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SEED POTATO TREATMENT

by

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General Measures for Disease Control

There are at least five important factors to be considered in the prevention and control of potato diseases; namely crop rotation, seed selection, seed treatment, spraying, and good storage conditions. Most of the diseases cannot be controlled by the use of one measure alone, but usually two or more measures must be employed before the most successful control can be obtained.

As an illustration, Rhizoctonia lives over in the soil and on the seed potatoes. For the control of this disease it is necessary therefore to use care in the rotation of the crops and in seed-potato treatment. Failure to properly handle either of these factors would make the crop susceptible to damage from the disease.

The fungi which cause wilt are held over in the soil from one season to the next. They are also carried inside of tubers from diseased hills. No seed treatment has yet been found effective in freeing these tubers from this internal infection. Consequently, control of this disease must be effected by rotation and seed selection, which is best accomplished by the use of a seed-plot where all diseased plants may be removed during the growing season while most easily detected.

The object of this circular is to emphasize one of the five control measures, namely SEED TREATMENT, which consists of suberization and seed disinfection.

Suberization

After considerable observation of seed-piece rot, it is believed that one of the major problems of the potato grower is the proper healing of the cut surfaces of seed pieces. Disregard of practices which bring about healing is responsible for considerable seed-piece rot in the field, resulting at times in complete crop failures. The planted seed pieces that are not completely rotted before the eye has had an opportunity to send out a shoot, may still give rise to a weak or to an apparently normal plant. Later in the season such plants will turn yellow, drop some of the lower leaves, and die prematurely.

When such plants are still alive when dug, they will show the remnants of a rotted seed-piece clinging to the underground stem, and the interior of the stem will be hollow and discolored. Tubers from such infected plants when planted the following year will give rise to healthy plants, indicating that the trouble is not due to a definite organism in the tuber.

This trouble may be avoided to a large extent by planting whole tubers or by properly "corking over" or suberizing the cut seed pieces. Suberization is very simple and is based upon the following three essential conditions which are necessary to assure the formation of a layer of cork cells over the cut surfaces; namely, (1) the presence of air (oxygen), (2) proper humidity, (3) proper temperature (from 60-70° F.). If these 3 conditions are fulfilled, a protective layer of cork cells will develop over the exposed cut surface, forming an effective barrier against decay organisms which may be present in the soil after the seed pieces are planted. If any one of these three conditions is lacking, cork cells will not develop, but the exposed cells will die. This may result in a shriveling of the seed piece, or the surface may dry hard and later crack. When such seed pieces are planted without a protective layer of cork cells, parasitic fungi and bacteria which are always present in the soil invade the seed piece and cause it to rot. Seed pieces may be planted immediately after cutting, providing the soil is not too wet or too dry and the weather not too cold. Under such favorable conditions the seed pieces will suberize in the soil before the soil organisms have had an opportunity to invade their tissues. When such conditions exist, special measures to bring about suberization before planting may not be necessary.

Since the healing of cut seed pieces is so simple and inexpensive, and the certainty of a perfect stand does so well compensate for the little trouble involved, there is no valid reason why every grower should not suberize his seed prior to planting. Growers who have once tried it become convinced of its effectiveness and usually continue the practice. The writer has never yet found any appreciable seed-piece rot in fields where sound seed was properly healed over before planting.

It may be necessary to slightly modify the method of suberization in different localities due to the variation in humidity of the air. The freshly cut seed pieces may be placed in ordinary burlap bags which previously have been moistened in water. Care should be taken not to use any bags that previously contained fertilizer or salt as these chemicals may cause burning of the seed-pieces. Ordinarily the humidity within the bags is high enough to insure proper suberization of the seed pieces if they are kept in a protected building or shed. If they are stored in a place where the bags dry out quickly, it may be necessary to sprinkle them occasionally, or to cover with a few additional moist sacks. If the weather is cold, it may be necessary to artificially heat the building. Suberization will take place most rapidly at a temperature of 60 to 70° F. The sacks of potato pieces should not be stacked too high as this may exclude air (oxygen) which is very necessary to complete the corking process. Storing the cut pieces under such ideal conditions will cause a protective layer of cork to be developed within 48 hours. Tests carried out at Oregon and other experiment stations in this country and Canada have shown that when this method of healing is used, land plaster or sulfur application to the seed is not at all necessary. The use of these substances may be somewhat of an aid as a fungicide in preventing seed-piece rot if suberization is not practiced; but it is far less effective in eliminating seed-piece decay than is the suberizing method.

It should be remembered that the best results are always secured by using sound tubers which have been kept under ideal storage conditions. Tubers from which the sprouts have been removed at various times and are beginning to shrivel do not readily suberize.

Seed Disinfection

A number of tuber-borne diseases, such as scab, Rhizoctonia, etc., are so often present on potatoes in this state that it is desirable for all potatoes, whether they show evidences of disease or not, to be treated with a disinfecting solution before planting. Seed treatment not only will control these diseases, but will be an aid in controlling such others as wilt, blackleg and dry rot, provided of course, the potatoes are not planted in soil already infected with these diseases. This disinfecting solution kills the fungous spores and bacteria that may be on the surface of the potatoes and which, if not killed, might produce disease later on.

Mercuric chloride effective material for treatment

A number of seed treatments have been used, but no treatment has ever been found more effective in controlling these diseases than the standard corrosive sublimate (mercuric chloride) treatment.

Mercuric chloride should be used in 1-to-1000 solution. It is prepared from the following materials:

Mercuric chloride (corrosive sublimate) - 4 ounces
Water - 30 gallons

Dissolve the mercuric chloride crystals or powder at the rate of 4 ounces to about a gallon of hot water in glass jars, stone crocks or a wooden bucket before diluting to thirty gallons. This formula makes a 1-1000 solution.

It decreases in strength with use. To correct this, add 1/8 ounce of the chemical for every 4 bushels of potatoes treated for two hours. If treated one and one-half hours, add 3/8 ounce. Time and conveniencecare served if the chemical is handled in a stock solution, one ounce dissolved in two quarts of water. Keep the water in the tank up to its original volume. The solution can be used as long as it remains clear, usually not more than seven or eight times.

Caution. In using this mercuric solution it should be borne in mind that it is very poisonous, and if potatoes are once treated with it they should never be used for human consumption or for feeding to animals.

Directions. Soak the uncut or whole potatoes in this solution from one-half to two hours and dry before planting.

If the black, knobby bodies on the tubers (the resting sclerotia of the fungus) are quite large, the tubers should be treated for two hours but usually the 1 1/2-hour treatment is sufficient to kill the fungus.

Treat tubers while dormant. The tubers should be treated while still dormant or before they have sprouted to any great extent. If it is necessary to treat tubers with long sprouts, the time of treatment should be reduced to 1/2 hour or 1 hour. This will reduce the danger of injury to the eyes, but of course lessens the effectiveness of control.

Treatment conveniently done in barrels. Mercuric chloride corrodes metal and must be used in wooden barrels or tubs, cement or wooden tanks. If the tubers are very muddy it is well to wash them before treating. The better practice is to treat the potatoes loose in the solution rather than to have them in sacks. Gunny sacks take mercuric chloride out of the solution and weaken it.

Acid Mercury Dip.

To shorten the soaking time to five minutes, the Minnesota Experiment Station developed what is called the "Acid Mercury Dip." This is described in Oregon Experiment Station Circular No. 66. Tests in Oregon in 1932 and 1933 showed that this method was practically as effective as the old, long-soak treatment, but it caused injury in a number of cases, especially if the tubers were not dried immediately after treatment, and cannot yet be recommended for general use until some consistent means of overcoming this danger is found.

Yellow oxide of mercury used as an instantaneous dip. This chemical was first used for treating potatoes by Professor F. M. Blodget and his associates at the Cornell Agricultural Experiment Station in 1929. They have tested it every year since and found it to be the best material for an instantaneous dip. It is as effective as corrosive sublimate in the control of Rhizoctonia. They found that the best results are obtained if the tubers are planted within a few days after they have been treated.

Procedure. One pound of yellow oxide of mercury (technical grade) is added to 15 gallons of water in a wooden container (a metal container may be used if painted on the inside with a good coating of asphaltum paint). This mixture is stirred vigorously with a wooden ladle until all is in suspension. A basket filled with seed potatoes is then dipped into the liquid, plunged up and down two or three times, and turned sidewise at the same time to insure complete wetting of the pieces and to keep the solution well stirred. The basket of treated potatoes is removed and drained, and the tubers are dumped into a crate or open container where they will dry.

Additional mixture may be made up and added to the treating tub as needed.

It is very essential that the mixture be thoroughly stirred before it is poured into the treating tub so that the yellow oxide which is heavy will not settle. The mixture does not lose strength and can be used as long as any is left. Fifteen gallons will usually treat 100 or more bushels of seed potatoes. The treatment costs less than 2 cents a bushel for material.

This treatment has not been extensively tested in Oregon. A few growers used it in 1934 and their results were satisfactory. In 1931, 82,740 bushels of seed potatoes were treated in New York with satisfactory results, and the amount treated with this chemical has increased every year. The main advantage of this treatment is that only an instantaneous dip is required, in contrast to the 1 1/2-hour soak in the mercuric chloride treatment.

The results of this treatment, however, have shown that it is not so effective against potato scab and is, therefore, not recommended in those parts of the State where the soil is alkaline enough for potato scab.
