

## Ascochyta Blight of Chickpeas in Nebraska

Robert M. Harveson, Extension Plant Pathologist

Ascochyta blight is the most serious chickpea disease worldwide. Integrating genetic resistance, crop rotation and fungicide application is the best way to manage the disease.

### Introduction

The chickpea (*Cicer arietinum*), also known as the garbanzo bean, is an annual grain legume crop that ranks among the world's three most important pulses (seed legumes used as food). It is an important source of protein in many parts of central Asia, Africa and the Mediterranean, and among food legumes it is the most effective in reducing blood cholesterol levels. India is the largest producer, currently growing 78 percent of the world's crop, followed by Pakistan, Mexico, Turkey, and Ethiopia. The crop is native to western Asia and the Middle East, and it is usually grown as a rain-fed, cool-weather crop or as a dry-climate crop in semiarid regions.

Interest in chickpea production in the United States as an alternative crop to spring cereals has increased rapidly in the Pacific Northwest where rainfall is marginal, and also in Nebraska. Currently, the leading producers in the United States are Idaho, Washington, California, and North Dakota. Due to a number of issues including agronomic, processing, and marketing constraints, production in the Central High Plains has been sporadic. However, production in Nebraska, concentrated near Alliance in Box Butte County, has increased

substantially over the past seven years, (1,500 acres in 2000 to almost 10,000 acres in 2006). Despite a reputation for poor yields, chickpeas have the potential for more than 4,000 lbs/acre, and production is expected to increase in the foreseeable future.

### Symptoms

Although chickpeas are reported to be susceptible to more than 50 pathogens, few diseases are currently recognized as significant economic constraints to production. Ascochyta blight, caused by the fungal pathogen, *Ascochyta rabiei*, is the most serious chickpea disease worldwide. The pathogen attacks all aerial portions of the plant. Lesions (0.5-1.0 cm convert to inches for growers (1/4 to 1/2 inch in diameter)) on foliage and pods tend to be circular (*Figure 1*) while those developing on petioles and stems are usually elongate (*Figure 2*). Dark brown lesions on pods and leaves contain concentric rings of pycnidia, the spore-bearing structures (*Figure 3*), and are visible with a 10x hand lens. Early in the season, individual plants infected as seedlings are found scattered in fields (*Figure 4*). These plants may serve as foci from which disease progresses to other plants when adequate environmental conditions occur (see below). This disease can cause economic losses due to reduced yields and quality. For a crop like chickpeas, quality may be more important than gross yields, as payments for small discolored seeds (a result of pod and seed infection) are significantly lowered (*Figure 5*).



Figure 1. Circular lesions typical of pod or leaf infections due to *A. rabiei*.



Figure 2. Elongate lesions typical of stem infections due to *A. rabiei*.



Figure 3. Circular foliar lesions showing pycnidia arranged in concentric patterns within lesions.



Figure 4. Individual, early-infected plant that may serve as a disease focus for other plants in the field. This plant likely originated from an infected seed.

### Infection and Survival

Disease develops most rapidly at temperatures of 68-70°F and high relative humidity. Blight will not develop at temperatures outside the range of 40-90°F or leaf wetness periods of less than six hours. Spores are released from pycnidia during humid weather in slimy, wet masses and are spread to new plants in fields by rain splashing and winds. Spores germinate 12 hours after landing on the host surface and penetrate and infect tissues after 24 hours. The pathogen can survive in infested residue in soils under dry conditions for at least two years. However, the fungus loses viability rapidly under conditions of high humidity (65-100 percent relative humidity) or when buried in soil.

The pathogen also can be carried over in seed and can grow from the pod wall into immature seeds. Between 50 and 80 percent of seed from infected pods has been found to be infected with the pathogen, but seed collected from healthy pods on the same plants were not infected. Seed infections can



Figure 5. Effect of infection on seed size and quality. Seeds (top) harvested from pods (bottom) collected from a severely infested field — healthy (left) and infected (right).



Figure 6. Chickpea cultivar trials showing entry highly susceptible to *Ascochyta* blight.

be either internal or external on the seed surface, and both types of infections are equally capable of transmitting the pathogen to emerging seedlings. *A. rabiei* can retain its viability in seed for at least five years, and seed transmission is a more effective source of infection than infected plant debris. Seed infections are also the most likely mechanism for long-distance spread of the disease throughout the world.

### Disease Management

Since no one method of control for *Ascochyta* blight will be completely effective by itself, the best option for managing this disease is to integrate several different techniques. These include genetic resistance if available (combined with seed treatments if necessary), rotating chickpeas with nonhost crops for three to four years, and judicious use of fungicides when warranted. Monitoring conditions that are favorable for disease development will also assist growers in deciding whether to use a fungicide.



Figure 7. Regrowth of new foliage several weeks after application with fungicides.

### Crop Rotation

Since *A. rabiei* is specific for chickpeas, rotating with nonhost crops will help reduce inoculum levels in soils. Chickpeas should not be grown more frequently than every three to four years, and new crops should not be planted near previously blighted fields due to risk of infection in new crops. Tilling and burying residue will speed up decomposition of infested residue which also will reduce inoculum by removing the source for the pathogen to survive in soils.

### Resistance

No resistance is available that is complete or exhibits immunity from the pathogen (Figure 6). Most cultivars have good resistance until flowering when lesions may develop on stems and leaves. If conditions are favorable, disease can develop rapidly after flowering, and fungicide applications should be considered. Cultivars are available with partial tolerance resistance to the pathogen, and more are currently being developed and evaluated at the Panhandle Research and Extension Center in Scottsbluff.

### Fungicide Applications

Producers should pay particular attention to protecting young green foliage during pod fill. Several fungicides are labeled for this disease, including Bravo (Chlorothalanyl), Quadris (Azoxystrobin), and Headline (Pyraclostrobin). All fungicides have been demonstrated to increase yields and reduce losses from the pathogen, but their use will not be economically feasible unless disease pressure is high. Watching weather reports and monitoring environmental conditions for disease development are useful methods for estimating need and timing for fungicide applications. Scouting fields early for the presence of isolated, infected plants is also an important part in this process. These isolated plants likely originated from infected seeds, and the fungus can rapidly



Figure 8. Poor stands due to seedborne *Ascochyta* blight in plots untreated with fungicides, compared to those using fungicides.

spread to surrounding plants if left unchecked when conditions are favorable for blight.

Treating fields at an early stage is much more effective than rescue treatments after an epidemic has begun. Because of a higher degree of systematic properties, studies have demonstrated that both Headline and Quadris are superior to Bravo in reducing disease losses after an epidemic has become severe. Using fungicide with these products has been shown to completely shut down disease activity of *A. rabiei* and allow for additional regrowth and flowering of infected plants (Figure 7).

Several seed treatments are available for early season disease protection, including Maxim (Fludioxonil), Apron (Mefenoxam), and Allegiance (Metalaxyl); however, these will only protect against seedling damping-off from certain soilborne pathogens such as *Pythium* and *Fusarium*. They will not protect plants from seedborne *A. rabiei* infections (Figure 8). Mertect (Thiabendazole) is labeled as another seed treatment specifically to protect against seedborne *Ascochyta*. For the latest information on labeled and appropriate use of fungicides for management of *Ascochyta* blight, contact the Panhandle Research and Extension Center, 4502 Avenue I, Scottsbluff, NE 69361-4939.

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**Index: Plant Diseases  
Field Crops**

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