SPRAY TRIALS WITH TWO ANTIBIOTICS AND AN ANTIMETABOLITE FOR POTATO LATE BLIGHT CONTROL

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INTRODUCTION

Streptomycin has been shown to be effective in the control of a number of fungal diseases of plants including rootrot of sugar beets (8), tobacco blue mold (5), downy mildew of cucurbits (1) and late blight of tomatoes in the greenhouse (9). An experiment at Fredericton in 1955 showed that streptomycin and its derivative dihydrostreptomycin might also be useful in the control of potato late blight in the field (6).

This paper reports the results of further field trials on the control of potato late blight with streptomycin and dihydrostreptomycin conducted in 1956 and 1957. Included also are the results of field trials with ethionine, an analogue of methionine which was found in preliminary studies to inhibit the growth of the late blight fungus, *Phytophthora infestans* (Mont.) de Bary, in pure culture.

GENERAL MATERIALS AND METHODS

The field plots consisted of four 60-foot rows of Green Mountain potatoes which were planted by machine in 1956 (June 21) and by hand in 1957 (May 29). Treatments were replicated four times in a randomized block design, and the fungicides were applied with a tractor-drawn power sprayer at the rate of approximately 200 gallons per acre. Data on yield and on the percentage defoliation caused by late blight were taken from the inner two rows of each plot only. The method used for estimating the percentage defoliation was that suggested by Horsfall and Barratt (7). Before the first experimental fungicide treatment was applied, all plots were sprayed with DDT alone to control insects.

1956 EXPERIMENT

The treatments tested in the 1956 experiment are shown in table 1. Dihydrostreptomycin and streptomycin (Agristrep) were applied at a concentration equivalent to 200 p.p.m. streptomycin base; and DL-ethionine was used at a concentration of 25 p.p.m. Ethionine and three of the antibiotic treatments were applied six times at seven- to ten-day intervals; one treatment, containing dihydrostreptomycin, was applied three times at 20-day intervals. Glycerin, which has been reported to increase the absorption of streptomycin by bean leaves (4), was added to the streptomycin and to two of the dihydrostreptomycin treatments; DuPont Spreader Sticker was added to the ethionine treatment and to one dihydrostreptomycin treatment.

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3Obtained as the crude product from Merck and Co. Ltd., Montreal, Quebec.
4Product of Merck and Co. Ltd., Montreal, Quebec.
5Obtained from Nutritional Biochemical Co., Cleveland, Ohio.
Very little late blight was present in the plots on September 10, and in an attempt to cause an epiphytotic, all plots were inoculated with a suspension of blight spores on September 11. During, and following the inoculation, weather conditions were favorable for blight development, and a moderate outbreak of the disease occurred. The plots were examined on September 19 and the percentage defoliation in each plot estimated. Table 1 shows the results of this examination and the total tuber yield obtained when the plots were harvested on October 19.

The two dihydrostreptomycin treatments applied six times gave about equal control of defoliation, and were significantly better than any of the other three treatments used. Dihydrostreptomycin applied three times significantly reduced defoliation as compared with the control and ethionine treatment, but was not so effective as six applications of streptomycin. Ethionine significantly reduced defoliation, but was much less effective than the antibiotic treatments. The highest yields were obtained from the plots receiving dihydrostreptomycin or streptomycin; however, differences in yield among treatments were not significant.

1957 Experiment

Table 2 shows the treatments tested in 1957. The streptomycin sulphate and dihydrostreptomycin sulphate used were of U.S.P. grade and were obtained from the Nutritional Biochemical Co., Cleveland, Ohio. As in 1956 both antibiotics were applied at a concentration of 200 p.p.m. streptomycin base. Because of the poor control of blight obtained with ethionine in 1956, the concentration used in 1957 was increased to 200 p.p.m. The fixed copper fungicide C.O.C.S. 55 (copper oxychloride sulphate) was included in the test for purposes of comparison, and was used at the concentration recommended by the manufacturer. DuPont Spreader Sticker was added to all treatments except C.O.C.S. Treatments were applied four times only. The first application was made on August 5, the date on which blight was first observed in the plots; the other applications were made on August 15, August 22 and September 5. On August 29, September 6 and September 14 the plots were examined and the percentage defoliation estimated. Table 2 shows the results of these examinations and the total yields obtained when the plots were harvested October 8.

Dihydrostreptomycin and C.O.C.S. were equally effective in controlling defoliation, and both were significantly better than streptomycin and ethionine. The yields from the plots treated with dihydrostreptomycin and C.O.C.S. were significantly higher than those of the control and ethionine-treated plots. Streptomycin gave moderately effective control up to the time of the second reading, September 6, and although the plots were 75 per cent defoliated at the time of the third reading, September 14, their yield was significantly greater than that of the control plots. The percentage defoliation in the ethionine-treated plots was significantly less than the control, but their yield was only slightly higher.

Discussion

The results of the tests with dihydrostreptomycin in 1956 and 1957 are in agreement with those obtained in 1955 (6), and show that control