LACK OF ECONOMIC BENEFIT BY EARLY BLIGHT FUNGICIDES APPLIED THROUGH CENTER PIVOT IRRIGATION SYSTEMS [1]

by
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Summary

Four applications of Du-ter ® applied through a center pivot irrigation system did not control early blight or increase yield. Four to six applications of Bravo ® applied through the sprinkler in August before the onset of disease significantly reduced numbers of subsequent lesions in both years of testing, but did not increase yield.

Introduction

Sprinkler systems have been successfully used to apply fertilizers (5, 10, 13), herbicides (14, 15), fungicides (1, 6, 12) and insecticides (11). This method saves the grower time and the use of energy.

Recently, Bravo ®, chlorothalonil, applied at the end of the irrigation period through solid set, portable sprinklers and during irrigation through center pivot irrigation systems was compared to aircraft and ground spraying for control of early blight in Idaho (12). Application through irrigation systems and aircraft application was as effective as ground spraying and all had less severity of early blight than the non-treated control. Unfortunately, yield data was not reported for either year.

In contrast to the Idaho results, we previously found that aircraft-applied fungicides neither controlled early blight nor increased yield of potatoes grown under sprinkler irrigation (4). Recently, Du-ter ®, triphenyltin hydroxide, and Bravo have been cleared for application through sprinkler systems by the Washington State Department of Agriculture. Thus we evaluated Du-ter and Bravo injected during irrigation through center pivot systems for control and increase in production of Russet Burbank.

Materials and Methods

Center pivot irrigation circles (98-125 acres) of the Russet Burbank were divided into pie-shaped treatment plots of about 10 acres each by either shooting angles at the center pivot with surveyor's transit or measuring arcs at the outer circumference. Treatments of Du-ter (1 year) and Bravo (2 years) were replicated at least 4 times in a random manner.

At the beginning of the experiment dye was injected into the center pivot system with a high pressure fertilizer injector pump during irrigation to determine the time to start or stop the fungicide injection. This same pump was calibrated to inject 8 to 9.5 oz/a of Du-ter and 1 or 1.5 pt of Bravo/a in approximtately 0.5 gal of solution per minute at the fastest center pivot rate of travel (Table 1).

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Irrigation catch bottles with 3.75-inch diameter metal funnels were placed about 200 ft outside the outer circumference of each plot to determine gallons of water applied per acre (Table 1).

Early blight lesions were counted from a sample of 20 leaves collected biweekly at random from each plot at the start of fungicide treatment (Table 1).

Aerial infrared pictures were taken weekly in 1976 and 1977 to locate and document any visual difference between treatments.

Five to six 20-ft single row plots in each treatment were harvested in mid-September. Samples from each treatment were composited for yield and grade determinations.

Results

Control plots averaged less than 1 lesion per leaf until early August (Table 1). Moderate to severe early blight developed the last of August and numbers of lesions increased rapidly up to as high as 72.5 lesions per leaf in 1977 (Table 1).

Four applications of Du-ter starting on June 8 and ending August 7 gave no control in 1973 (Table 1). Applying Bravo 4 to 6 times, starting in early August and ending in early September significantly reduced the numbers of lesions in 1976 and 1977. Infrared photos of fields showed visual differences between Bravo-treated and control plots by September in 1976 but not in 1977. Neither Du-ter nor Bravo significantly increased yields. Bravo did seem to increase the % U.S. No. 1 tubers with the increase being significant at the 1 pt/a rate in 1976. The fields we studied died prematurely by mid-September.

Discussion

The first fungicide application for early blight control should be in late July or early August in Washington (Table 1) (4). The 4 to 6 applications of Bravo reduced the number of early blight lesions but did not increase yield. The 4 applications of Du-ter applied prior to August 7 probably were applied too early for control. However, in Idaho McMasters and Douglas (12) with only 2 applications of Bravo applied through a center pivot irrigation system on July 26 and August 6 controlled early blight until August 27.

Bravo reduced the number of early blight lesions by one-half or more up into September, but did not increase yield (Table 1). These findings agree with those of Harrison, et al (7, 8) in Colorado where they controlled the disease with ground-applied fungicides to rill irrigated potatoes but did not increase yields. These results do not agree with those of Douglas and Groskopp (3) who were able to control early blight and increase yields in eastern and southeastern Idaho with ground-applied fungicides on sprinkler irrigated potatoes. Harrison, et al (7) attributed their lack of yield increase to the late development of disease under Colorado conditions and his difficulty in measuring early blight defoliation because of the prevalence of Verticillium wilt (8, 9).

Fields of Russet Burbank die early by known (8, 9, 16) and unknown factors in Washington, even those that have had only one previous crop of potatoes. Early blight is most severe on the foliage of such physiologically aged early dying plants (2). Therefore, if fungicides are ever to give economic benefit they should under these severe early blight conditions, but they did not. Even though Bravo controlled early blight it did not control the other diseases. Early blight probably would not have been an economic problem even in the absence of the other diseases since it doesn't express itself on foliage in fields that do not have early dying.

We conclude that fungicides applied by aircraft and through center pivot irrigation for early blight control do not provide any economic benefit under growing conditions in Washington.

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Table 1. Effect of fungicides applied through a center pivot irrigation system on production of Russet Burbank potato and the control of early blight.

Fungicides	Year	Rate/acre	Gal. solution/acre[1]	Early blight lesions/leaf[2]						% U.S. No. 1 tubers (lb)	Yield cwt/a
				July 1-5	July 15	Aug 1-8	Aug 13-23	Aug 27-Sept 2	Sept 7-10		
Du-ter	1973	8-9.5 oz	3952	--[3]	0.6 a[4]	2.1 a	8.0 a	27.1 a	--	65 a	634 a
Control	1973	None	--	--	0.8 a	2.0 a	9.5 a	31.7 a	--	63 a	640 a
Bravo	1976	1 pt	5976	0 a	0.1 a	0.2 a	6.6 a	5.1 a	5.8 b	78 a	609 a
Bravo	1976	1.5 pt	5976	0.1 a	0.3 a	0.2 a	6.9 a	6.3 a	11.3 b	74 b	581 a
Control	1976	None	--	0.2 a	0.0 a	0.1 a	9.1 a	10.3 a	38.6 a	72 b	580 a
Bravo	1977	1.5 pt	5103	0.01 a	0.0 a	1.4 a	0.9 a	15.7 b	7.2 b	60 a	619 a
Control	1977	None	--	0.1 a	0.0 a	2.8 a	2.3 a	72.5 a	46.67 a	54 a	597 a

[1] Du-ter in 1973 was injected on June 8, July 17, July 26 and August 7 in 4137, 3921, 3946 and 3809 (ca. 3952) gal solution/a. Bravo in 1976 was injected August 4, August 13, August 23 and September 1, in 5897, 5862, 5809 and 6334 (ca. 5976) gal solution/a. Bravo in 1977 was injected on August 4, August 11, August 18, August 25, September 2 and September 9 in 5253, 4503, 5103, 6604, 5253 and 3902 (ca. 5103) gal solution/a.

[2] Average count of 20 leaves/treatment.

[3] Data not recorded.

[4] Treatments with the same letter in a given year are not significantly different at the 5% level according to Duncan's Multiple Range Test.