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## Leaf Rust of Wheat

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Leaf rust of wheat, caused by the fungus *Puccini recondita* f. sp. *tritici*, can cause heavy yield losses in wheat. Growers frequently underestimate the losses caused by leaf rust because the disease never destroys an entire crop in Kentucky and seldom causes severe shriveling of the grain. Yet the disease reduces the number of Kernels per head, as well as grain test weight. Grain from severely rusted plants is also lower in protein content.

Some leaf rust occurs in the state every year, but variations in the weather and the amount of rust overwintering in the southern states produce large year-to-year differences in leaf rust development. Yield loss is most severe when the disease occurs early in the spring on susceptible varieties and continue until the crop is mature.

### Symptoms

Small, round-to-oval, raised, orange-red, dusty pustules are scattered or clustered mostly on the upper surface of the leaves and leaf sheaths of infected plants. Each pustule contains many thousands of microscopic, orange-red rust spores.

Leaf rust frequently starts on the lower leaves and gradually progresses up the plant to the flag leaf. However, when massive levels of spores are windblown into the field after flag leaf development, pustules may be more noticeable on the flag and the leaf just below the flag than on lower leaves. Some pustules may also develop on the stems (culms), and occasionally on the awns and glumes of the head. As the season progresses, the pustules become more and more numerous until 30 to 50 percent or more of the total leaf area may be destroyed. Such severely infected leaves usually shrivel and die prematurely. As the wheat matures, other dark gray-to-black, flattened pustules (telia) of about the same size may develop in large numbers, mostly on the undersides of the leaves, leaf sheaths and culms. These pustules contain the overwintering spores (teliospores). The teliospore stage does no damage to the wheat crop and may not even occur if plants become infected near maturity.

### Disease Cycle

Spores of the leaf rust fungus can't endure low temperatures. Thus, the fungus overwinters primarily in the southern states and Mexico. In mild winters, the leaf rust fungus may also survive within leaves of fall-sown or volunteer wheat in Kentucky. The typical, orange-red pustules are then produced in early spring.

Spore produced on wheat grown in the southern states and Mexico are carried northward into Kentucky by the wind. They settle on the wheat plants and, when moisture is present, germinate and infect within 6 to 8 hours. Once established, the fungus may produce a new generation of spores every 7 to 14 days if moisture is prevalent and temperatures are favorable (59 to 77 degrees F). The disease continues to spread from plant to plant and from field to field by windblown spores until the crop matures. Thus, rust has the ability to "explode" on susceptible varieties if weather conditions remain favorable after the disease begins to develop. The migration of spores is reversed in the fall when spores are blown from the northern states southward, where they infect winter wheat.

### Physiologic Races

Like most cereal rusts, the leaf rust fungus is specialized into numerous physiologic races. More than 150 races are known to exist. A wheat variety may be immune to certain physiologic races of leaf rust, moderately resistant to other races, and completely susceptible to still others. No wheat variety is highly resistant or immune to all known races. Luckily, only a few races are abundant and widely distributed in

Kentucky during any one year.

As new, virulent races of rust develop, wheats that were formerly resistant may become susceptible, or at least moderately susceptible. For example, the soft winter wheat variety Caldwell at one time had fairly good resistance to leaf rust; it is now rated as moderately susceptible and may someday be rated as very susceptible to leaf rust. To meet this challenge, wheat breeders and plant pathologists are working constantly to incorporate resistance to an increasing number of races into new crosses, selections and varieties. The battle between the rust fungi and the wheat breeders and plant pathologists is a continuous one.

### Control

1. Sow wheat varieties with at least moderate resistance to leaf rust.
2. Sow winter wheat after the Hessian fly-free date for your locality and at the recommended rate. Plant seed into fertile, well-prepared soil. In situations where moderate or greater amounts of nitrogen have been applied to wheat without adding sufficient potassium and phosphorus (as determined by a soil test), the possibility of severe rust attack increases. Following the recommendations given in the soil test report should make it possible to increase yield without increasing the susceptibility of the crop to leaf rust.
3. Treat the crop with a foliar fungicide if warranted by sufficient leaf rust pressure.

Only apply a foliar fungicide if:

- the yield potential of the crop is sufficient to offset the cost of the fungicide plus application costs;
- the wheat variety is at least moderately susceptible to leaf rust and field scouting of the crop indicates that rust is active, the crop has not yet passed the soft dough stage of grain development and leaf rust is not yet severe on the top two leaves throughout the crop.

A well-equipped ground rig is the best means of applying fungicides to the crop. Proper application requires twenty to thirty gallons of water per acre; this is especially important when protectant fungicides such as mancozeb are used. Use of less water, although tempting, frequently results in poor disease control because of poor fungicide distribution and coverage. Protectant fungicides **MUST** be applied **BEFORE** significant infection occurs. Thus, timing of the fungicide application is critical and must be coordinated with frequent field scouting to keep at least one step ahead of the disease. Systemic fungicides, such as propiconazole (i.e., Tilt), are taken into the plant and can eliminate young infections as well as protect tissue from new infections. Nonetheless, timing of application is still very important with systemic fungicides.

While waiting too long to apply a fungicide is a major concern, applying them too far in advance of a leaf rust epidemic is also a problem. Protectant materials are only active for a period of 7-10 days following application. In addition, leaves that emerge following application will be completely unprotected. Systemic products are active for longer periods (14-21 days), but it is still very possible to "run out" of product prior to the time when significant infection occurs. The key to avoiding this problem rests with field scouting. Specifically, regular observation of leaf rust susceptible crops will give a pretty good indication as to if and when fungicides are needed. At a minimum, scouting will allow you to determine with little difficulty when fungicides are not needed because of little or no disease pressure.

The proper time of application varies from area to area and season to season. This is because of yearly variations of leaf rust overwintering in Kentucky, movement of spores into Kentucky from the southern states, and the weather. The main goal of fungicide use to control leaf rust is to keep the flag leaf as disease-free as possible until after the kernels have filled (mid dough stages).

If possible, leave a nonsprayed strip in your field if you decide to use fungicides. After harvest, compare yields and test weights between the sprayed and nonsprayed areas. This will give you the means to assess the value of the spray relative to disease control and its economic impact. Always read and follow label instructions prior to making any fungicide applications.