

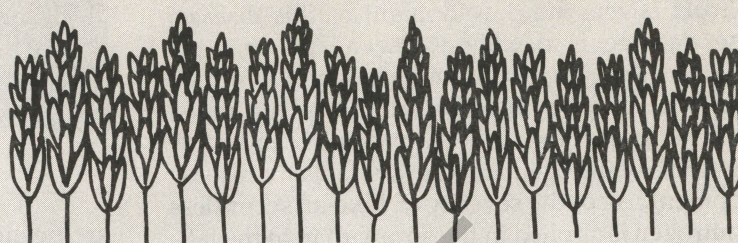
AGRICULTURAL GUIDE

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Plant Diseases

Wheat Take-all

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Take-all is a root and crown disease of winter wheat that interrupts plant development and may seriously suppress yields. It is a common problem in the winter wheat regions of Southwestern and Northwestern North America, and it occurs occasionally on winter wheat in Missouri.

In Missouri, damage varies yearly depending on soil fertility and environmental conditions. Losses from light to moderate infections often go undetected. If the conditions are favorable for this disease, severe root and crown rot develop, and yields may drop more than 50 percent.

Wheat Take-all is caused by the fungus, *Gaeumannomyces graminis*. It infects wheat, barley, rye, and several grasses, including smooth brome grass (*Bromus* spp.), quackgrass (*Agropyron* spp.) and bentgrass (*Agrostic* spp.).

Symptoms

Take-all is most obvious near heading time. Diseased crops appear uneven in height and irregular in maturity. Infected plants are stunted, mildly chlorotic (turn yellow), have few tillers and ripen prematurely. Their heads are bleached (white-heads) and sterile. Some may contain shrivelled grain, and all are subject to darkening by sooty molds. Roots are sparse, blackened and brittle from the fungal invasion (See Figure 1). A black-brown dry rot extends to the crown and basal stem. This area of the stem may be covered by a superficial, dark coating which can be scraped off with a knife or thumbnail. The coating is the fungal growth. Diseased plants may lodge (See Figure 2). Although these symptoms are often the first obvious indications of Take-all, they are terminal stages of the disease.

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Figure 1. Degenerate wheat roots and darkened stem bases are indicative of Take-all.

Disease cycle

The Take-all fungus survives on the undecomposed root and crown residue of infected plants. It spreads from area to area in this debris. Infection occurs when the fungus penetrates the young roots of a living plant. Infection occurs throughout the growing season but is more severe when the temperature is between 54 and 64 degrees F. Damage is usually the greatest when plants are infected in the autumn or early spring. Damage may not be visible when plants are infected in late spring because of the maturation of the host plant.

Conditions that favor Take-all

Take-all is more severe in lighter, alkaline, infertile, and poorly drained soils. Wet soils, especially during

the second half of the growing season, favor Take-all development. Symptoms are less noticeable in dry conditions than in moist conditions.

Take-all severity on wheat depends on the supply of nutrients to the host. Plant nutrients offer increased resistance to Take-all and a greater capacity to tolerate infections by producing more roots. It is important, therefore, to maintain good levels of available nitrogen, phosphorus, potassium, and magnesium.

Soil pH affects the development of this disease. Disease damage is usually worse as the soil pH approaches 7.0. Thus, applications of lime and nitrate fertilizers (that raise the pH around plant roots) generally increase Take-all. Ammoniacal and slow release forms of nitrogen are less favorable for disease development. Also, the severity of Take-all seems less when nitrogen is applied in the spring than in the fall.

Control

Wheat varieties highly resistant to Take-all are not available. So other disease control techniques such as crop rotation must be used.

Rotating a field out of wheat and into a non-host crop (a crop which is not infected) such as oats, forage legumes, corn, or milo for one to three years is usually sufficient for disease control. The fungus needs a host to thrive on, such as wheat, and will die without it. Double cropping wheat and soybeans is not a useful rotation for Take-all control. In this situation, the disease develops on the wheat and may develop on the soybeans.

Maintaining the soil at an optimum fertility level helps reduce the severity of the disease. Adequate nitrogen, phosphorus, potassium, and magnesium

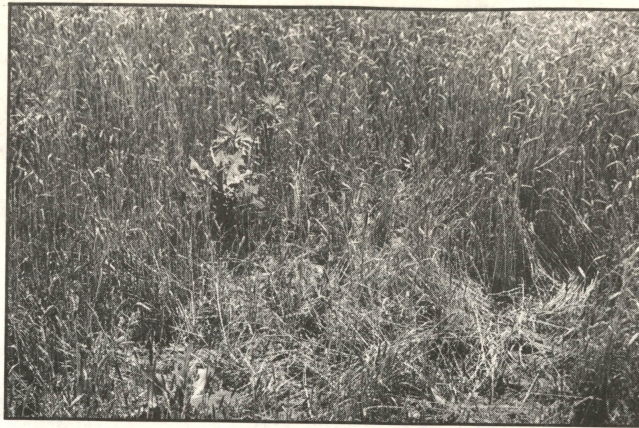


Figure 2. Lodged plants caused by Take-all.

are needed to promote root and plant growth.

Other control techniques that may be useful include:

- **Eradicating** wild grass hosts (quackgrass, wild barley, or downy brome) and volunteer wheat;
- **plowing down** wheat residue soon after combining may help (although this is controversial);
- **improving drainage** (Take-all is more severe in wet areas); and
- **delaying fall planting.**

The disease is not reduced by burning wheat stubble.

A phenomenon called Take-all decline may occur when wheat is grown yearly in the same field. After an increase of the disease for two to three years, it becomes less severe during the next one to two years and may no longer be a problem thereafter. The decline is a form of biological control caused by microorganisms in the soil that suppress the causal fungus of Take-all. However, it is not economically feasible for wheat growers to wait three to four years for this phenomenon to develop.