

1990 Early Blight Control Studies San Luis Valley, Colorado

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ABSTRACT

Twelve fungicide treatments and 2 fertilizer treatments were tested on cv. Sangre and compared to a non-treated check plot. All treatments were rated for effects on plant growth, vigor, early blight (*Alternaria solani*) disease severity and tuber yield and grade. All disease measured during the study was the result of natural infection and no inoculations were done in the field.

Data showed there were no significant treatment effects on plant height or vigor except for treatment 10 ($P < 0.05$). Treatment 10 reduced vigor and proved to be extremely phytotoxic under the conditions it was applied. Bravo/Duter in combination significantly reduced disease severity by August 2 when compared to the check but was not better than other Bravo formulations or the 1.5 pt rate of Rovral applied for treatment 5 ($P < 0.05$).

Data for the average number of early blight lesions/leaflet showed that even though there were no significant treatment effects evident on August 24, treatment effects occurred for data collected August 29 ($P < 0.05$). This data was collected 28 days after the final Rovral applications were made and 16 days after the final Bravo applications were made. All Rovral treatments and Bravo 720 treatments provided statistically equivalent early blight control ($P < 0.05$). Four applications of Bravo 90 DG were significantly better than 2 applications of Rovral but were equivalent to 3 applications of Rovral ($P < 0.05$). Bravo/Duter in combination or Bravo/Zinc provided significantly better control than all other treatments except for Bravo 720 alone at 1.5 pt/A or Bravo 90 DG ($P < 0.05$).

Recently developed (experimental) compounds applied for treatments 11-14 did not appear to have activity against *Alternaria solani* under the conditions this field test was run ($P < 0.05$). These treatments and Microp 4XL had no significant effect on any of the data collected during this study ($P < 0.05$).

Treatment 10 (Texsul 10:30) was the only treatment that significantly affected (reduced) yield and all other treatments were statistically equal to the untreated check ($P < 0.05$). A high incidence of decay (assumed to be caused by *Phytophthora erythroseptica*; Western Leak or Pink Rot organism) was found in the plots at the time of harvest. None of the treatments affected the weight of tubers rotted ($P < 0.05$).

MATERIALS AND METHODS

Field trials were conducted at the Colorado State University Research Center located in the San Luis Valley, near Center, Colorado. The SLV is classified as a high desert valley (ca. 7600 ft msl) with abundant irrigation water. At least

90% of Colorado's potato crop is produced in the SLV with an estimated 65,000 A planted in 1990. Most of the crop is stored after harvest and sold on the fresh market.

Research plots were located within a certified seed field. The soil type was a gravelly sandy loam and plots were irrigated throughout the growing season using furrow irrigation. Normal cultural practices were followed throughout the study. The cultivar used in the study was Sangre. Sangre is an early to medium maturing red-skinned white-fleshed cultivar grown for the fresh market.

A portable (back-pack) sprayer was used to apply treatments to plots 25 ft long X 4 rows wide (row spacing=34 in). Treatments were delivered in a total volume of 40 gal/A at 18 psi boom pressure. The check plot (treatment 1) was not treated. Foliar treatments used, application rates, dates of application and the total number of applications made are listed in Table 1. Two of the treatments (#2. MICROP 4XL and #10. TEXSUL 10:30) are potential fertilizers and not fungicides but were included in the study to determine their effect on Sangre in the San Luis Valley. Microp 4XL was applied to these plots on June 1, June 20 and July 16 at the rate of 1 gram/acre in 40 gallons of spray. An additional study was done using Microp 4XL; those results are not included in this report.

Table 1. Treatments applied in 1990 Early Blight Trials. G. D. Franc, Colorado State Cooperative Extension, San Luis Valley Area, Center, CO.

TREATMENT (40 gal/Acre of spray applied)	DATE OF APPLICATION (N/A=NOT APPLICABLE)				TOTAL # OF APPLICATIONS
	JUL 12	JUL 23	AUG 1	AUG 13	
1 CHECK (NOTHING APPLIED)	N/A	N/A	N/A	N/A	N/A
2 MICROP 4XL, 1 oz/A (EARLY SOIL SURFACE APPLICATION)	N/A	N/A	N/A	N/A	N/A
3 ROVRAL 4F (1.0 pt/A) + TRITON CS-7 (0.125% V/V)	+	+	+		3
4 ROVRAL 4F (1.0 pt/A) + TRITON CS-7 (0.125% V/V)	+		+		2
5 ROVRAL 4F (1.5 pt/A) + TRITON CS-7 (0.125% V/V)	+		+		2
6 BRAVO 720, 1.0 pt/A	+	+	+	+	4
7 BRAVO 720, 1.5 pt/A	+	+	+	+	4
8 BRAVO 900G, 0.875 lbs/A	+	+	+	+	4
9 BRAVO/ZINC, 1.5 pt/A	+	+	+	+	4
10 TEXSUL 10:30	+				1
11 MN 4004	+	+	+	+	4
12 MN 4008/OT-80.5	+	+	+	+	4
13 MN 4008	+	+	+	+	4
14 MN 4016	+	+	+	+	4
15 BRAVO 720 (1 pt/A) + DUTER (8 oz/A)	+	+	+	+	4

All data were collected from the center two rows of the 4 row field plots. A randomized complete block design of 15 treatments was used for the study with 3 replications. Data was analyzed using *MSTAT-C* (subprogram: *ANOVA-2*) and means

were separated using Duncan's Multiple Range Test at $\alpha=0.05$ (subprogram: RANGE). All data collected using the Horsfall-Barratt scale were analyzed directly and converted to percentage for presentation in the tables. Data analyzed for the study are listed in Appendix 1 and Appendix 2.

RESULTS

Data in Table 2 shows there were no significant treatment effects on plant height ($P<0.05$). When compared to the check plot, treatment 10 significantly reduced plant vigor and proved to be extremely phytotoxic under the conditions it was applied ($P<0.05$). None of the other treatments significantly affected plant vigor ($P<0.05$).

Data in Table 2 also showed treatments 10 and 15 were the only treatments that significantly reduced the estimated percentage of leaflets infected with early blight when data was collected on August 2 ($P<0.05$). However, the Bravo/Duter combination applied for treatment 15 was not significantly better than the other Bravo formulations or the 1.5 pt rate of Rovral applied for treatment 5 ($P<0.05$). Although treatment 10 appeared to reduce infection, this effect was not real because leaves were desiccated from the treatment and it was impossible to collect meaningful data.

Data for the average number of early blight lesions/leaflet (Table 2) shows that even though there were no significant treatment effects evident on August 24, treatment effects occurred for data collected on August 29 ($P<0.05$). This data was collected 28 days after the final Rovral applications were made (August 1) and 16 days after the final Bravo applications were made (August 13). On August 29, treatment 2, treatment 5 and treatments 10-14 did not differ significantly from the untreated check ($P<0.05$). All Rovral treatments (treatments 3-5) and Bravo 720 treatments (treatments 6 and 7) provided statistically equivalent early blight control ($P<0.05$). Four applications of Bravo 90 DG (treatment 8) were significantly better than 2 applications of Rovral (treatments 4 and 5) but were equivalent to 3 applications of Rovral ($P<0.05$). Bravo/Duter in combination or Bravo/Zinc (treatments 15 and 9, respectively) provided significantly better control than all other treatments except for Bravo 720 alone at 1.5 pt/A (treatment 7) or Bravo 90 DG (treatment 8) ($P<0.05$).

Although the trend was not significant for individual treatments, field plots treated with Bravo 720 (treatments 6-8) showed less infection than those treated with Rovral. Field plots were treated with Bravo 4 times and Rovral treatments received 2 or 3 applications. Rovral treatments receiving 3 applications had less infection than those receiving 2 applications.

The numbered (experimental) compounds applied for treatments 11-14 did not appear to have activity against *Alternaria solani* under the conditions this field test was run ($P<0.05$). These treatments and Microp 4XL had no significant effect on any of the data collected during this study ($P<0.05$).

Data in Table 3 shows there was a significant treatment effect on tuber yield and grade ($P<0.05$). However, treatment 10 (Texsul 10:30) was the only treatment that significantly affected (reduced) yield and all other treatments were statistically equal to the untreated check ($P<0.05$). The reduction of yield

caused by treatment 10 was due to extreme phytotoxicity and not related to early blight control or lack thereof. Results showed that this product cannot be used at the rate tested in this study. None of the other treatment means differed significantly from the untreated check.

A high incidence of decay (assumed to be caused by *Phytophthora erythroseptica*; Western Leak or Pink Rot organism) was found in the plots at the time of harvest. The weight of tubers decayed was determined and analyzed along with other yield data. None of the treatments had a statistically significant effect on the weight of tubers rotted ($P < 0.05$).

DISCUSSION

All infection measured during the study was the result of naturally occurring inoculum and no inoculations were done in the field. Potatoes had been grown continuously in these plots for over 5 yr to encourage the natural increase of potato pathogens. Increased disease pressure may change the relative effect of the treatments included in this study.

Table 2. Effect of foliar fungicide treatments on cv. Sangre plant height, vigor and foliar early blight disease severity. G. D. Franc, Colorado State Cooperative Extension, San Luis Valley Area, Center, CO 1990.

	TREATMENT APPLIED ¹	PLANT HEIGHT		PLANT VIGOR	ESTIMATED * LEAFLETS INFECTED	AVERAGE NUMBER LESIONS PER LEAFLET ON:	
		AUG 9	AUG 10			AUG 24	AUG 29
1	CHECK	18.6	5.0 AB	35.0 AB	3.1	26.6 AB	
2	MICROP 4XL	15.5	4.3 B	37.0 A	2.8	31.4 A	
3	ROVRAL 4F:10D 1 PT	15.4	4.5 AB	28.0 AB	1.7	18.1 DE	
4	ROVRAL 4F:200 1 PT	16.1	5.0 AB	31.0 AB	2.8	19.6 CD	
5	ROVRAL 4F:200 1.5 PT	16.2	4.5 AB	19.5 ABC	2.3	20.3 BCD	
6	BRAVO 720 1 PT	16.2	5.5 A	17.0 BC	1.6	17.7 DE	
7	BRAVO 720 1.5 PT	16.7	5.0 AB	17.0 BC	2.0	13.9 DEF	
8	BRAVO 90 DG 0.875 LBS	15.6	5.2 AB	23.5 ABC	1.8	12.8 EF	
9	BRAVO/ZINC	15.7	4.8 AB	22.0 ABC	2.6	11.1 F	
10	TEXSUL 10:30	12.3	3.0 C	2.0 D	1.1	25.1 ABC	
11	MN 4004	16.4	4.8 AB	26.5 ABC	2.8	29.1 A	
12	MN 4008/DT-B0.5	16.8	4.8 AB	18.5 ABC	2.4	25.6 ABC	
13	MN 4008	15.8	4.2 B	26.5 AB	2.7	27.3 A	
14	MN 4016	17.0	4.7 AB	21.0 ABC	2.9	25.7 ABC	
15	BRAVO 720 1.0 PT/DUTER 8 OZ	15.5	4.5 AB	11.5 C	2.1	9.6 F	
	SIGNIFICANCE ²	NSD	P<0.05	P<0.05	NSD	P<0.05	

¹ Treatments were applied with the aid of a backpack sprayer in a total volume of 40 gallons of spray per acre. Treatment plots were 4 rows wide (34 inch centers) X 25 feet long.

² Treatment means with different letters differ significantly (P<0.05). Duncan's multiple range test was used for mean separation.

Table 3. Effect of foliar fungicide treatments on cv. Sangre yield and grade. G. D. Franc, Colorado State Cooperative Extension, San Luis Valley Area, Center, CO 1990.

TREATMENT APPLIED ¹		SANGRE YIELD (CMT/A) ON SEPTEMBER 18									
		US#1 (>10 OZ)	US#1 (<10 OZ)	US#1 (Total)	US#2	B SIZE	CULLS	ROTTED (LEAK)	TOTAL		
1	CHECK	22.2 AB	153.9 A	176.2 A	2.5	8.8	15.1	42.6	245.2 A		
2	MICROP 4XL	33.2 AB	162.1 A	195.4 A	3.0	9.5	13.3	15.4	236.5 A		
3	ROVRAL 4F:100 1 PT	20.1 ABC	155.1 A	175.2 A	2.6	7.7	15.8	32.8	234.08 A		
4	ROVRAL 4F:200 1 PT	9.2 BC	165.3 A	178.5 A	1.2	9.3	9.9	46.1	245.1 A		
5	ROVRAL 4F:200 1.5 PT	26.6 AB	156.3 A	183.0 A	2.6	10.8	19.3	27.5	243.0 A		
6	BRAVO 720 1 PT	26.8 AB	146.2 A	172.9 A	0.6	8.2	10.0	66.5	258.2 A		
7	BRAVO 720 1.5 PT	34.2 AB	165.1 A	199.4 A	4.0	8.1	11.8	37.5	260.7 A		
8	BRAVO 90 DG 0.875 LBS	23.6 AB	145.5 A	169.1 A	4.5	7.0	14.1	42.0	236.8 A		
9	BRAVO/ZINC	40.9 A	136.9 A	177.8 A	2.9	9.4	10.1	51.3	251.7 A		
10	TEXSUL 10:30	0.8 C	74.7 B	75.5 B	2.4	12.1	4.4	43.8	138.1 B		
11	MN 4004	23.7 AB	148.4 A	172.1 A	4.9	7.4	7.3	60.0	251.7 A		
12	MN 4008/OT-80.5	29.3 AB	138.0 A	167.3 A	0.7	7.5	17.5	63.1	256.2 A		
13	MN 4008	34.4 AB	158.3 A	192.7 A	2.6	8.4	12.3	21.4	237.4 A		
14	MN 4016	23.5 AB	147.4 A	170.9 A	5.1	9.6	15.9	37.0	238.5 A		
15	BRAVO 720 1.0 PT/DUTER B OZ	41.8 A	149.6 A	191.5 A	1.8	6.7	9.5	29.7	239.2 A		
	SIGNIFICANCE ²	P<0.05	P<0.05	P<0.05	NSD	NSD	NSD	NSD	P<0.05		

¹ Treatments were applied with the aid of a backpack sprayer in a total volume of 40 gallons of spray per acre. Treatment plots were 4 rows wide (34 inch center) X 25 feet long.

² Treatment means with different letters differ significantly (P<0.05). Duncan's multiple range test was used for mean separation.