

Management of Take-All Disease of Wheat in Arkansas

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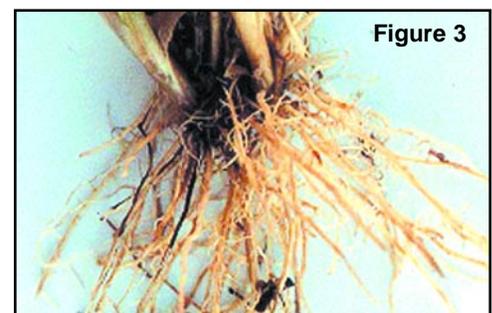
Take-all disease of wheat is a sporadic problem in Arkansas, usually affecting long-term wheat fields double-cropped with soybean or field peas in the summer. The disease tends to increase in the same spots and fields each wheat crop, eventually making it impractical to continue wheat production in these areas. Occasionally, take-all is severe the first time wheat is planted in a field, and this is likely due to the take-all fungus living on grassy weeds from fall through spring in previous years. Because there are no effective fungicides for take-all control or other "quick fixes," growers affected by take-all must consider other management options.

Cause

Take-all disease of wheat is caused by the soilborne fungus, *Gaeumannomyces graminis* variety *tritici*.

Symptoms

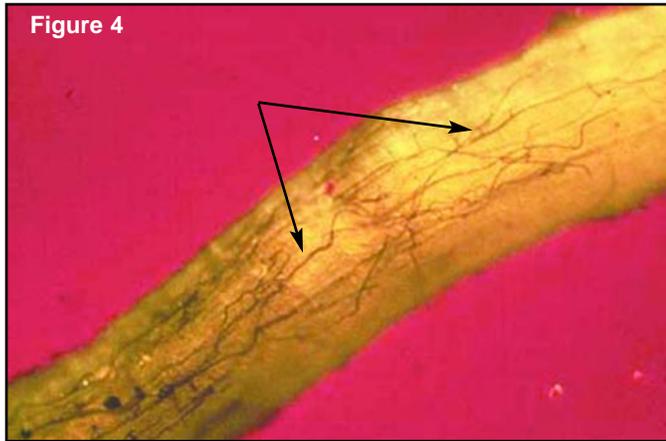
Take-all is most noticeable in the late spring when diseased plants die prematurely and stand out as "white-heads" (Figure 1) compared to healthy plants with green heads. Diseased plants usually occur in small to large scattered patches through the field (Figure 2).



Roots infected in the fall start to develop black lesions (Figure 3) but the plants still appear healthy and grow normally. Developing lesions on roots have a black inner vascular cylinder and white outside cortex that is diagnostic for take-all.

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Sometimes black runner hyphae of the fungus can be seen growing on the surface of roots near the black lesions (Figure 4). Severely diseased plants die more rapidly during grain fill if they become stressed during hot, dry weather. Plants that have died from take-all can be easily pulled from the soil, and the roots, crowns and lower stems will be black and rotted (Figure 5).



Disease Cycle

The take-all fungus survives between wheat crops in infested crop debris (crowns, roots, lower stems) or in the roots of certain grassy weeds (Figure 6). The



fungus infects wheat whenever temperature and soil moisture are favorable. Depending on available soil moisture, there usually are infection periods in the fall (late September through October) and in the spring (March through early May) when soil temperatures are 50° to 68° F (Figure 7).

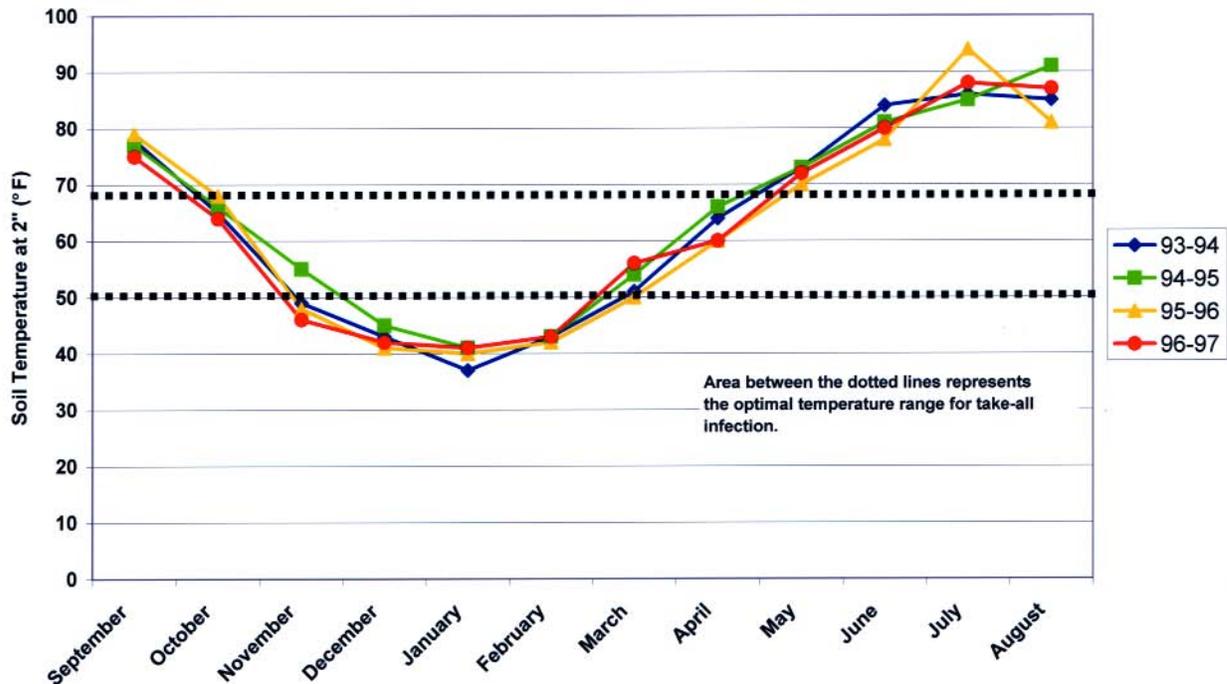
During late winter and early spring, the fungus grows up the roots into the crown of the plant and possibly to some roots of nearby healthy plants. Patches of stunted, yellow plants appear in late March to early April. Under this scenario, the fungus kills enough root and crown tissue that the diseased plant dies before the end of grain fill, resulting in severe yield loss.

It is important to remember that only the most severely diseased plants die prematurely. Many more plants in the field will have sub-lethal levels of disease, and these diseased roots are the most important sources of inoculum for future wheat crops.

Control

1. Rotation out of wheat
 - a. This is the best option for fields where irrigated crops can be grown in the summer.
 - b. One full year out of wheat allows most of the take-all fungus in the field to die if there are no grassy weeds for it to live on during the fall, winter and spring months.
 - c. All grassy weeds growing during the winter can probably support the take-all fungus, however, rescuegrass, prairie wedgegrass, cheat grass and ryegrass have been found to be the best wild hosts.
 - d. Rice has been shown to be the best rotation crop because the take-all fungus does not survive well in flooded soils during the summer months.
2. Continuous wheat/summer fallow
 - a. This is the best option for fields where an irrigated summer crop cannot be grown.
 - b. Fallowed soil is hotter during the summer because it is not shaded by a crop.
 - c. High temperatures speed up the breakdown of infested wheat crowns and roots and weaken the take-all fungus in them.

Figure 7. Average Monthly Soil Temperature (Keiser, AR, 1993-1997)



3. General practices to be used together with options 1 and 2.
 - a. Maintain the soil pH between 5.5 and 6.5 by soil testing and use of moderate amounts of lime. A soil pH higher than 6.5 can increase take-all damage.
 - b. Maintain a well-balanced fertilization program that supplies recommended levels of nitrogen, phosphorus, potassium, sulfur, copper and manganese based on frequent soil testing or Extension fertilizer recommendations. Proper fertilization will help wheat outgrow take-all and minimize damage.
 - c. Plant as late as practical in the fall to allow maximal time for the fungus to die and to avoid most of the period that is favorable for fall infection.
 - d. Plant wheat into a firm seedbed. This has been shown to help minimize take-all when compared to planting in a fluffy seedbed. No-till planting methods are beneficial. If using conventional planting methods and the seedbed has not received a rain to pack it down after tillage, consider rolling or culti-packing prior to seeding.
4. Fungicides, including seed treatment fungicides, are not effective.

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