

5-1944

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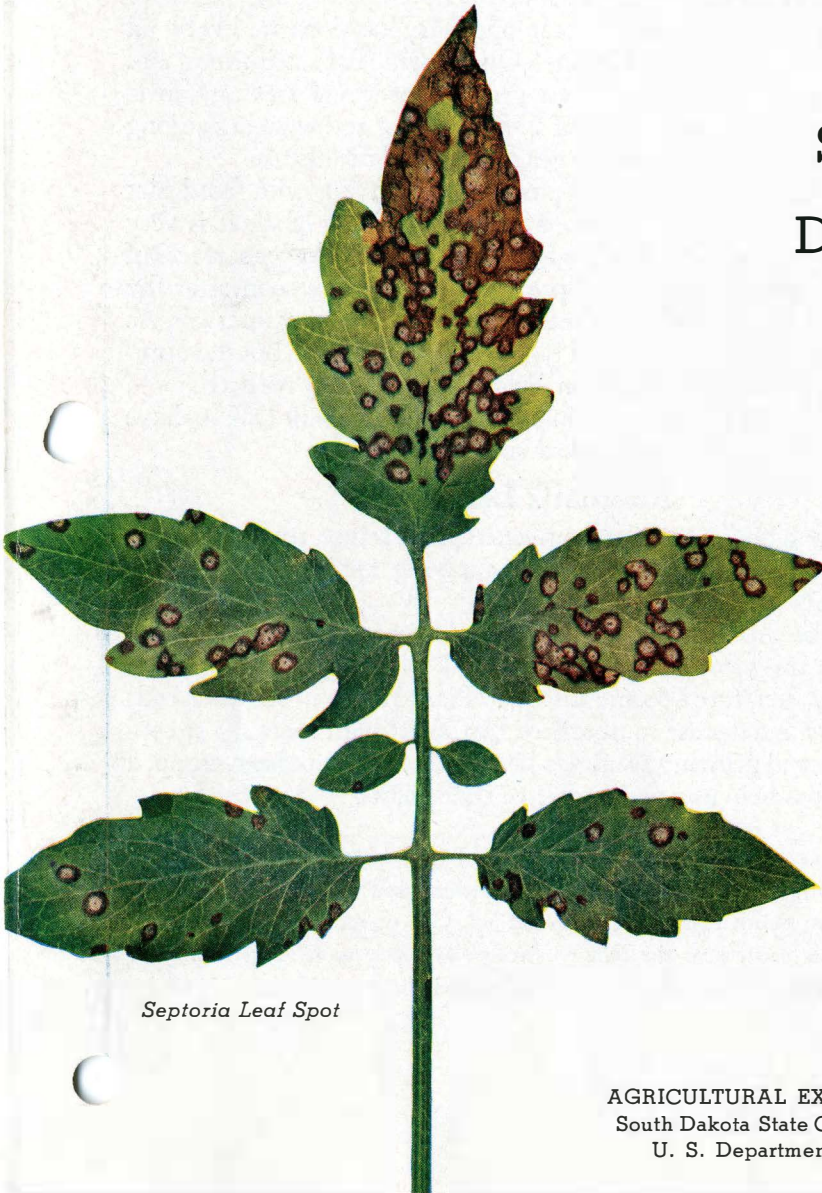
Buchholtz, W. F., "Tomato Leaf Spot Diseases in South Dakota" (1944). *Extension Circulars*. Paper 406.
http://openprairie.sdstate.edu/extension_circ/406

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Circular 408
MAY, 1944

TOMATO LEAF SPOT DISEASES

IN
SOUTH
DAKOTA



Septoria Leaf Spot

AGRICULTURAL EXTENSION SERVICE
South Dakota State College -:- Brookings
U. S. Department of Agriculture

SUMMARY

Septoria Leaf Spot

The causal fungus overwinters on last year's infected plant remains. Therefore burning or thorough plowing under of all refuse disposes of at least part of the disease source. Rotation of tomato plantings with other vegetables within the garden or between gardens avoids the overwintering source.

The disease is favored by rain, dew and moist air. Hedges and low trees around gardens reduce air movement and prevent rapid drying of foliage, which in turn favors development and spread of leaf spot. Conversely, tomatoes in open airy locations are likely not to suffer as heavily from leaf spot. On the same basis, trimming and staking up plants results in less ground cover and free air movement and in some cases less leaf spot. Walking and working among the plants when the leaves are wet may spread the disease.

Some degree of control is possible by spraying with Bordeaux mixture according to directions on the container label. It is very important to cover thoroughly both the upper and lower surfaces of leaves, stems and branches. Spraying should begin soon after the first fruits are set and be continued thereafter at 10-day intervals. As a result of spraying, total yield is likely to be increased, but the number of fruit set and early season yield may be slightly reduced.

None of the varieties of tomatoes adapted to South Dakota have shown resistance to Septoria leaf spot.

Alternaria Leaf Spot

Plowing under or burning infected plant refuse, rotation, avoiding enclosed damp locations and spraying apply for Alternaria as for the Septoria leaf spot.

Because the fruits may be infected, Alternaria spores sometimes occur on the seed. Seedlings and young plants grown from such seed may therefore become diseased. Plant refuse in seedling beds may serve as a disease source. Seed treatment with mercury or copper dusts and growing seedlings in soil which has not been cropped to tomatoes help assure disease-free transplants.

THE COVER

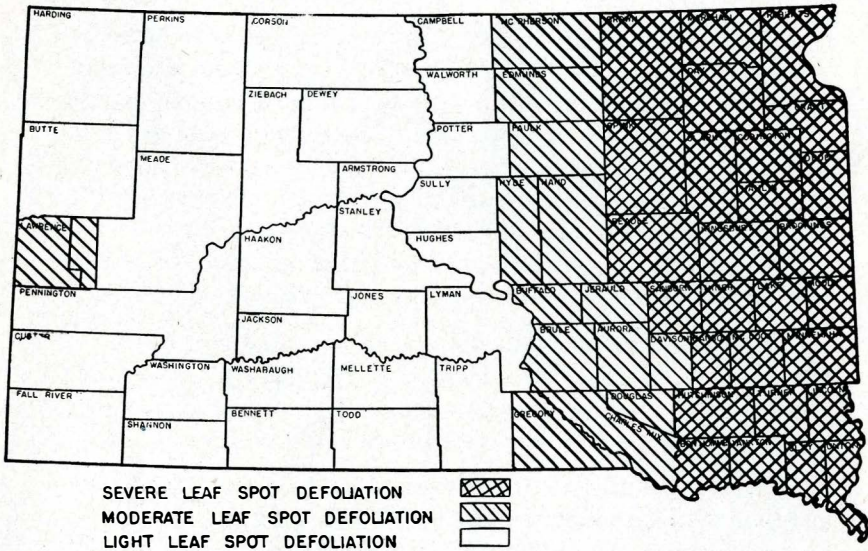
Septoria leaf spot was the disease which caused tomato failures in eastern South Dakota in 1942 and '43. One or more black specks usually occur near the center of fully developed spots. This is the character by which the disease can definitely be recognized.

Tomato Leaf Spot Diseases In South Dakota

W. F. BUCHHOLTZ*

Tomato leaf spots in 1942 and '43 caused low yields and poor quality of fruit in many eastern South Dakota gardens. Successful control of these diseases must be based on preventing early infection of the plants and the spread of the organisms which cause them. This circular describes briefly the two leaf spot diseases of tomatoes common in South Dakota. Control measures for each are listed on page 7.

Both diseases result in the development of numerous spots on the leaves and stems which eventually cause the leaves to drop off prematurely. Thus they are often called defoliation diseases. Both



The shaded areas are those in which tomato leaf spot has been most commonly observed and reported. In eastern counties the tomato crops were very poor in 1942 and '43 because of leaf spot diseases.

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are caused by microscopic organisms known as fungi (molds). These fungi can live over the winter on diseased plants. They enter the leaf tissues through wounds, natural openings (breathing pores) or directly through the skin. Once inside, they grow rapidly and soon kill a small circular area of leaf tissue. Within a week or ten days a spot gradually develops. Once established in the plant, the fungi produce seed-like bodies called spores, which are the means of spreading the disease. When the spores are set free they are spread by wind, rain, drainage water, machinery or insects or by persons walking or working among the plants. With favorable conditions of moisture and temperature the spores germinate and new infections and more spots result.

Consideration of these facts makes it obvious that control must be based on the prevention of early infection and spread of the disease organisms. Complete control is seldom achieved. It is possible to limit the destructiveness of tomato leaf spots by precautionary measures to prevent infection from contaminated seed and soil and several thorough timely sprays.

Since methods of control are defined by the nature and cause of a particular disease, it is necessary to determine accurately what the disease is. Certain diseases such as wilt, once present, can not be controlled, and it is a waste of time and material to apply a spray or dust. The wilt fungus enters the plant through the roots, and lives in the water tubes of the plants until the plant dies. Because it is inside the plant, a fungicide applied to the surface will not reach the wilt fungus. Spraying or dusting therefore does not control wilt.

The leaf spot fungi, on the other hand, penetrate the leaf surface, which can be covered with a fungicide. Their growth is sufficiently near the surfaces of the plant that some of the spray or dust comes in contact with them and may retard their development.

Diagnosis of a particular disease often requires careful examination of the diseased leaves, stems, or roots, sometimes with the aid of a microscope. Many diseases are readily recognized; others are difficult to distinguish.

If identification is difficult or uncertain, the county extension agent may have more information or be able to assist in sending a specimen to the Department of Plant Pathology, Agricultural Experiment Station, Brookings.

Septoria Leaf Spot

In 1942 and '43 Septoria leaf spot was the most destructive disease of tomatoes in eastern South Dakota. During these two growing seasons temperatures were moderate and rainfall ample. It caused such abundant spotting on the above-ground parts that most of the leaves were dropped or killed and the fruit failed to mature properly. There was also considerable injury from sunscald because of the lack of shade normally provided by the leaves.

This disease may occur on plants in any stage of development. In the field it usually is evident after the plants set fruit. Often the first symptoms appear on the older bottom leaves as small water-soaked spots about one-sixteenth to one-eighth inch in diameter. In a few days these water-soaked spots become circular in shape, with ash-gray centers surrounded by a dark border (Cover). Later tiny dark specks develop in the central portion of the spot (Cover). The spots of this disease are usually smaller and more numerous than



The leaf spot defoliation in the row to the right was typical for such early, heavy-bearing, "dwarf" varieties as Bounty, Victor and Bison in eastern South Dakota in 1942 and '43. The later ranker-growing variety to the left produced leaves continuously and suffered less from the loss of its older leaves. Later varieties of this type (Marglobe, Rutgers) are often caught by early frost in South Dakota.

those of the *Alternaria* leaf spot. The fruits are seldom affected, but there may be spotting of the stems and blossoms.

The *Septoria* leaf spot fungus also attacks wild relatives of the tomato, such as ground cherry, horse nettle, Jimson weed, and nightshade. It lives over the winter on the dead leaves and stems of infected tomatoes and wild host plants.

Spores are produced in the tiny dark specks found in the center of the spots. With dew or rain a great number of these spores are exuded onto the surface of the leaves. They may be spread by splashing rains or, when dry, be swept by moving air to other tomatoes or weeds.

Alternaria Leaf Spot

Alternaria leaf spot does occur on tomatoes in South Dakota, but during 1942 and '43 was not as destructive as *Septoria* leaf spot. The *Alternaria* spots usually appear on the older leaves and consist of irregular brown areas. They are considerably larger than those resulting from *Septoria* infection. They may be from one-fourth to one-half inch in diameter. They often are irregular in outline, with surfaces marked by ridged, concentric rings (in a target-like pattern).

On the stem they appear as small dark, slightly sunken areas which may enlarge to form either circular or elongated spots with ash-colored centers. They may or may not show the target-like pattern found on spots on the leaves. Large spots quite often develop at the ground line on the stems of seedlings and may completely girdle the stem. This symptom is known as collar rot. Such plants seldom develop a normal root system or a crop of fruit.

Heavy infection of the flowering stems by the *Alternaria* leaf spot fungus may cause blossoms to fall. The fruit may become infected and develop dark, leathery, sunken spots at the point of attachment. This dark, dry decay extends into the fruit and makes it unfit for use. However, fruit rot of this type, blossom rot and collar rot are not common in South Dakota.

The *Alternaria* leaf spot fungus lives over winter on infected dead plants and on seed from infected fruits. Seedling infection develops from spores on such seeds or infected seed bed soil.

This fungus causes a similar disease on the potato; in fact it was first observed as a potato disease. It may also infect horse nettle, eggplant, nightshade, and other members of the tomato and potato family.

CONTROL MEASURES

1. Burn or plow under all plant remains in gardens where tomato leaf spot has been serious.
2. Rotate tomatoes with other garden vegetables.
3. Cover seed with mercury or copper seed treatment dusts and grow seedlings in soil which has not been cropped to tomatoes.
4. Avoid enclosed, damp locations for tomatoes in eastern South Dakota or where leaf spot has been serious.
5. Trimming and staking plants may result in less leaf spot.
6. Avoid walking or working among tomato plants when the leaves are wet.
7. Spray with Bordeaux mixture. Cover both upper and lower surfaces of leaves, stems and branches.

(If you do not know whether leaf spot has been serious on your tomatoes, refer to the map on page 3 to see in what part of South Dakota it has occurred most commonly.)

Other Factors Causing Heavy Leaf Spot Damage

Under favorable conditions, Septoria leaf spot may cause heavy loss of leaves in spite of control practices. Three factors which contribute to heavy leaf loss by tomatoes are (1) approaching maturity of the plant, (2) heavy fruit load; and (3) limited leaf area as determined by lack of vine growth.

The early, heavy-bearing "dwarf" varieties such as Bounty, Victor and Bison, although adapted to South Dakota growing seasons, suffer heavily from leaf spot, as compared to a slightly later variety such as Firesteel. Still later varieties tend to lose even less leaves, but are a bit late for most of South Dakota. Later transplants and plants grown from seed sown in the garden (therefore late) are attacked later in the season by leaf spot and seem to lose less leaves than early transplants. Maturity of fruit on such plants in many instances may be unsatisfactory.

Experiments in other states show that plants fertilized with nitrogen grow more rapidly and extensively and apparently suffer less from leaf spot defoliation than unfertilized plants.

**Extension Service, South Dakota State College of Agriculture
and Mechanic Arts, Brookings, South Dakota**

Published and distributed under Acts of Congress, May 8 and June 30,
1914, by the Agricultural Extension Service of the South Dakota State
College of Agriculture and Mechanic Arts, Brookings, JOHN V. HEPLER,
Director, U. S. Department of Agriculture cooperating.