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THE CONTROL OF POTATO LATE BLIGHT TUBER ROT

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INTRODUCTION

The annual potato loss caused by late blight rot is very great. Sometimes whole bins or carload shipments are destroyed by this decay, especially in localities where the disease occurs rather infrequently and where farmers, therefore, are not familiar with it. However, some loss from late blight rot occurs every year in Maine, even though most of the farmers know the disease and the control methods.

The fungus may persist in the late blight lesions on the stalks for long periods and will produce viable spores whenever the weather conditions are favorable. Periods of cloudy and rainy weather or the presence of heavy dews are favorable for the revival of fungous growth in the infected stems and for the production of the infective conidia or spores, which are disseminated on the tubers as they pass over the digger.

A survey conducted in 1944 showed that approximately 10 per cent of the total potato crop of Aroostook County, Maine, rotted in storage because of late blight tuber rot. For 110 bins that were examined care-

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fully (1), rot varied from a trace to 75 per cent, and the average loss was 16 per cent. It has been observed in Maine that very little or no rot occurs when the potato plants are completely killed by blight early in the season. On the other hand, the amount of tuber decay may be very large when there is only a little late blight in the field, and the plants remain green until late in the season.

Tuber Rot Caused by Digging While the Foliage is Partly Green and Infected with Late Blight

Jones and Morse (2, 3, 4) state that it is best to delay digging when there is danger of rot. Murphy (5) concludes: "Evidence derived from field experiments in Canada and in Ireland is presented to show that the bulk of the infection in the case of potatoes which develops in storage is contracted when the tubers are being dug." He also states that as early as 1887 Jensen called attention to the danger of digging the crop while there was still green foliage on the diseased plants.

Large amounts of tuber rot may result when the late blight spores are continuously being washed by rain from the green foliage into the soil where they infect the potatoes before they are dug. However, it is believed that most of the tuber rot found in Aroostook County, Maine, is from infection that occurs while the crop is being harvested. The viable spores of late blight, which develop in the green stalks and leaves, come in contact with the potatoes during the process of digging, but the rot is not apparent until after the potatoes have been in storage for a week or more or have been shipped to the market.

During the season of 1941 an inspection was made of the potato bins of two growers who had experienced very severe losses in storage from late blight rot. These growers had harvested their choice seed stocks rather early in the season from fields that appeared to be relatively free from late blight and had thought the crop to be in a healthy condition. Several weeks later, however, when the bins were examined 50 to 60 per cent of the tubers were infected with late blight decay.

Further investigations revealed that similar losses were not uncommon, especially when the crop was sold on the early market, when the main crop was harvested before frost, or when seed stocks were harvested early in the season for the control of the virus diseases. In all cases it appeared that the potatoes were contaminated with spores while being dug, and that the rot was not apparent until the tubers had been in storage for several weeks.

This information led to a renewed study to determine the factors that may contribute most to the control of late blight tuber rot as it

occurs in Aroostook County, Maine. Experiments were conducted during the 3-year period 1942 to 1944 to get more definite information regarding the effect of digging the potato crop before the foliage is completely dead on the amount of tuber rot that develops in the bin.

The Green Mountain variety was used for these studies. The fields received five or six spray applications during the season, and the disease was kept under fairly good control. Some late blight, however, developed late in the season.

A part of each field was harvested each year after the middle of September when the foliage was mature and dying but still possessed some green stalks and leaves. Other parts of the same fields were harvested at later dates when the plants were completely dead, having been killed by frost. The potatoes were put into commercial bin storage immediately after being harvested and were examined for late blight tuber decay after a period of approximately 8 weeks.

The data in table 1 show that the amount of late blight tuber rot in the crop that was harvested while the foliage was green varied from 20 per cent in 1942 to 53 per cent in 1944. In contrast, the potatoes that were dug after the foliage had been killed by frost ranged from no rot in 1942 to 6 per cent in 1944. These experiments clearly confirm the contention that a great deal of late blight rot may develop if infected fields are harvested while the foliage is still green.

Unfortunately, the farmers in Maine, and probably elsewhere, continue to harvest their potato crop while the foliage is partly green and while late blight infection is present.

TABLE 1.—*Comparison of late blight tuber rot in potatoes from plots in the same field harvested before and after the foliage was killed by frost. Aroostook County, Maine.*

Treatment	Year and Amount of Tuber-Decay[1]		
	1942	1943	1944
	Per cent	Per cent	Per cent
Plots harvested before foliage was completely dead	20	48	53
Plots harvested after foliage had been killed by frost	0	4	6

[1]Average of eight 50-pound samples for each treatment after being in storage for 8 weeks.

Control of Late Blight Tuber Rot by Killing the Tops with Herbicides

Most farmers with considerable acreages of potatoes to handle, find it necessary to begin harvesting their potatoes as soon as possible in the fall and often cannot wait until the plants are dead from maturity or have been killed by frost. Some growers have found that the amount of late blight tuber decay occurring in the bin may be reduced by thoroughly spraying the potato vines just prior to digging with a concentrated copper sulphate solution. This procedure, however, does not completely kill the potato foliage which is a hindrance while the crop is being harvested. It also does not allow enough time for the skin or periderm to harden, which results in much bruising and in a poor appearance of the crop.

Experiments were conducted in 1943 and 1944 to determine whether late blight tuber rot may be controlled effectively by killing the potato tops with a chemical weed killer or herbicide before the crop is dug. The data in table 2 show that late blight tuber rot can be greatly reduced. In 1943, 40 per cent of the tubers harvested from the green plots developed storage rot, whereas only 3 per cent rotted when harvested after the plants had been killed.

Table 2.—*Effect of killing tops with a herbicide on the amount of late blight tuber rot.*

Treatment	Amount of Tuber Decay[1]	
	1943	1944
	Per cent	Per cent
Tubers dug while foliage was partly green	40.0 ± 2.8	53.0 ± 1.8
Tubers dug 2 days after tops were killed by spraying[2]	11.0 ± 1.9	13.6 ± 1.5
Tubers dug 10 days after tops were killed by spraying[2]	3.0 ± .6	3.0 ± .9
Tubers dug after tops were killed by frost	5.9 ± .9	.0 ± .0

[1]Average of eight 50-pound samples for each treatment after being in storage lockers for 6 weeks.

[2]Plants killed by spraying with 2 gallons of Sinox and 10 pounds of ammonium sulphate in 100 gallons of water.

In 1944, by killing the tops and digging 10 days later, tuber rot was reduced from 53.9 per cent to 3 per cent.

Discussion and Conclusion

Much of the late blight tuber rot that occurs in Maine is the result of harvesting the crop while the fungus is still viable and before the plants are completely dead. Many farmers do not detect the disease if it is present in small amounts on the partially dead stalks and leaves or they consider that such a small amount of blight will cause no loss. They should realize that a light infection on the foliage may cause a great deal of tuber decay in the bin. The freshly dug tubers become inoculated with the fungous spores in the process of digging the crop. The amount of tuber rot may be greatly reduced by delaying harvesting until the plants have been killed by frost.

Potato growers generally are very desirous to harvest their crop as early as possible in the fall and often do not wait until the vines are dead from natural causes. When late blight is present the potato tops should be killed by spraying with a herbicide or the harvesting should be delayed until the foliage is dead as a result of maturity or of freezing weather.

Literature Cited

1. Cassell, Robert C. 1944. Losses in stored potatoes in Maine. The Plant Disease Reporter 28:293-297.
2. Jones, L. R. and Morse, W. J. 1902. Report of the botanists. Fifteenth Annual Report of Vt. Agr. Exp. Sta., pp. 219-223, 1901-1902.
3. ———, and ———. 1903. Report of the botanists. Sixteenth Annual Report of Vt. Agr. Exp. Sta., pp. 161-163, 1902-1903.
4. ———, and ———. 1904. Report of the botanists. Seventeenth Annual Report of Vt. Agr. Exp. Sta., pp. 391-395, 1903-1904.
5. Murphy, Paul A. 1921. The sources of infection of potato tubers with the blight fungus, *Phytophthora infestans*. Sci. Proc. Royal Dublin Society 16 n.s.: 353-368.