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Potato Diseases in South Dakota

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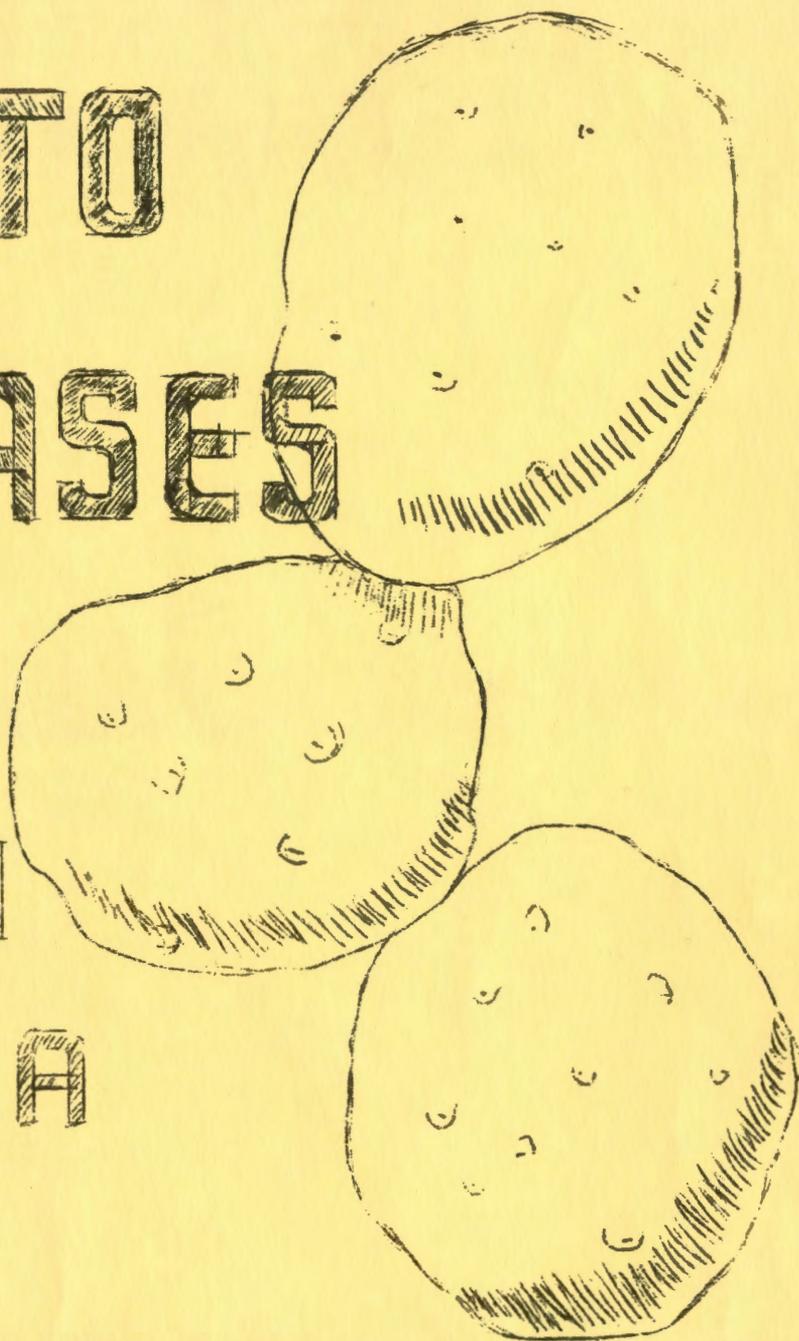
POTATO

DISEASES

IN

SOUTH

DAKOTA



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POTATO DISEASES

Kenneth D. Fisher

This pamphlet describes the common diseases of potato which occur in South Dakota and suggests measures for their control. The information is primarily intended as a guide in recognizing the various diseases. It is essential to recognize the symptoms of disease as control often depends on prevention rather than cure.

There are four important practices which will help reduce the occurrence and severity of most diseases:

1. Seed Potatoes. The quality of the harvested crop depends on the quality of the seed planted. Plant certified seed potatoes; they are as disease-free as possible. South Dakota grown Certified Seed Potatoes are recommended.

2. Seedpiece Treatment. An effective seed treatment kills the disease organisms on the surface of the tubers and helps prevent seed-piece decay. Seedpiece treatment is recommended in years when the soil is wet and cool throughout the spring. Semesan Bel (1 lb. per 7 1/2 gals. water), or Captan, (5% Dust or 50% wettable powder at 2 lbs. per 100 gals. of water) are effective. Other seed treatment chemicals include Dichlone, Acid Mercury, Zineb, Puratized Agricultural Spray and Streptomycin.

3. Crop rotation. Many of the microorganisms which cause disease live in the soil. These organisms can survive 2-3 years in the absence

of potatoes. Thus a 4-5 year rotation is recommended. Crop rotation helps eliminate the disease-producing organisms which live in the soil or potato debris.

4. Proper storage. To keep storage losses at a minimum, attention should be given to providing the proper temperature, humidity, and ventilation. The best temperature for storage of table stock or seed potatoes is 35-40° F. Potatoes for processing chips, french-fries, etc. should be stored at higher temperatures (50°F). Storage facilities should be thoroughly cleaned and disinfested each year prior to harvest time. Recommendations are given in the section on control of ring rot below.

Potato diseases are caused by parasitic bacteria, fungi, viruses and unfavorable environmental conditions. The symptoms and suggested control measures for the more important diseases commonly found in South Dakota are presented below.

DISEASES CAUSED BY BACTERIA

Blackleg - The base of the entire stem may become black, soft rot accompanied by a foul odor. Leaves become yellow and roll upward. Plants often stunted, with tiny aerial tubers in leaf axils. Affected plants usually die. Tubers from infected plants may decay in storage showing stem end discoloration and a black soft rot.

Bacteria overwinter in tubers and in decaying plant debris in soil. Bacteria are spread by cutting knives, used or dirty sacks, storage bins and the corn seed maggot.

- Control:
- 1) Use disease-free certified seed potatoes.
 - 2) Disinfect cutting knives. Use boiling water or mercuric chloride (1 part in 500 parts water).
 - 3) Destroy refuse and cull piles to prevent seed maggot flies from spreading bacteria.
 - 4) Avoid rough handling at harvest and in storage; this cuts down on wounds where bacteria may enter.
 - 5) The Maine Agricultural Experiment Station reports blackleg seedpiece decay can be reduced by dipping cut seed pieces in 100 parts per million Streptomycin solution.

Ring Rot - The disease is usually not apparent until plants are almost fully grown. One stem or the entire plant may turn yellow and wilt. Leaves of affected plants show a characteristic yellowing and dying of tissues between larger veins. A milky bacterial ooze can be squeezed from the cut end of infected stems. Diseased tubers may or may not show symptoms during harvest. The first symptom of ring rot breakdown is a faint yellow to brown discoloration of the vascular ring

located about 1/4 inch below the skin. Further breakdown is characterized by a cheezy rot in this ring. Secondary infection by soft rot or dry rot organisms often occurs. Ring rot is the most serious disease which occurs in the United States. All certified seed carries a zero tolerance for ring rot. The bacteria overwinter in diseased tubers. The seed may become contaminated in storage bins, used lumber, cutting knives and machinery.

- Control:
- 1) Plant only certified seed potatoes. South Dakota Certified seed is recommended.
 - 2) Cut seed with disinfected knife. (See black-leg control)
 - 3) Disinfest storage areas before harvest:
 - a) Spray cellars, bins, etc. with copper sulfate (6-10 lbs. per 100 gallons of water) or formalin (1 qt. per 30 gallons of water) or Lysol (1 qt. to 10 gallons of water).
 - b) Soak or drench used bags with copper sulfate or formalin.
 - c) Clean all machinery and equipment (planters, truck boxes, diggers, graders, etc. and spray, drench or soak with formalin (1 qt. per 30 gallons of water) or Lysol (1 qt.

per 30 gallons of water).

- 4) Use new or sterilized gloves and sacks in planting or harvesting if possible.
- 5) If ring rot does develop in a particular field, harvest it last. Do not put in storage with healthy tubers.
- 6) Discourage visitors from cutting potatoes in field and storage house with their knives.
- 7) Do not exchange machinery unless you disinfect it before and after use.

DISEASES CAUSED BY FUNGI

Late blight - The foliage show dark green to purple-black spots which enlarge rapidly under favorable conditions. White "mildew" on underside of leaf evident early in the mornings. Tubers may be infected in field, during harvest, or in storage. Brown to purple discolored areas about one-half inch deep occur on tuber surface. Further decay is characteristically a wet rot.

The late blight does not become serious in South Dakota every year. Usually it occurs when weather conditions are cool and wet. The fungus overwinters in diseased tubers, and is spread from diseased plants by wind and irrigation water.

Control: 1) Destroy all cull piles by spreading them out

to freeze or soak with kerosene and burn.

- 2) Destroy all volunteer potato plants.
- 3) On irrigated crop, omit late season irrigation and night irrigations if possible.
- 4) Harvest when vines are dead or beat off vines prior to harvest.
- 5) If weather conditions indicate possible spread (temperature 37-78° F, relative humidity above 91%), spray or dust for disease control. Use zineb or maneb (1 1/2 lbs per 100 gallons of water) or Tribasic Copper Sulfate (3 lbs per 100 gallons water). Fungicides may be applied with insecticides and should be applied at ten-day intervals if conditions for the development of disease continue.
- 6) Clean harvest machinery and storage areas as suggested for ring rot control.

Early blight - Dark brown spots 1/4 inch in diameter with concentric rings in the spots. Severe infection causes leaf drop. Infected tubers have small, slightly sunken corky spots at surface. The fungus overwinters in crop debris in the soil. Older leaves attacked first; disease more severe at cooler temperatures.

Control: Spray or dust as recommended for late blight control

if disease severity warrants control program.

Fusarium wilt - Mid to late season yellowing or bronzing of foliage occurs. Top leaves may turn red to purple. Plants are spindly. Vascular tissues of stem and tubers become brown or discolored. Affected plants wilt and die. The fungus is able to survive in the soil and affected tubers.

Control: Plant only disease-free Certified Seed.

Rogue out diseased plants.

Avoid potato production in fields where Fusarium wilt is a problem.

Note: Another wilt disease, Verticillium wilt occurs infrequently on potatoes in South Dakota. Symptoms and control measures are similar to those of Fusarium wilt.

Rhizoctonia - Sprouts may die before emerging, or stems are girdled by reddish-brown lesions at or below groundline. If stems are girdled, foliage turns light green to yellow and may turn purple at tips of leaflets. Aerial tubers often form on stem. Dark brown to black crusty bodies which look like dirt appear on diseased tubers. Rhizoctonia causes very little tuber breakdown in storage. The "Rhizoc" or "dirt that will not wash off" organism lives in the soil and can overwinter on diseased tubers.

Control: 1) Plant Rhizoctonia-free seed. South Dakota Certified seed is recommended.

2) Rogue out diseased plants in Certified fields.

3) Plant reasonably shallow and late if possible.

Common Scab - Tubers have rough scab-like lesions. These vary from corky areas to wart-like bumps and rough pits. On some varieties the only symptom is a russetting of the skin. The scab organism lives in the soil.

Control: 1) Use Scab-free Certified seed.

2) Avoid fields where scab has been a problem.

3) Use long rotation with small grains and alfalfa.

4) Plant varieties which are resistant to common scab.

Silver Scurf - Circular or irregular spots occur mostly on the stem end of affected tubers. Spots are sooty if tubers are undisturbed or silvery when tubers are wet. Silver scurf causes some loss in storage as affected tubers lose water and consequently shrivel.

Control: Silver scurf development in storage is retarded by low temperatures and relative humidity. Long rotations and seed piece treatment will help control the disease.

Storage Rots - Decay in storage is caused by many fungi. Most of the tuber breakdown is of a dry rot type. If secondary organisms are present, soft and wet rots may occur.

Symptoms: Hard leathery to dry cheezy rot of tubers occur during storage. Usually rots start at wounds and bruises. Diseased tissues may be brown-black to light gray.

Control: Avoid rough handling and injury at harvest and during storage. Losses are less if storage area is disinfested and temperature is kept low (35-40° F). Good ventilation will reduce storage losses.

DISEASES CAUSED BY VIRUSES

Purple top wilt - Young leaves fail to develop normally, leaflets roll upwards. In white varieties upper foliage becomes yellow or light green. In red varieties a characteristic purple top develops. Aerial tubers on stems may form. Plants later wilt and die. Virus survives over winter in certain perennial weeds and is transmitted by leafhoppers to potato.

Control: 1) Plant disease-free certified seed.
2) Rogue out diseased plants.
3) Keep insects and weeds under control.

Spindle tuber - Foliage often erect, darker-green than normal. Plants may be stunted. Tubers "bottle-shaped" or elongated with many eyes at stem end. Virus lives in tubers and is transmitted by cutting knives, planters, and several insects.

Control: 1) Use Certified Seed.

- 2) Disinfest cutting knives with boiling water.
- 3) Rogue out diseased plants in certified fields.

Leafroll - Previous season infection shows up soon after leaves emerge. Leaflets roll upward from the margins. Plants appear erect and rigid, foliage turns light green. Current season infection occurs after midseason. The virus survives in many weeds and affected tubers. It is transmitted by aphids.

- Control:
- 1) Plant disease-free seed.
 - 2) Control current season spread by controlling aphids.
 - 3) Use varieties which show no tuber symptoms of necrosis (see below).

Mild Mosaic - Symptoms vary from none at all to mottling and crinkling of the leaves. Leaves ruffled at edges, turning light green or yellow. Virus overwinters in infected tubers and weeds. It is spread by aphids and potato leaf hoppers.

- Control:
- 1) Plant disease-free seed.
 - 2) Rogue out diseased plants in certified fields.
 - 3) Control spread of disease by controlling insects.

Rugose Mosaic - Severe crinkling, mottling and ruffling occurs. Lower foliage with spots usually dies. Entire plant often develops symptoms and dies by mid or late season. The disease is one of the most severe forms of mosaic. Viruses which cause

rugose mosaic survive in tubers and weeds. They are spread by aphids.

Control: Same as for mild mosaic.

Other Virus Diseases - There are several other virus diseases which occur infrequently such as yellow dwarf, calico, haywire and witch's broom. Affected plants look abnormal and should be rogued in certified fields. They are not usually a problem if certified seed is planted.

DISEASES CAUSED BY ENVIRONMENTAL FACTORS

Net necrosis - Brown streaks are scattered through the tubers from bud to stem end. Streaks may be most severe in vascular ring, but not necessarily so. Streaks appear as brown dots when tubers are cut crosswise. Net-necrosis is a symptom which may be caused by any of these factors:

- a) Fusarium wilts
- b) Leafroll
- c) Yellow dwarf
- d) Frost injury
- e) Heat

Control: See control measures for Fusarium wilt and leafroll. Frost and heat necrosis appear when mature tubers are too close to surface of soil to protect them from

extremes of temperature. High ridging or hilling will reduce the amount of frost or heat necrosis.

Tipburn - Foliage turns brown and dry at edges, often rolling up and inward. The disease is also known as hopper burn, caused by leaf hoppers feeding on leaves. Tipburn can also result from excess moisture on the leaves. The disease appears in hot dry weather.

Control: Keep leaf hopper populations under control.

Low Temperature Injury - Frost injury causes discoloration of the tubers varying from ring-necrosis to net-necrosis and blotchiness. Moderately frozen tubers are flabby and sweet. If severe freezing occurs, potatoes will "leak" when thawed. There is little discoloration in frozen tubers.

Hollow-Heart - White to brown irregular cavities appear in center of oversized tubers because of too rapid growth. The only control is to use cultural practices which help reduce the number of oversized tubers.

Black Heart - This disorder occurs when oxygen supply is poor. High temperatures and poor ventilation in storage are the usual causes of inadequate oxygen supply. Black heart can be avoided if steps are taken to insure proper storage temperature and maintenance of adequate ventilation.

Second Growth - Knobby tubers or second growth results from irregular

moisture supply (rainfall or irrigation) and may also be caused by several viruses. Maintenance of adequate moisture levels will help control this disorder.

Sunburn and Sunscald - These disorders are caused by excessive exposure to strong sunlight. Sunburn or greening occurs if tubers are not covered in the hills. Sunscald results in some death of tissues. Sunscald lesions may be invaded by rot organisms. The only possible control is to prevent exposure of tubers to sunlight. Covering loads in truck boxes is the most practical control measure.

The following list indicates the disease resistance characteristics of those varieties commonly planted in South Dakota.

<u>Varieties</u>	<u>Disease Resistance Characteristics</u>
Bliss Triumph	susceptible to most common diseases
Early Ohio	susceptible to most common diseases
LaRouge	some resistance to common scab
Norland	some resistance to common scab
Red Pontiac	susceptible to most common diseases
Red LaSoda	some resistance to mild mosaic
Catoosa	resistant to common scab and late blight
Redskin	some resistance to common scab, mild mosaic and net-necrosis
Haig	some resistance to scab, mild mosaic and net-necrosis
Irish Cobbler	resistant to mild mosaic
Ketaldin	some resistance to mild mosaic, leafroll
Kennebec	resistant to late blight, mild mosaic and net-necrosis
LaChipper	some field resistance to common scab and late blight
Russet Burbank	resistant to common scab
Sebago	resistant to common scab, late blight, and net-necrosis
Superior	some resistance to common scab
White Cloud	susceptible to most common diseases