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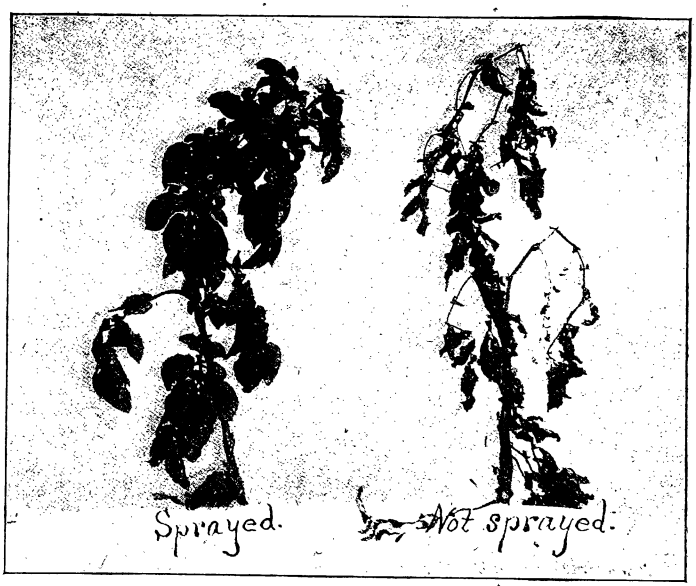

SHALL POTATO GROWERS SPRAY?

F. H. HALL, F. C. STEWART, H. J. EUSTACE AND F. A. SIRRINE.

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*Connected with Fertilizer Control.
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POPULAR EDITION*

OF

BULLETIN NO. 221.

SHALL POTATO GROWERS SPRAY?

F. H. HALL.

More than insurance.

Rarely, to-day, do we find a farmer who neglects or refuses to insure his buildings against loss by fire. Yet many barns and dwellings have stood for fifty years or more unharmed by this devouring element; so that all money paid out for premiums has been an outlay without return.

On the other hand, how many growers of potatoes have raised the crop for ten successive years without suffering severe loss from blight or rot? Very few indeed can report continued immunity from destructive attacks of these diseases; and careful investigations show that there are almost no seasons when the potato crop is not considerably lessened by almost unnoticed injury to foliage and vines through fungus troubles which may easily be prevented by spraying. Merely as a matter of insurance against the occasional destructive attacks, the application of bordeaux mixture each year is a profitable venture; for one crop saved from the heavy loss or complete destruction which follows such outbreaks of late blight as that which occurred in

* This is a brief review of Bulletin No. 221 of this Station, on Potato Spraying Experiments in 1902, by F. C. Stewart, H. J. Eustace and F. A. Sirrine. Any one specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the mailing list to receive bulletins regularly, either popular edition or complete edition, as desired. Bulletins are issued at irregular intervals as investigations are completed, not monthly.

many parts of the State in 1902, will repay the expense of many previous sprayings. But spraying is more than insurance against these severe attacks:—it repays its cost every year. This last statement is proven true by very careful, thorough and long-continued series of experiments abroad and in America, both in New York State and in several sister states.

What spraying does.

"I do not see how that can be true," the potato-grower will say. "My potatoes have rotted only twice in the last ten years." Yes, you have noticed this particular disease but seldom, though it has probably done more damage than you imagine in several other years; but your vines have probably been touched by the early blight nearly every season, and the small brown spots on the leaves, which characterize it, by destroying no inconsiderable portion of the plant's starch factory have materially lessened your crop. Flea beetles have punctured the leaves, consumed part of the juices which should go to build up tissue or tuber and also destroyed leaf surface which is needed to elaborate more starch. Colorado beetles—"potato bugs"—have not been completely controlled by the most thorough applications of paris green you were able to make; and when you "put on enough to kill them, sure," you probably burned some leaves and so added another injury to the already long list.

Properly made bordeaux mixture, thoroughly applied, will completely prevent both early blight and late blight or rot; it will drive most of the flea-beetles away to untainted feeding grounds, and, when combined with poison, will even kill a few of these destructive, but often overlooked, little pests; applied in the bordeaux, paris green will be more thoroughly distributed than it can be in any dry application, and the lime in the mixture will prevent any burning of foliage. Thus the bordeaux mixture, by checking or preventing several small losses, increases the value of the crop every year more than the materials and labor cost. At the same time it appears to exert a specific effect upon the vigor of the plants, and, aside from repression of injury, adds both quantity and quality to the product.

Growers slow to adopt.

These facts have been well proven by previous experiments; but growers seem disinclined to adopt the practice. Accordingly the Station has inaugurated a series of tests in two widely separated localities in the State, at the Station and near Riverhead on Long Island, which are to be continued for ten years. These tests will show the average effect of the treatment over a period long enough to include the usual range of climatic variations, and should, at the end of the ten years, present conclusive data as to the advisability of spraying every season. The results of the past season's work indicate decisively that the practice is a profitable one.

Plan of the tests.

The area devoted to the experiment in each locality is three-tenths of an acre, one-tenth to each of three systems of treatment—check rows, rows sprayed three times during the season and rows sprayed seven times. These rows alternate throughout the plat, so that differences of soil are equalized. Except for the spraying, all rows received the same manuring, cultivation and treatment to prevent injury from "bugs." The bordeaux was made by dissolving 6 lbs. of copper sulphate (blue vitriol) in 25 gals. of water, neutralizing this by adding thin whitewash made from about 4 lbs. of lime slaked and thinned with 25 gals. of water. To poison the insects, paris green ($\frac{1}{2}$ to $\frac{3}{4}$ lb.) or green arsenoid (5 ozs. to 8 ozs.) was added when necessary—not at every spraying. On the check rows the poison was applied in lime water to prevent burning the foliage. All the spraying was very thoroughly done, using the greatest care to secure a uniform and complete coating of leaves and stems.

Results at Riverhead.

At Riverhead neither diseases nor "potato bugs" were at all prevalent, and most growers would have said that the treatments were completely thrown away; yet the unsprayed rows yielded at the rate of 267 2-3 bus., those sprayed three times 295 1-3 bus., and those sprayed seven times 312 bus. In this case, then, under conditions when very little advantage was to be expected from spraying, three applications gave a gain of 27 2-3 bus. per acre, and seven applications a gain of 45 bus.

Results at Geneva.

In the vicinity of Geneva, diseases were very destructive. Early potatoes blighted and rotted badly and had to be dug in July and marketed at once. Late potatoes began to show signs of the blight during the last week in July and the first week in August, and by September 1st many fields were dead; but since the weather became drier about this time, the tubers did not rot as badly as might have been anticipated from the amount of rot-blight present. Yet dead vines do not grow large potatoes; so yields of 100 bus. per acre near Geneva were rare, and the average was probably pretty well down toward 50 bushels.

On the Station plats potato beetles appeared in large numbers at two different times, but prompt use of paris green prevented damage by them. Flea beetles, however, did some injury to the check rows, but very little on the treated ones. Late blight appeared on the check rows on July 28, and by September 10 practically all the plants on these rows were dead. There was little, if any, appearance of blight on any of the sprayed rows, either those treated seven times or those treated three times. The vines remained vigorous and healthy, holding the foliage almost perfect up to within a very few days of the death of the plants, which was two weeks later than that of those not sprayed. The unsprayed rows lost many leaves very early in the season, and this loss increased continuously, so that the manufacture and storage of starch were decreased throughout the season; but the sprayed plants were able to continue the starch-making process with undiminished activity to the close of their natural period of growth.

Accordingly, the difference between the sprayed and unsprayed crops was very striking; and the rows sprayed seven times outyielded those treated three times to a surprising degree, considering the small difference apparent in the vigor of the foliage. The cultivation of the entire area had been thorough, the ground being put in very good shape at the start and then kept clean and well stirred by five workings with a horse cultivator. The soil was also enriched by applying 1000 lbs. to the acre of a good complete fertilizer made from materials mixed at the Station. The unsprayed rows yielded at the rate of 219 bus. per acre, the

rows sprayed three times 317½ bus. and those sprayed seven times 342½ bus. This is a gain of 98½ bus. from three sprayings and 123½ bus. from seven sprayings.

Comment and conclusions. Can growers expect as good results as this? Probably not quite such striking differences, since spraying on a large scale can not be so thoroughly done as in this case; nor can the fields be sprayed just at the right time to secure the greatest advantage, because of pressure of other work. Neither is it fair to expect the same acre yields on large areas as was obtained from this small plat where there were no waste land and no missing hills. Yet the margin is sufficiently great to allow for all these factors and still guarantee a good profit from spraying, as the applications should be made at an expense of $1 to $1.50 per acre for each application.

How applied. Commence spraying when the plants are six to eight inches high and repeat the treatment at intervals of about two weeks as long as the plants remain green. Usually six applications will be required. Use the 1-to-8 formula bordeaux mixture (6 lbs. copper sulphate to 50 gals. water) adding paris green or other arsenical poison when "bugs" are plentiful. Thoroughness of application is to be desired at all times, but is especially important when flea-beetles are numerous or the weather favorable to blight. When a horse sprayer is used there should be two nozzles for each row.

Those who wish to get along with three sprayings should postpone the first one until there is danger of injury from "bugs" or flea-beetles, and then spray thoroughly with bordeaux and paris green. The other two sprayings should likewise be thorough and applied at such times as to keep the foliage protected as much as possible during the remainder of the season. Very satisfactory results can be obtained from three sprayings.

A single spraying is far better than none and will always be profitable; but more are better. There is no excuse for using paris green alone for "bugs." Whenever it is necessary to fight insects use bordeaux containing paris green.