



Crown Rust of Oats

Emmanuel Byamukama, Associate Professor and SDSU Extension Plant Pathologist
Connie Strunk, SDSU Extension Plant Pathology Field Specialist
Shaukat Ali, Associate Professor, SDSU
Melanie Caffé-Tremi, Associate Professor, SDSU

August 2021

Crown rust of oats is considered the most economically important fungal disease of oats in the northern Great Plains. In years of heavy outbreak, crown rust can cause up to 80% yield loss in susceptible cultivars. Additionally, yield loss can occur due to lodging of infected plants (Figure 1) and these plants are not picked up by the combine during harvesting. Crown rust also reduces test weight of oats, making it difficult to market oat grain. In South Dakota, heavy crown rust development occurs in East River areas where buckthorns (the alternate host of crown rust pathogen) are abundant and rainfall occurs more frequently than West River area.



Figure 1. Fungicide treated (left plot) and non-treated plots (right plot). Notice the lodging in the untreated plot due to heavy crown rust infection.

Symptoms

Crown rust can develop on oats at any growth stage provided there is inoculum and the weather is conducive for infection to take place. Crown rust symptoms start as chlorotic spots on the lower leaves (Figure 2). As symptoms advance, these spots develop into raised reddish-orange pustules. These pustules are loaded with microscopic spores called uredospores (Figure 3). These are blown by wind or spread by rain splash to cause more infections. Pustules can develop on leaf sheaths, stems and panicles but the pustules on leaves are the most damaging. Depending on the time of infection, infected plants can be stunted and also these plants have poor drought tolerance. As the oats mature, the crown rust pustules turn black, an indication of forming resting spores called teliospores (Figure 4).



Figure 2. Beginning symptoms of crown rust on oats.



Figure 3. Crown rust pustules with uredospores.



Figure 4. Crown rust pathogen forming resting spores – teliospores.

Causal agent and disease cycle

Oats crown rust is caused by a fungal pathogen *Puccinia coronata var. avenae*. The crown rust disease cycle starts with resting spores, teliospores (Figure 3), germinating early in spring to produce spores called basidiospores. These spores are carried by wind and they must infect an alternate plant, the buckthorn (*Rhamnus* spp) (Figure 5), in order to complete the life cycle. The buckthorns are a tree-like shrub, introduced

into the United States as a windbreak shrub and as an ornamental plant. It produces berries that birds feed on and then spread these seeds around. The basidiospores infection on buckthorn results into production of aeciospores. The aeciospores are spread by wind and infect oats to cause crown rust. Spores that are produced on oats are called uredospores. These become secondary source of inoculum. Infections on oats later turn into teliospores, the overwintering spores for the crown rust pathogen. The crown rust pathogen can also infect few wild grasses.



Figure 5. Buckthorn growing along a tree shelter belt. A close-up of crown rust aeciospores developing on buckthorn.

Environmental conditions

Crown rust is favored by mild to warm temperatures between 68-77 degrees Fahrenheit and wet conditions. Wind facilitates movement of spores from oat stubble to buckthorns and from buckthorn to oats. Wind and rain splash also spread the spores within the oat field. Dry and hot weather (>86 degrees Fahrenheit) prevents infection from taking place. Infections that take place before flag leaf emergence cause the greatest yield loss.

Management

Plant crown rust resistant/tolerant oat cultivars (Figure 6). The Crop Performance Test (CPT) program provides annual results on oats cultivar performance as well as crown rust ratings. Here is a link for the Oat Variety Trial Results <https://extension.sdstate.edu/oat-variety-trial-results>. A resistant cultivar does not cost a grower any more than a susceptible cultivar yet can give over 50 bushel more than a susceptible cultivar.



Figure 6. Comparison of a crown rust resistant cultivar Deon (left) and susceptible cultivar, Horsepower (right) under natural crown rust inoculum.

Apply a well-timed fungicide if a susceptible/moderately susceptible cultivar is planted and crown rust is starting to develop on leaves below the flag leaf. Scout oats at flag leaf emergence through head emergence to determine the need for a fungicide. Fungicide application decision should also be based on weather forecast and the growth stage. A well-timed fungicide protects against grain yield loss in susceptible cultivars (Figure 7).

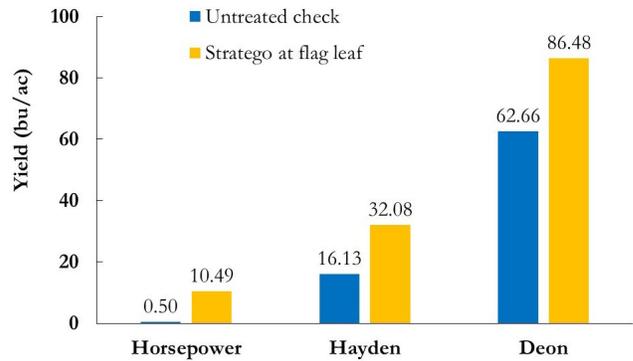


Figure 7. Grain yield response in oats as influenced by cultivar and fungicide application.

Where possible, plant oats early to escape infection. The later the oats are infected (after heading), the less will be yield loss.

Other resources:

Crown rust of oats. University of Illinois. <http://ipm.illinois.edu/diseases/series100/rpd109/>

Oats crown rust. USDA-ARS. <https://www.ars.usda.gov/midwest-area/stpaul/cereal-disease-lab/docs/cereal-rusts/oat-crown-rust/>



**SOUTH DAKOTA STATE
UNIVERSITY EXTENSION**

**SOUTH DAKOTA STATE UNIVERSITY®
AGRONOMY, HORTICULTURE & PLANT SCIENCE DEPARTMENT**

SDSU Extension is an equal opportunity provider and employer in accordance with the nondiscrimination policies of South Dakota State University, the South Dakota Board of Regents and the United States Department of Agriculture.

Learn more at extension.sdstate.edu.

© 2021, South Dakota Board of Regents