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THE POTATO CUTTING KNIFE

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Potentially, ring rot is still considered the most dangerous potato disease in Colorado. There are two principal ways in which ring rot can be controlled; (1) use of disease-free or relatively disease-free seed (certified seed), and (2) use of a sterilized or disinfected cutting knife.

It is not always possible to obtain certified seed. Therefore, in many cases, growers use seed which is little better than that which is used for table stock. Inferior seed may carry a dangerously high amount of ring-rot infection. It is apparent that the grower who uses such seed takes a much greater risk in employing a non-sterilized or non-disinfected knife for cutting than does a grower who cuts a superior grade of seed by the same method. In other words, in using an inferior grade of seed, the cutting knife becomes the all-important factor.

To illustrate the effect of cutting methods on the spread of ring rot, we will follow the methods used by two growers. Growers A and B obtain their seed from the same source. The seed is of a poor grade, carrying a high amount of ring-rot infection (5 percent). To simplify our picture, we will assume that every tuber is just large enough to cut into halves. Each grower cuts 10,000 tubers, thus cutting 500 ring-rot-infected tubers. Grower A, who uses a sterilized or disinfected knife, plants a total of 20,000 seed pieces, of which 1,000 are infected (original amount of infection in the seed). Now this is bad enough -- but let's see what is in store for grower B who cut his seed tubers with a non-sterilized knife. Grower B also plants a total of 20,000 seed pieces. However, 11,000 of these seed pieces are infected with ring-rot bacteria. Only 9,000 seed pieces are healthy. Just for purposes of illustration, let us assume an impossible 100 percent stand for both growers. Grower A will have 5 percent ring rot in his harvest (no increase over the amount originally present in the seed). This is not so good, but with care in sorting, he can market his stock for table use. Grower B, however, has wasted his time, land, and money. His harvest (if he bothers to harvest) shows 55 percent ring-rot infection, which is an increase of 50 percent over the original amount of infection present in the seed. From a marketing standpoint, grower B's potatoes are total loss.

As early as 1938, the Colorado A & M College recognized the importance of the cutting knife in spreading ring rot. Studies are still being conducted on this problem. During the past year, Experiment Station and Extension Service workers retested the effectiveness of disinfecting or sterilizing the cutting knife. Using the Colorado Rotary Potato Cutter, several disinfectants were tested against boiling water. Here are some of the results obtained. When a 5-gallon tank of 1-500 corrosive sublimate was used, 20 sacks of clean but unwashed Red McClure seed potatoes were safely cut (stand 100 percent free from ring rot). After 25 sacks were cut, ring rot appeared in test plots (31 percent infection). When a 1-gallon tank of the same chemical was used, 5 sacks were safely cut, a small amount of ring rot appeared after cutting 10 sacks (4 percent),

and 79 percent ring rot resulted after cutting 15 sacks. Boiling water used to sterilize the cutting knife uniformly gave 100 percent healthy plants. When an untreated knife was used, 78 percent ring rot resulted. In these experiments, the rotary knife was contaminated with ring-rot bacteria for each test lot cut.

There are two bulletins published by the Colorado A & M College on ring-rot control which are written especially for potato growers of the State. They will be sent free of charge on request. Press Bulletin 94, Colorado Agricultural Experiment Station, gives a description of ring rot and general control measures. Bulletin 381-A, Colorado Extension Service, gives a description of the Colorado Rotary Potato Cutter, with detailed plans for its construction and use.

Until a better knife is devised, and until superior disinfectants are found, the College recommends the use of the rotary knife sterilized by turning in boiling water. Where boiling water cannot be used, disinfect the knife in 1-500 corrosive sublimate solution. Use a tank of 5-gallon capacity or more. The solution in each tank should be replaced after cutting 20 sacks of seed potatoes.

✓ THE EFFECT OF PSYLLID INJURY ON SEED POTATOES

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Psyllid yellows was first described by Richards of Utah in 1927. It is caused by a tiny insect known as the potato or tomato psyllid, and is one of the most serious maladies affecting potatoes in the Rocky Mountain region and adjoining states. Severe epidemics of psyllid yellows have probably occurred at various times in the State of Colorado ever since the potato industry started. Psyllid yellows caused crop failures in the Greeley district from 1911 to 1913. In 1934 the value of the crop in Colorado was reduced at least one-half by psyllid yellows.

Some difficulty has been experienced in determining the amount of injurious effect on the vigor of seed potatoes borne from plants showing wide variation in the severity of the disease. To determine the effect of psyllid injury on vigor of seed potatoes, studies were conducted at the Colorado Potato Experiment Station at Greeley using seed tubers that had been produced the previous season on plants showing a wide range of psyllid yellows symptoms. Triumph was planted at Greeley and Estes Park in 1938. Psyllids are generally more abundant in the mountains and foothills than in the plains region. In each location one series of plots was sprayed and one was not sprayed. One gallon of liquid lime-sulfur was mixed with 40 gallons of water. The sprayed plots at Greeley were power-sprayed three times, using 450 pounds pressure. The plants and tubers developed normally, giving no indication of psyllid yellows, and producing 360 bushels of U.S. No. 1 tubers per acre. The unsprayed plots at Greeley produced a normal set of tubers, but the plants developed medium severe vine injury, producing only 190 bushels per acre of U. S. No. 1 tubers.

The sprayed plots at Estes Park received two applications. Traction equipment was used which developed about 250 pounds pressure. A large population of psyllids was present at Estes Park, resulting in severe vine injury. Although there was a fairly normal set of tubers in the sprayed plots, the yield was low.

The unsprayed plots were very heavily infested with psyllids, several hundred nymphs being found per plant. Vine injury was very severe, and the tubers were small at time of harvest.

All the plots were harvested during the last week of September. Tubers weighing 1 1/4 to 1 1/2 ounces were selected for planting the test plot the following year. These were stored in the potato storage house at Greeley until the first of April, then placed in cold storage until the first of June. The tubers from the unsprayed plants at Estes Park began to sprout in November. In December, the sprouts were removed. There was also some sprouting of the tubers from the sprayed plots at Estes Park. The sprouts were again removed when the tubers were placed in cold storage. The tubers from the sprayed and unsprayed plots at Greeley gave no evidence of sprouting at the time the seed was placed in cold storage.

Plantings to test the vigor of the seed were made at Greeley June 12, 1939. Each plot was a single row, planted with 30 whole tubers, spaced 14 inches apart in the row. There were eight blocks, and the plots were randomized in each block.

Plots planted with seed tubers from sprayed and unsprayed plants at Greeley were classed, respectively, as "No vine injury" and "Medium severe vine injury;" those planted with seed tubers from sprayed and unsprayed plants at Estes Park were designated "Severe vine injury" and "Very severe vine injury."

The plants in all plots were carefully examined during the summer, but no evidence was found of any disease carried by the seed that could be connected in any way with psyllid yellows.

The average stand in the no vine injury plot was 99.1 percent; for the medium severe vine injury, 97.9 percent; for the severe vine injury, 87.9 percent; and for the very severely injured plots, 89.6 percent. The seed pieces that failed to produce plants were found to be dormant.

The size of plants was measured at the completion of vine growth, by measuring the height and diameter of the largest stem produced by each seed tuber. The diameter of the stem was measured about 1 inch above the surface of the ground. The largest plants were produced from seed tubers developed the previous year on plants that showed no psyllid yellows symptoms. The smallest plants, both as to height and thickness of stem, were produced from seed from plants that were very severely affected with psyllid yellows the previous year. Many of the stems were weak and decumbent, with much irregularity in the size of the plants.

The plots were harvested the last of September and the tubers graded and weighed. Where vines were uninjured by psyllid yellows the previous year, the plots gave the largest yield, and the production decreased significantly with increasing severity of injury. Plots planted with seed tubers from plants classed as no vine injury the previous year produced 380 bushels per acre of tubers of U. S. No. 1 size; medium severe vine injury, 350 bushels; severe vine injury, 240 bushels, and very severe vine injury, 192 bushels per acre.

It is difficult to estimate the damage done to seed potatoes by psyllid injury. The injury to seed potatoes borne on vines showing only slight psyllid injury would probably be very slight and possibly not noticeable in the crop produced from such seed, but as the severity of the injury increases, the vigor and vitality of the seed decreases.

✓SCAB

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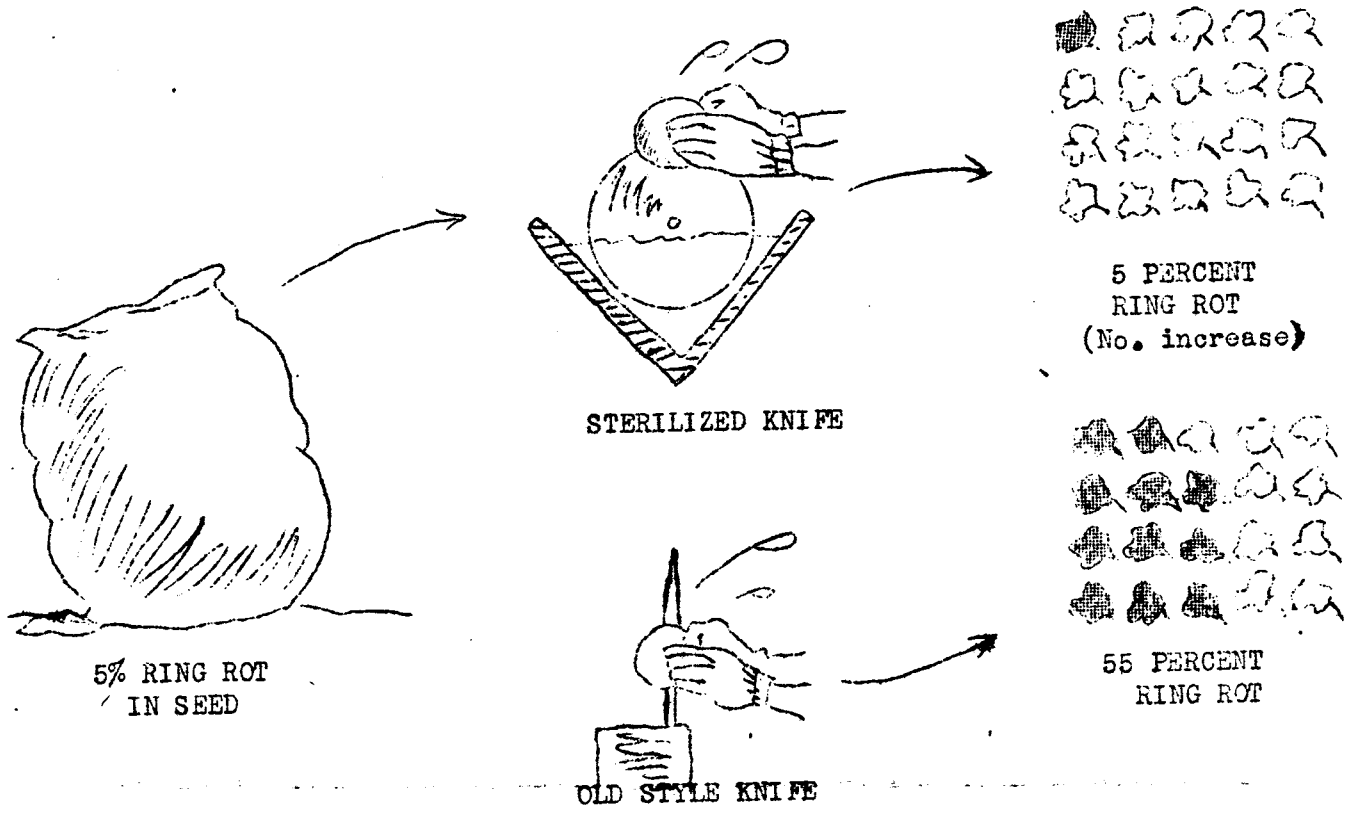
It is at the end of the growing season rather than at the beginning that scab of potatoes receives attention. Since scab does not reduce yield or viability of the plant the real damage is not observed until the crop is harvested. If, however, the grower were to keep a record of his loss due to poorer grade potatoes, he would realize that scabby tubers do cost him money each season. At the present time, when the demand for potatoes is greater than normal, a high percentage of scabby tubers is tolerated. When production again exceeds demand, a greater discrimination will be made against low quality potatoes and scabby tubers again will be considered a serious defect, with consequent greater losses to the grower.

In spite of all the work on the control of this disease, only resistant varieties offer any real promise of adequate control. Seed treatment, soil treatment, and crop rotation have all been found of doubtful value in the control of scab. Any one or all of these measures may reduce the amount of scab, but none has been found to materially reduce it when conditions are favorable for the development of the disease. The organism causing scab normally lives in the soil, and practically all soils are infected with one or more varieties or races. Just what conditions favor infection is not fully known. Soil alkalinity, aeration, moisture, and temperature all influence scab development. Chemical relationships in the soil and the relationship of organisms in the soil to one another, often determine whether or not the soil-borne scab will attack a crop of potatoes. Of the physical factors involved, temperature is no doubt the most important. Scab is favored by high soil temperatures; consequently any measure that will keep the soil cool will reduce the amount of scab infection. Deeper covering and frequent irrigation will aid in maintaining a cool soil. Scab infects tubers from the time they are 1/2 inch in diameter until they are half-grown. It is during this period of development that a potato crop should have plenty of water to obtain good growing conditions and a reduced amount of scab. Practically no scab infection occurs after the tubers are one-half to two-thirds mature.

If seed is badly scabbed and is to be planted in soil that has never produced scabby tubers, seed treatment may prevent introduction of the organisms. It is highly probable, however, that if scab has never appeared in a given field previously, it would not be possible to introduce it on the seed pieces. On the other hand, if the soil produces scabby tubers, seed treatment will not prevent infection. Soil treatment to kill the soil-borne scab has not been successful. In addition, the danger of killing beneficial soil organisms is always present. Further, the cost of chemicals that are effective in killing the scab organism in the soil is prohibitive. It is possible that a chemical may be developed that will kill only the scab organism in the soil. Such chemicals are being tested by experiment stations each season.

The most promising method of control of scab disease is the use of resistant varieties. Many new varieties are being developed and tested for resistance and adaptability. Several of the most promising are being tested on growers' farms each season. The U. S. Department of Agriculture and a large number of state experiment stations, including the Colorado Agricultural Experiment Station are cooperating in testing these new varieties in uniform scab gardens again this season. A few seedlings have been found to have commercial potentialities in several regions in Colorado, and these improved seedlings will be increased in a number of areas this season. The splendid cooperation of the growers with the U.S.D.A. in this testing program has facilitated the search for acceptable, scab-resistant varieties.

THE CUTTING KNIFE BECOMES
ALL-IMPORTANT WHEN THE SEED CONTAINS RING ROT



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