SCREENING OF POTATO FUNGICIDES IN 1967[1]

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Introduction

The weather in Prince Edward Island was generally favorable for the development and spread of potato late blight, Phytophthora infestans (Mont.) de Bary, in the growing season of 1967. At the Research Station, the rainfall of 9.65 inches was well distributed throughout the 13-week period beginning July 1, and recordable amounts were collected for 33 days. In addition, trace amounts were observed on a number of other days. Mean relative humidities of over 80% were recorded for 10 of the weeks and there were many periods of 24 hours or longer in which 90 to 100% readings were recorded. The longest of these was 96 hours, Dews were frequent and often heavy, and these, because of generally low evaporation rates, maintained moisture on the foliage and provided the spores with ideal conditions for germination. Thus the conditions under which the fungicides were screened were the severest in years.

Materials and Methods

The 13 fungicides briefly described below were compared in the 1967 screening test at Charlottetown, P.E.I.

Brestan 60. American Hoechst Corporation, California. A combination of triphenyltin acetate (60%) and maneb (20%). 7 oz/acre.

Cela A-36. Cela, Ingelheim, Germany. Confidential. 7 oz/acre.

Cufram Z. Niagara Brand Chemicals, Burlington, Ontario. Complex containing Zn, Mn, and Cu. 1.5 lb/acre.

Daconil 2787. Diamond Alkali Company, Painesville, Ohio. Tetrachloroisophthalonitrile (75%). 1.0 lb/acre.

Difolatan, flowable. Chevron Chemical (Canada) Limited, Oakville, Ontario. Cis-N-(1,1,2,2-tetrachloroethyl) thio-4-cyclohexene-1, 2-dicarboximide. Product contained 1.0 lb actual per 0.8 Imperial qt and was used at 1.2 qt per acre, giving an acre dosage of 1.5 lb actual chemical.

Difolatan 80 W. Supplier and chemical as above. Used at 1.5 lb/acre, giving an acre dosage of 1.2 lb actual chemical.

Dithane M-45. Rohm and Haas Company of Canada Limited, West Hill, Ontario. Zinc coordinated manganese ethylenebis(dithiocarbamate). Mn, 16%; Zn, 2%. 1.5 lb/acre.

DuTer. Philips-Duphar, Amsterdam, Holland Triphenyltin hydroxide (20%). 1.0 lb/acre.

Fennite. Fisons (Canada) Limited, Toronto, Ontario. Confidential. 1.5 lb/acre.

Organil 66. Procida, Neuilly sur Seine, France. Confidential. 1.5 lb/acre.

Polyram 80W. Niagara Brand Chemicals, Burlington, Ontario. Zinc activated polyethylene thiuram disulfide. 1.5 lb/acre.

RH-90. Rohm and Haas Company of Canada Limited, West Hill, Ontario. Confidential. 2.4 lb/acre.

Siaprit. S.I.A.P.A., Rome, Italy. Zineb (47%). 3.7 lb/acre.

Plots of the blight-susceptible potato 'Green Mountain' were planted by hand on June 9, 50 seed pieces being dropped in each 50-ft row. Individual plots were 50 ft long by four rows wide and 14 of them were laid out in each of five ranges. Single rows of the same cultivar were planted as buffers between plots and as borders for the area. These rows were not treated with fungicides.

During the first part of the season the experiment was adversely affected by the weather. Precipitations for May and June were respectively 6.23 inches and 5.72 inches, the highest recorded for these months since the station was established in 1909. Fortunately, no rain fell in the first few days of June and it was during this time that tillage, fertilization, and planting were carried out. During the remainder of the month there were periods of heavy rain as, for example, June 15-18 with 1.83 inches and June 21-23 with 2.43 inches. The result was that standing water over a part of the first range caused so much seed-piece decay that this replicate had to be eliminated from the test. The low yields obtained this season were probably caused by the removal of some of the fertilizer through erosion and seepage.

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No insecticides, were added to the fungicide mixtures. Instead insects were controlled by spraying the entire area with endosulfan at appropriate times. The fungicides were applied on July 18, 26; August 3, 10, 17, 28; and September 7, 12, at a mean interval of 8 days. The applications were made with a tractor-sprayer unit, which delivered 120 gal/acre.

On July 29, the buffer and border rows were inoculated by sprinkling the foliage with a water suspension of spores produced on cultures of race 1, 2, 3, 4, 5, 6, 7 and race 1, 3, 4, 6, 7, 8. The disease established itself at a moderate pace through August and accelerated rapidly early in September, when showers and intermittent rains prevailed during the first six days of the month. This latter period provided constant ideal conditions for sporulation and germination and made it impossible to spray the plots. The multiplicity of leaf infections during these days was soon manifested by the severe defoliations shown in Table 1. The defoliation of the check plots reached 80% on September 5, and differences in the fungistatic abilities of the test products, under these extreme conditions, became apparent.

The test ended when the plants were sprayed with a sodium arsenite top killer on September 18, 101 days after planting. In the first week of October the crops were lifted, graded, weighed and examined for tuber rot Data are presented in Table 2.

Table 1. Percentage defoliation

Treatment	Sept. 5	Sept. 12	Sept. 15
Brestan 60	14	30	40
Cela A-36	27	58	80
Cufram Z	22	58	68
Daconil 2787	16	38	43
Difolatan, Flowable	12	19	22
Difolatan 80W	17	26	34
Dithane M-45	9	14	18
DuTer	13	46	54
Fennite	22	41	54
Organil 66	9	17	23
Polyram 80W	13	31	41
RH-90	7	14	20
Siaprit	9	25	40
Check	80	100	100

Results and discussion

The fungicides in the 1967 trials were compared under a very severe disease epidemic. After the fourth application, on August 28, spraying was delayed because it rained for several days, and, during this period, the foliage in the treated plots would have been under constant attack by spores from the inoculated rows. Under these severe conditions, Dithane M-45, RH-90, Difolatan (flowable), and Organil 66 gave the best control of foliage blight. The flowable preparation of Difolatan was superior to the 80% wettable powder form; but plots sprayed with the 80W powder received 0.3 lb less of actual chemical per acre per treatment. Plots treated with Difolatans had the smallest percentages of loss from tuber rot. That the unsprayed control showed a lower percentage of tuber rot than seven of the treatments is probably the result of the rapid and early death of its foliage, a phenomenon commonly observed in these tests in years of severe blight attack. The marked effects in the control were the great reduction in yield and the high proportion of smalltubers. None of the fungicides showed visible phytotoxic effects.

Table 2. Effect of treatments on yield and rot

Treatment	Total (bu/ acre)	Small (bu/ acre)	Rot (bu/ acre)	No. 1 (bu/ acre)	Rot (%)
Brestan 60	296.1	43.1	4.8	248.2	1.7
Cela A-36	269.5	46.0	4.2	219.3	1.6
Cufram Z	242.2	37.6	15.4	189.2	6.3
Daconil 2787	259.4	31.4	6.4	222.6	2.5
Difolatan, Flowable	296.1	30.6	2.2	263.3	0.7
Difolatan 80W	259.6	35.2	2.0	222.4	0.8
Dithane M-45	314.8	35.2	13.2	266.4	4.2
DuTer	272.6	51.3	9.0	212.3	3.3
Fennite	251.9	35.4	8.6	207.9	3.4
Organil 66	306.2	34.5	11.0	260.7	3.6
Polyram 80W	255.4	33.9	13.6	207.9	5.3
RH-90	317.7	35.4	9.5	272.8	3.0
Siaprit	263.5	34.5	9.7	219.3	3.7
Check	184.4	44.5	5.7	134.2	3.1
L.S.D. 5%	38.1			30.0	2.5
L.S.D. 1%	51.0			40.1	3.4