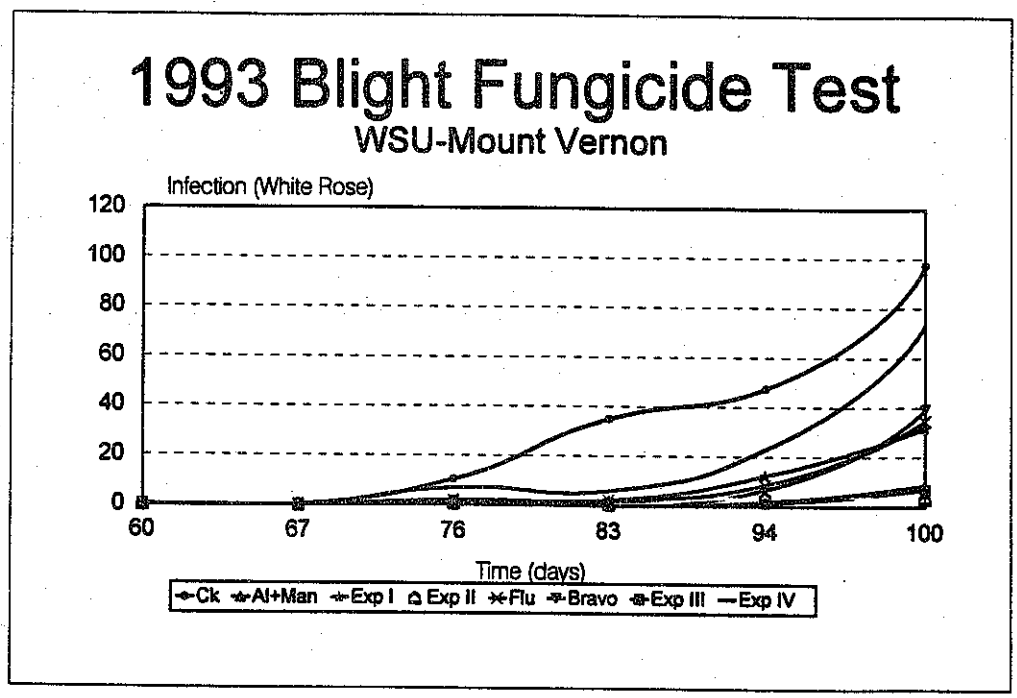

Figure 2. Effect of fungicide treatments on disease progress during the season for 1993 blight management study.