STRAIGHT VS. SPLIT POTATO BLIGHT SPRAY SCHEDULES[1]

A Progress Report

L.C. Callbeck[2]

In regions where potato late blight, Phytophthora infestans (Mont.) de Bary, is often a serious threat to the health of the crop near the end of the growing season, many growers employ a split schedule of spraying. Under such a program a carbamate fungicide is used for the early-and mid-season sprays and a copper fungicide is used for the late-season sprays. By and large, the growers who follow this practice are of the opinion that the change to a copper fungicide will provide a greater measure of protection against losses from late blight tuber rot. This somewhat popular grower theory is being tested experimentally at Charlottetown and this paper is a report on the progress that has been made up to and including 1963.

The first field test was conducted in 1953. In that year four treatments were included as follows: (1) Bordeaux mixture all season, (2) nabam + zinc sulphate all season, (3) a split schedule of the nabam spray followed by Bordeaux mixture for the late-season sprays, (4) unsprayed check.

The experiment was laid out in a Latin square, the plots of which were each 4 rows wide by 50 feet long. Separating the plots from one another, and bordering the area, were single rows of potatoes. These rows were not sprayed, their purpose being to equalize the late blight epidemic over the experimental area. The Green Mountain variety, which is very susceptible both to disease of the foliage and to rot of the tubers, was used. Planting was on June 4.

The fungicides were applied with a tractor-sprayer unit which delivered approximately 120 gallons per acre at a pressure of 375 pounds per square inch. The boom carried four nozzles per potato row, two being above the plants and two being on drop pipes.

The sprays were applied on July 20, 30, August 10, 20, 27, September 3, 10, giving a mean interval of 8.7 days. In the split schedule, the change from nabam to Bordeaux was made on August 27, at which time the unsprayed check plots had reached a defoliation of 40 per cent. During the season insects were controlled by spraying all rows with an insecticide mixture as conditions required.

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[1] Contribution No. 131, Experimental Farm, Research Branch, Canada Department of Agriculture, Charlottetown, Prince Edward Island.

[2] Plant Pathologist.

The weather during July and August of 1953 was very conducive to the development and spread of late blight. The border and buffer rows were inoculated by sprinkling them with a water suspension of late blight spores on the evening of August 12 and the epidemic built up evenly and rapidly, the unsprayed plots showing a defoliation of 45 per cent at the end of the month. From the 27th of August, the date on which the change to Bordeaux was made in the split schedule until the experiment was terminated on September 17 by spraying the plants with a sodium arsenite top killer, there were nine days of recordable precipitation, the total fall being 2.06 inches. Of this amount 1.0 inch fell on September 14-15. There were also several periods of light mist and drying conditions were extremely poor throughout most of this period.

The results of two defoliation readings are given in Table 1, in which it is indicated that a straight programme is superior to a split one in so far as the fungicides used in this test are concerned. It is suggested that Bordeaux mixture superimposed on nabam is not so effective as when built up on itself. In the laboratory an artificial weathering process with water removed three times the amount of copper from glass slides on which Bordeaux had been sprayed over a deposit of nabam + zinc sulphate than from slides carrying Bordeaux mixture only.

The plots were harvested on October 14, or 27 days after top killer had been applied. It was found (Table 1) that the treatments followed the same order in respect to losses from tuber rot as for the decimations of the foliage, the crop from the split schedule plots suffering the greatest loss.

Because of the pressure of other projects the study on the split schedule was abandoned for several years; but in 1961, at the request of a number of grower groups from Prince Edward Island to Manitoba, it was resumed. The field test was laid out and conducted in the same manner as in 1953 except that the now more popular maneb replaced the nabam + zinc sulphate (zineb) mixture.

The season of 1961, however, was unusually warm and dry, and no blight developed. The unsprayed check plots, probably because they alone were not damaged by the passage of the equipment through them, gave the highest yield at 410.3 bushels per acre. The maneb-treated plots were second with 404.1 bushels. The Bordeaux plots, with 381.0 bushels per acre, had the lowest yield, and this may be a reflection of copper phytotoxicity in a season of high temperature and little rain. The plots on the split schedule, having less time for copper injury and Bordeaux interference with transpiration to effect the yield, placed between the plots on straight maneb and Bordeaux schedules, the yield being 397.5 bushels per acre.

Table 1. Foliage and tuber data, 1953

Treatment	% Defoliation Sept. 3	% Defoliation Sept. 15	Total bu./ac.	Rot bu./ac.	No. 1* bu./ac.	% Rot
Bordeaux	0	7	352.6	4.6	320.4	1.3
Nabam	2	9	420.7	6.3	389.9	1.5
Split Schedule	3	16	390.9	14.8	352.8	3.8
Check	65	100	291.5	16.6	241.8	5.7
S.D. 5%			31.2		31.3	2.8
S.D. 1%			44.9		45.0	-

*Total yield less small tubers and rotted tubers.

Table 2. Foliage and tuber data, 1962

Treatment	% Defoliation Sept. 4	% Defoliation Sept. 17	Total bu./ac.	Rot bu./ac.	No. 1* bu./ac.	% Rot
Bordeaux	20	40	352.6	42.9	261.8	12.2
Maneb	9	16	434.5	58.8	330.6	13.5
Split Schedule	15	37	372.4	66.6	257.4	17.9
Check	85	100	189.8	40.2	99.0	21.2
S.D. 5%			31.8		43.6	
S.D. 1%			45.7		62.7	

*Total yield less small tubers and rotted tubers.

Table 3. Foliage and tuber data, 1963

Treatment	% Defoliation Sept. 3	% Defoliation Sept. 16	Total bu./ac.	Rot bu./ac.	No. 1 bu./ac.	% Rot
Bordeaux	2	45	465.2	48.0	378.0	10.3
Maneb	3	30	474.7	86.4	355.1	18.2
Split Schedule	3	36	445.0	70.2	330.8	15.8
Check	44	100	360.5	174.2	147.2	48.3
S.D. 5%			29.7		60.9	11.5
S.D. 1%			42.6		87.2	16.6

The seasons of 1962 and 1963 were wet and humid and severe blight epidemics developed in both years. During the July-September period of 1962 a measurable amount of rain fell on 44 days to give a total of 16.38 inches, approximately 6.0 inches above normal for the region. The same period in 1963 was almost as wet, 14.56 inches of rain being recorded.

In both years insects were controlled by spraying all rows with Thiodan, three applications being given in each season.

The plots in 1962 were planted on June 5 and the eight spray dates were July 19, 29, August 6, 14, 21, 28, September 4, 10, the mean interval being 7.6 days. In the split schedule the change from maneb to Bordeaux was made on August 21. The first blight lesions, the result of natural inoculation, were observed in unsprayed plots near the end of July. These plots and all buffer rows were completely defoliated by the beginning of September. The data of the defoliation readings are given in Table 2.

The top killer Reglone was applied on September 21 and the tubers were lifted and examined on October 5. The data on yields and tuber rot are shown in Table 2.

In 1963 the planting date was June 3. The fungicides were applied on July 19, 30, August 8, 20, 28, September 5, 12, dates which gave a mean interval of 9.2 days. For the split schedule the shift from maneb to Bordeaux was made on September 5, on which date the unsprayed check plots had reached a defoliation of nearly 50 per cent, and about 4 per cent of the leaves in the maneb-treated plots were showing late blight lesions.

Reglone was applied on September 18 and harvesting was done on October 3. The data for 1963 are presented in Table 3 and a three-year summary (1961 results excluded) of the experiment is contained in Table 4

Table 4. Three-year summary of straight vs. split test.

Treatment	Total bu./ac.	Small bu./ac.	Rot bu./ac.	No. 1 bu./ac.	% Rot	% Defoliation [1]
Bordeaux	390.1	38.2	31.8	320.1	8.2	1.6
Carbamate	443.4	34.3	50.5	358.5	11.4	12
Split Schedule	402.8	38.6	50.5	313.7	12.5	18
Check	283.9	40.9	77.0	166.0	27.1	100 approx.

[1] Means calculated at time check plots were 97 to 100% defoliated.

The results obtained in these first years of study suggest that a straight schedule of a carbamate or of Bordeaux mixture is slightly superior, in controlling foliar blight, to a split schedule of these fungicides in which a carbamate is used for the early-and mid-season sprays and Bordeaux is used for the late-season sprays. It is indicated, too, that the split schedule results in fewer bushels of saleable potatoes, caused, in part, by a higher percentage of loss from late blight tuber rot.

As stated under the title, this paper is a progress report, a statement which implies that the evidences are neither complete nor conclusive and that further studies are to be made and reported on. In the future some changes may be introduced. For example, it has been suggested that a fifth treatment be added. This treatment would be a variation of the split schedule in that the carbamate would be used for the early sprays only, both the mid-season and late sprays being Bordeaux mixture. It might be desirable, too, to introduce a proprietary copper fungicide in place of Bordeaux mixture.

EXPERIMENTAL FARM,
CANADA AGRICULTURE,
CHARLOTTETOWN, P.E.I.