TAKE-ALL OF IRRIGATED SPRING WHEAT IN NORTH DAKOTA

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In North Dakota, most spring wheats (both hard red and durum) are grown under dryland conditions. Yields can be increased 50 percent or more by irrigation (1). At times of high wheat prices the growing of irrigated wheat becomes economically attractive in its own right. Even when the increased yield does not completely cover the cost of irrigation many North Dakota farmers still grow wheat under irrigation as a rotation between irrigated crops of corn or row crops.

Take-all root rot caused by the soil fungus *Gaeumannomyces graminis* is not a widespread problem in dryland spring wheat in the Northern Great Plains (4). Although the pathogen is occasionally found, it is presumed not to have the proper conditions to take serious disease (5, 6). There are a few previous reports of take-all on spring wheat (2), and none from the Great Plains area of the United States.

This report is based on the author's field observations and laboratory examination of collected plants. Only the occurrences confirmed in the laboratory will be reported here. Several other suspected cases of take-all have been reported to the author but were not confirmed by laboratory exmaination and are not included in this report.

Locations. Three fields of center-pivot-irrigated spring wheat showed typical take-all symptoms. All fields were on sandy soil. Field 1 near Pettibone, Kidder County, in central North Dakota, had been under irrigation for four years and planted to four successive crops of wheat. Field 2 near Karlsruhe, McHenry County, in north central North Dakota, had been irrigated for seven years and planted to wheat in five of those seven. Field 3 in Divide County, in northwestern North Dakota, near the Montana-North Dakota border had been irrigated for five years and in wheat for at least the previous three.

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Identification. Field symptoms were typical of take-all: small-to-large, roughly circular patches of upright killed plants which were bleached almost white. When pulled up, stem bases and crowns of dead plants exhibited typical shiny coal-black discoloration and severely reduced root development (Fig. 1). Plants could be easily pulled from the ground because of root destruction.

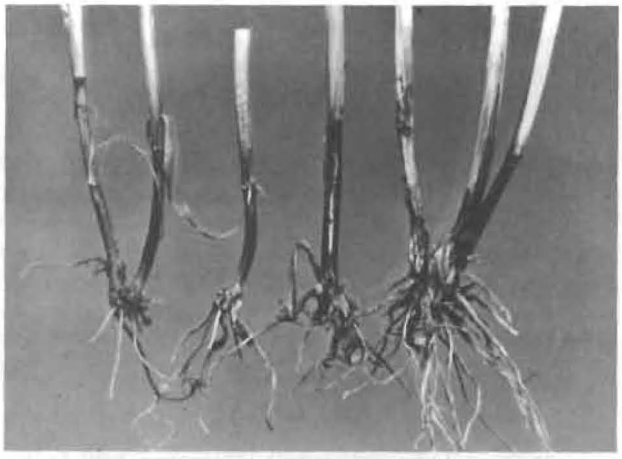

Fig. 1. Wheat crowns affected by Take-all. The stem bases show coal-black discoloration. The roots are largely destroyed. Photo courtesy of C. R. Grau.

Isolations from symptomatic tissue were made and *G. graminis* was recovered. Crowns and stems collected from field #2 were also submitted to Dr. R. J. Cook, USDA, Pullman, Washington, who confirmed the identification of take-all.

Losses. In field 1, the farmer reported an average of 25 bu/A for the field with take-all. An adjacent irrigated field of the same wheat variety, but not showing take-all symptoms, yielded 45 bu/A, and the farmer reported that he had obtained comparable yields in previous years before the take-all appeared. This is about a 45 percent loss. In field 2 the loss was about 30 percent of total yield based on previous yields in that field and yields of nearby fields. The farmer reported his yield in field 3 was about 43 percent below what he expected based on yield from an adjacent irrigated field without take-all.

DISCUSSION

The take-all fungus has long been known to be present in the spring wheat areas of the Northern Plains and was probably a component of the original grassland microflora (4). These three cases are the first confirmed reports of take-all in North Dakota and the first reports of take-all in irrigated spring wheat in the Northern Great Plains.

A serious world wheat shortage could stimulate widespread interest an irrigated spring wheat to maximize yields. Take-all has the potential to wipe out most of the increased yield sought by irrigation. Studies in other parts of the U.S. indicate that use of fertilizer containing ammonium nitrogen sources suppress some of the effects of take-all.

Research is currently underway at NDSU and at the North Central Branch Station on cropping practices to reduce effects of take-all root rot of wheat under irrigation.

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