

OREGON STATE AGRICULTURAL COLLEGE
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CONTROL OF POTATO VIRUS DISEASES

by

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One of the most important problems facing the grower of certified seed potatoes is the elimination of virus diseases which includes the mosaics, loaf-roll, spindle tuber and witches broom.

It is not the purpose of this circular to discuss in detail the symptoms of the various virus diseases, which may affect the potato, but rather to stress the means which should be employed effectively to eliminate or prevent the occurrence of these diseases.

Every seed piece from an infected tuber when planted will develop into a diseased plant. This principle of systemic infection by virus diseases in potato tubers is made use of in the working out of a control program.

All experimental evidence shows that aphids are the chief agents of spread. Three species of aphids, Myzus persicae, Myzus pseudosolani, and Macrosiphum solanifolii are known to occur in potato fields of Oregon, and these have proven to be carriers of some of our potato-virus diseases. Tests with other insects naturally feeding on potatoes have given no evidence that they may transmit any of the virus diseases with the exception of spindle tuber. This disease, however, is not common in Oregon.

Isolated Tuber-unit-planted Seed Plots

Every grower who specializes in the growing of certified seed or who raises his own seed should maintain a seed plot isolated by a distance of at least 500 yards from other potato fields. All such seed plots should be planted by the tuber-unit method, if the best results are to be obtained. One convenient way for accomplishing this is to set aside for each year a seed plot of about one-tenth the total acreage. This will be large enough to produce all the seed potatoes required for planting the general field the following year. There are several satisfactory ways to plant the tubers in units. The essential thing is to plant all the sets from each tuber together in the row so marked or separated from the sets of the next tuber, as to permit ready and accurate recognition of each separate unit. A common practice is to use medium-sized tubers, to cut them into four pieces, and plant the pieces about 15 inches apart, leaving one space unplanted between units, or place a stake between units in the row. When thus marked, each unit can be identified accurately during growth, and all the sets from any single tuber removed if any set from that tuber unit shows symptoms of virus disease.

One convenient way to plant tuber units by hand is worthy of mention. Cut each tuber partly, but not completely, through with two cuts at right angles to each other, leaving a small but definite part of the tissues uncut so that the four sets will hang together. These partly cut tubers are then laid in boxes that can be dragged or carried along the planting furrows. The tuber is picked up, easily broken apart and the four sets are spaced in the furrow.

Another method of planting tuber units is used in Montana and Maine. A standard Iron Age, commercial, planting machine is modified for tuber-unit planting by attaching a tuber-unit feed wheel. On the other hand, two opposite pockets can be stopped off in the ten-pocket feed wheel of the standard equipment, and thus provide two four-hill tuber units separated by blank spaces.

The seed is cut by hand and the four seed pieces from each tuber are put into a tin can of suitable size with the top removed. Several cans, each containing the sets from one tuber, are mounted on a special rack built on the planting machine over the regular hopper. In planting, the operator picks up a can, pours the sets on the revolving plate, and places one set in each of four consecutive openings. The empty can is returned to the rack, and the operation is repeated with another tuber. One extra space on the plate is left vacant or stopped off between the units

to give proper separation in the row. Extra racks and cans are provided so the only delay occasioned in reloading the machine is the time necessary to exchange the racks. By operating with a slow, steady team, the planting can be done with few extra stops or little delay.

It is of course also possible to use a mass-planted seed plot, but the advantages of a tuber-unit-planted plot over a mass planted plot are so numerous that only the former method should be used. Tests conducted at the Oregon Experiment Station for several years have shown that far greater success can be attained by a tuber-unit-planted seed plot than in a mass-planted plot. There are four main advantages to be gained from a tuber-unit planting in a seed plot. (1) Diseased plants are more conspicuous and easier to detect if they are grouped in the row. (2) Grouped hills are more easily removed than scattered hills. (3) Fewer centers or sources for the dissemination of disease within the field exist because of the grouping of diseased hills from a tuber. (4) Backward, diseased hills that do not yet show symptoms can be judged by their more advanced sister hills in the same tuber unit, and therefore may be removed sooner (and more easily) than when each hill is passed upon individually.

The first roguing of the seed plot should be made when about 50% of the plants are up. Roguing should be repeated once a week; after that until every diseased plant is removed. The secret of success in roguing is the early removal of the diseased plants which serve as sources of infection for the remaining healthy plants in the plot. It is imperative that the rogued plants be placed immediately in bags carried from the field, and emptied at a safe distance. Care should be taken to remove all the seed pieces as well as the tops of diseased plants. Merely pulling a diseased plant and leaving it in the field may do more harm than to leave the field unrogued. The insects (aphids) on the plant are disturbed and fly to other plants, which doubtless would become diseased.

Tuber indexing. The suppression of potato virus diseases by roguing in tuber-unit seed plots has proven quite satisfactory for many of the commercial varieties. In the case of some varieties like White Rose, Bliss Triumph, Garnet Chili and some others it has been found somewhat difficult to check the disease by such field-plot methods. The performance of these varieties in commercial plantings indicates the necessity of eliminating the virus diseases to a large extent before the tubers are planted in the field. This can be accomplished by tuber indexing.

In this method, all seed tubers are numbered and one eye from each tuber is grown well in advance of field planting to determine whether the tuber is healthy. All diseased tubers are discarded and only the healthy ones are kept for planting in an isolated seed plot.

Generally the indexes are grown in pots in a greenhouse. This requires many facilities which are not usually available on most farms where special attention is given to potato-seed improvement.

To overcome some of these difficulties tests were started at the Oregon Experiment Station in the early spring of 1933, to determine if an electrically-heated hotbed could be satisfactorily used for tuber indexing. The results were very satisfactory, and some electrically-heated hotbeds are now used commercially for indexing varieties which are very susceptible to virus diseases. Details of construction and cost of operation are to be found in "Oregon Committee on Electricity in Agriculture, Progress Report 23," copies of which may be secured by writing to the Oregon State College, Corvallis.