Fun Facts - The top dry-bean producing States in 2006-08 were the following:

- **North Dakota--38 percent.**
- **Michigan--14 percent.**
- **Nebraska--11 percent.**
- **Minnesota--10 percent.**
- **Idaho--7 percent.**
- **California--4 percent.**
- **Washington--4 percent.**
- **Colorado--3 percent.**

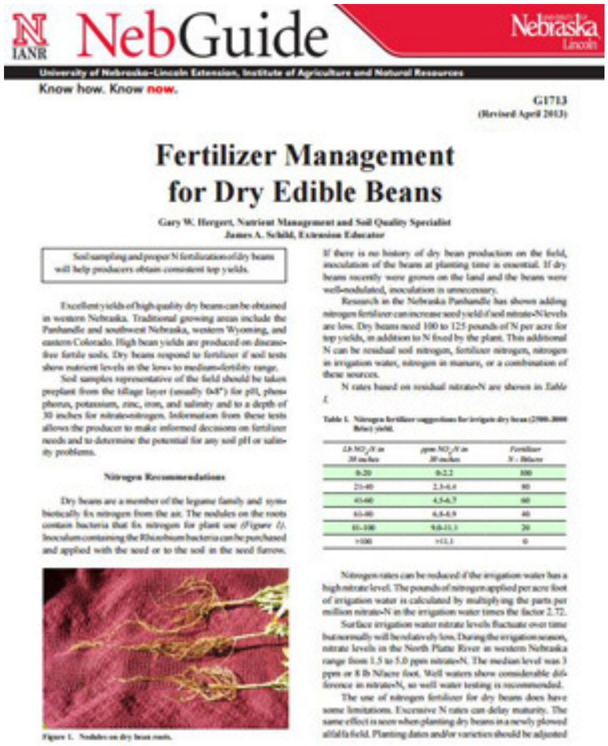
USDA ERS - Dry Beans
https://www.ers.usda.gov/topics/crops/vegetables-pulses/dry-beans.aspx

Comprehensive Bean Production Handbooks

University of California
http://beans.ucanr.edu/files/80592.pdf

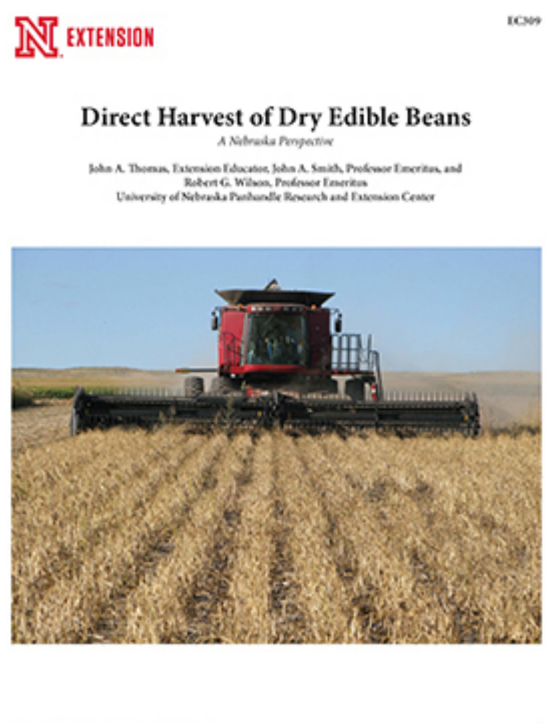
North Dakota State University
https://www.ag.ndsu.edu/publications/landing-pages/crops/dry-bean-production-guide-a-1133

UNL Extension Publications (Shown on following pages)



Fertilizer Management for Dry Edible Beans

G1713



Direct Harvest of Dry Edible Beans: A Nebraska Perspective (EC309)

EC309


NebGuide

Nebraska Lincoln

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G2013

Western Bean Cutworm in Corn and Dry Beans

Ronald C. Seymour, Extension Educator; Gary L. Hein, Professor of Entomology; and Robert J. Wright, Extension Entomologist

This NebGuide addresses the life cycle, scouting and treatment of the western bean cutworm in corn and dry beans.

Western bean cutworm (WBC) can be a severe pest in corn and dry beans. Larval feeding damages both crops through reduced yield and quality. In corn, direct feeding losses may be compounded by fungal infections associated with larval feeding and waste products. In dry beans, damaged or "worm-chewed" beans are a significant quality factor for both processed and bagged dry beans. Western bean cutworm infestations occur every year in western Nebraska and the surrounding region, but can be found in high numbers throughout the state. Traditionally, the western bean cutworm has largely been limited to areas in the western Great Plains, but in the last 10 years, western bean cutworm has steadily spread eastward through the Corn Belt to as far east as Pennsylvania.

Life History

Western bean cutworm has one generation per year with moth emergence usually beginning in early July. The emergence date can be predicted by calculating growing degree days. Starting heat unit accumulations on May 1, using a base air temperature of 50°F, growing degree days for 25 percent, 50 percent, and 75 percent moth emergence are 1319, 1422, and 1536, respectively.

Populations vary from year to year, but there is a tendency for greater populations to occur every six to eight years. Throughout the western Great Plains region, western bean cutworm populations are greater in fields with sandy soils.

Western bean cutworm moths are about 3/4 inch long with a wing span of about 1 1/2 inches (*Figure 1*). The body is light brown, and the wings are generally dark brown with a distinctive pattern. The front wings have a broad white or cream stripe that runs two-thirds of the length of the leading edge. Behind this stripe is a central white spot and, farther away from the body, a half moon shaped spot. The hind wings are cream colored without markings. When at rest, the wings are swept back over the body. The moths are strong fliers and are known to travel several miles. Female moths emit a pheromone (scent) that attracts males for mating.

Figure 1. Adult western bean cutworm.

Figure 2. Newly laid western bean cutworm eggs.

After mating, eggs are usually laid on either field corn, popcorn, sweet corn, or dry beans. Tomatoes and fruits of nightshade and ground cherry are acceptable but non-preferred hosts. Eggs are laid in masses of 5 to 200 with an average of about 50 eggs per mass (*Figure 2*). The eggs are 0.03 inches in diameter, dome shaped with ridges and reticulations. When first laid, the eggs are pearly white, but within two days they turn tan. Egg development usually takes five to seven days and the eggs turn dark purple shortly (less than 24 hours) before hatching (*Figure 3*).

After egg hatch, the larvae remain clumped near the egg mass for several hours, feeding on the chorion (shells) of the eggs. The larvae then move to protected feeding sites, the location depending on the growth stage of the host. Larvae feed for about 31 days and develop through five stages (instars) on

Western Bean Cutworm in Corn and Dry Beans

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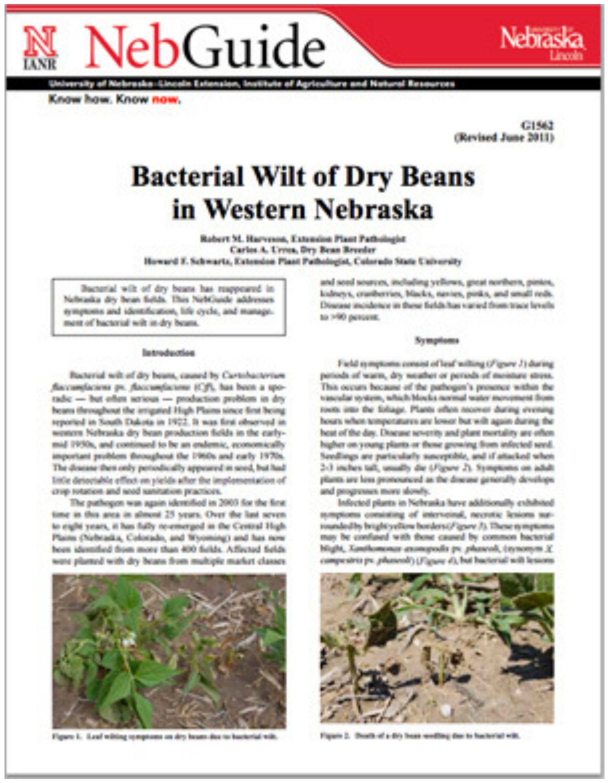
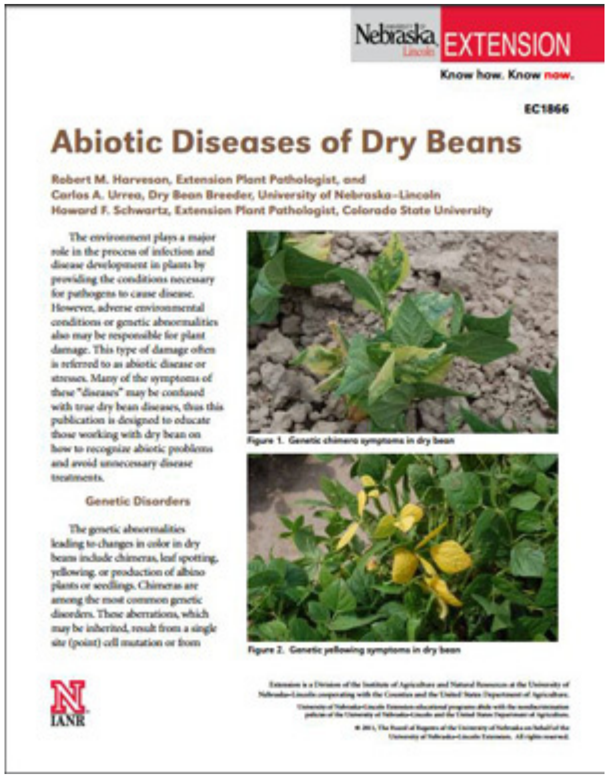


[Bacterial Wilt of Dry Beans in Western Nebraska]

G1562

White Mold of Dry Beans

G1786



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Abiotic Diseases of Dry Beans

Robert M. Harveson, Extension Plant Pathologist, and
Carlos A. Urrea, Dry Bean Breeder, University of Nebraska–Lincoln
Howard F. Schwartz, Extension Plant Pathologist, Colorado State University

The environment plays a major role in the process of infection and disease development in plants by providing the conditions necessary for pathogens to cause disease. However, adverse environmental conditions or genetic abnormalities also may be responsible for plant damage. This type of damage often is referred to as abiotic disease or stresses. Many of the symptoms of these "diseases" may be confused with true dry bean diseases, thus this publication is designed to educate those working with dry bean on how to recognize abiotic problems and avoid unnecessary disease treatments.

Genetic Disorders

The genetic abnormalities leading to changes in color in dry beans include chimeras, leaf spotting, yellowing, or production of albino plants or seedlings. Chimeras are among the most common genetic disorders. These aberrations, which may be inherited, result from a single site (point) cell mutation or from

Figure 1. Genetic chimera symptoms in dry bean

Figure 2. Genetic yellowing symptoms in dry bean

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Abiotic Diseases of Dry Beans

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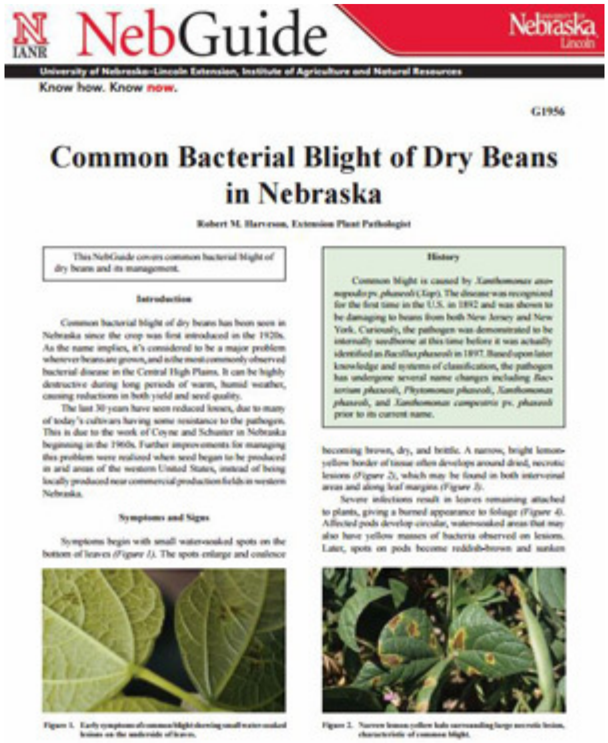

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Common Bacterial Blight of Dry Beans in Nebraska

Robert M. Harveson, Extension Plant Pathologist

This NebGuide covers common bacterial blight of dry beans and its management.

Introduction

Common bacterial blight of dry beans has been seen in Nebraska since the crop was first introduced in the 1920s. As the name implies, it's considered to be a major problem wherever beans are grown, and is the most commonly observed bacterial disease in the Central High Plains. It can be highly destructive during long periods of warm, humid weather, causing reductions in both yield and seed quality.

The last 30 years have seen reduced losses, due to many of today's cultivars having some resistance to the pathogen. This is due to the work of Coyne and Schuster in Nebraska beginning in the 1960s. Further improvements for managing this problem were realized when seed began to be produced in arid areas of the western United States, instead of being locally produced near commercial production fields in western Nebraska.

Symptoms and Signs

Symptoms begin with small water-soaked spots on the bottom of leaves (*Figure 1*). The spots enlarge and coalesce becoming brown, dry, and brittle. A narrow, bright lemon-yellow border of tissue often develops around dried, necrotic lesions (*Figure 2*), which may be found in both interveinal areas and along leaf margins (*Figure 3*).

Severe infections result in leaves remaining attached to plants, giving a burned appearance to foliage (*Figure 4*). Affected pods develop circular, water-soaked areas that may also have yellow masses of bacteria observed on lesions. Later, spots on pods become reddish-brown and sunken

History

Common blight is caused by *Xanthomonas axonopodis* pv. *phaseoli* (Xap). The disease was recognized for the first time in the U.S. in 1892 and was shown to be damaging to beans from both New Jersey and New York. Curiously, the pathogen was demonstrated to be internally seedborne at this time before it was actually identified as *Bacillus phaseoli* in 1897. Based upon later knowledge and systems of classification, the pathogen has undergone several name changes including *Bacterium phaseoli*, *Phytomonas phaseoli*, *Xanthomonas phaseoli*, and *Xanthomonas campestris* pv. *phaseoli* prior to its current name.

Figure 1. Early symptoms of common blight showing small water-soaked lesions on the underside of leaves.

Figure 2. Narrow lemon-yellow halo surrounding large necrotic lesion, characteristic of common blight.

Common Bacterial Blight of Dry Beans in Nebraska

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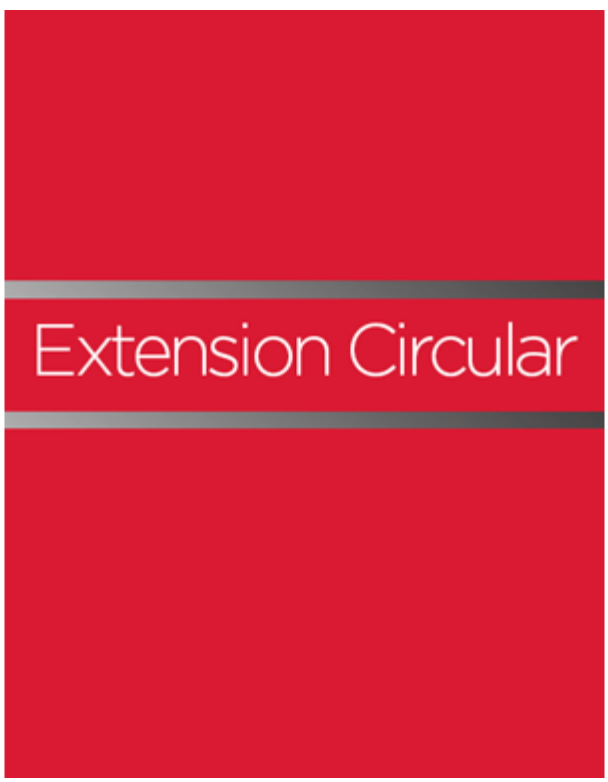
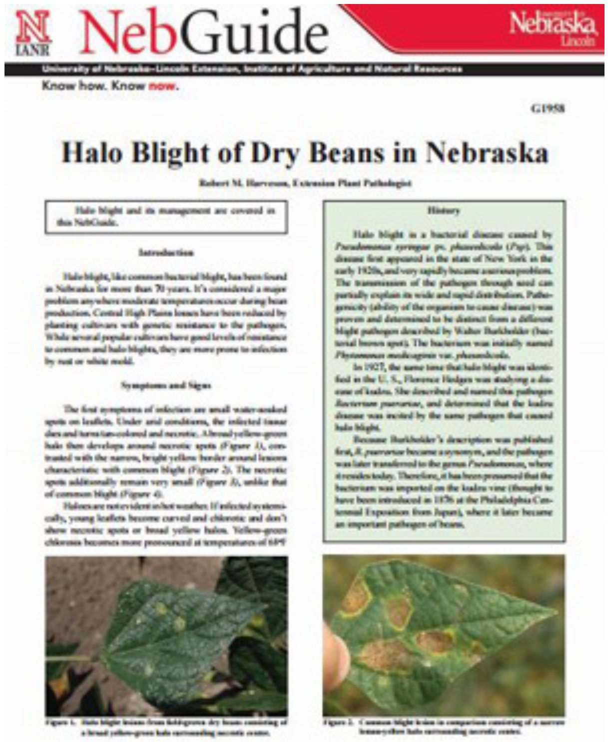


Soilborne Root and Stem Diseases of Dry Beans in Nebraska

EC1869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Halo Blight of Dry Beans in Nebraska

Robert M. Harveson, Extension Plant Pathologist

Halo blight and its management are covered in this NebGuide.

Introduction

Symptoms and Signs

History

Halo Blight of Dry Beans in Nebraska

G1958

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G1957

Bacterial Brown Spot of Dry Beans in Nebraska

Robert M. Harveson, Extension Plant Pathologist

Bacterial brown spot and its management are covered in this NebGuide.

Introduction

Bacterial brown spot is a more recently discovered disease of dry beans in Nebraska than either halo blight or common bacterial blight. It was first seen in western Nebraska dry bean fields on a limited basis throughout the late 1960s. Epidemics still occur sporadically, but the pathogen's presence has increased in incidence and damage along with halo blight during the past 20 years in the Central High Plains.

Brown spot-tolerant bean cultivars were first identified and reported by Schuster and Coyne in 1969 from field and greenhouse tests in Nebraska using the dry bean lines US 1141 and GN Nebraska #1 selection 27, and the snap bean cultivar Tempo. When the disease occurs today, however, it can be very damaging due to the lack of resistance in modern commercial cultivars.

Symptoms and Signs

Lesion size can vary, but generally lesions are small, circular, and brown *(Figure 1)*, often surrounded by a yellow zone *(Figure 2)*. As the disease progresses, lesions begin combining to form linear, necrotic streaks bound by leaf

History

Bacterial brown spot, caused by *Pseudomonas syringae* pv. *syringae*, was first described by Walter Burkholder in 1930. It was determined to be a new disease of beans based on his laboratory investigations of diseased specimens from New Jersey. He named the pathogen *Phytomonas viignae* var. *leguminophila*, but it was later recognized to be a synonym of *Pseudomonas syringae*. Originally it was considered to be rare in the U.S., but in the mid-1960s, severe outbreaks occurred in Wisconsin snap and lima bean fields.

veins *(Figure 3)*. If water soaking occurs, it appears as small circular spots on the underside of leaves *(Figure 4)*. Old lesion centers fall out, leaving tattered strips or "shot holes" on affected leaves *(Figure 5)* and evidence of water soaking may be visible in the edge of tissue next to the shot holes. Stem and petiole lesions are occasionally found when the pathogen becomes systemic.

Pod lesions are circular and water-soaked initially, but later turn brown and become necrotic *(Figure 6)*. If young pods or those in the flat stage become infected, they may be bent or twisted with ring-spots or water-soaked brown lesions.

Like the halo blight pathogen, a cream to silver-colored bacterial ooze may emerge from stems, pods or leaves after

Figure 1. Small, brown, necrotic lesions characteristic of early bacterial brown spot infection.

Figure 2. Bacterial brown spot lesions surrounded by yellow zones.

Bacterial Brown Spot of Dry Beans in Nebraska