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KEYS TO AID IN THE IDENTIFICATION OF THE MORE IMPORTANT
FOOT ROTS OF WINTER GRAINS IN THE PACIFIC NORTHWEST*

by

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There is an increasing need for simplified information on the occurrence and identification of cereal foot rots in the Pacific Northwest. This note attempts to aid the producer, field worker and experiment station worker in identifying these diseases and in addition to assist the student who is frequently confused by the mass of undigested data on these diseases.

The foot-rot diseases of small grains are caused by fungi which attack the plant usually after it is past the seedling stage. The roots or crown or both may be attacked, causing various types of lesions with or without blackening of the basal parts of the plants. Some of the fungi that cause foot rots also cause seedling blights as well. This circular, however, deals only with the diseases of cereals that attack plants at or near the soil surface from shooting until harvest.

There are a number of non-parasitic conditions that may in part at least be confusable with foot-rot symptoms. These include alkali injury, flooding, drought and insect injury. In determining the cause it is necessary to consider these factors. The following tables give the essential facts needed in identifying the cereal foot rots in the region under discussion:

* Investigations conducted cooperatively by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Oregon and Washington Agricultural Experiment Stations.

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Table 1.

Foot Rots of Cereals in the Pacific Northwest
and Areas Where They Occur Most Abundantly

Grains attacked	Name of foot rot	Where prevalent	Technical Name of Parasite
Wheat	Take-all	West of the Cascades	<u>Ophiobolus graminis</u>
	Cercospora foot rot*	High prairies of the Columbia Basin	<u>Cercospora herpotrichoides</u>
	Coastal foot rot	Coast region	<u>Helminthosporium sativum</u>
	Crown rot	Columbia Basin	Various; <u>Helminthosporium</u> in part
	White foot rot	Coast region	<u>Gibellina cerealis</u> **
	Fusarium foot rots	Coast region	<u>Fusarium culmorum</u> , etc.
Oats	Black foot rot	Coast region	<u>Helminthosporium avenae</u> **
	Fusarium foot rot	Coast region	<u>Fusarium culmorum</u> var. leteius etc.
	White foot rot	Coast region	<u>Gibellina cerealis</u> **
Barley	Take-all	Willamette Valley	<u>Ophiobolus graminis</u>
	Cercospora foot rot	High prairies of the Columbia Basin	<u>Cercospora herpotrichoides</u>
Rye	Cercospora foot rot	Do	Do
Spelt	Fusarium foot rots	Coast region	<u>Fusarium culmorum</u> var. leteius
	Coastal foot rot	Coast region	<u>Helminthosporium sativum</u>
	White foot rot	Coast region	<u>Gibellina cerealis</u> **

* Also called Columbia Basin foot rot. For the exact locations where this disease occurs, see Oregon Agricultural Experiment Station Circular of Information No. 74.

** Identification not entirely certain.

Table 2.

The Most Important Cereal Foot Rot in Each
of the Several Geographic Divisions of the Pacific Northwest

Region	Diseases	Most Important Host Plant
West of Coast Range	Fusarium foot rot	Spring oats
Willamette Valley	Take-all	Winter wheat
Western Washington	Take-all	Winter wheat
Prairies of Columbia Basin	Cercospora foot rot	Winter wheat
Semi-arid regions	Crown rot	Winter wheat

Table 3.

Key to the Foot Rots of Small Grains in the Pacific
Northwest as Based on Symptoms in the Field

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- A. Diseased plants usually more or less stunted, their stem bases and roots light brown, dark brown, or black.
1. Black scurf present on bases of stems inside of outer sheaths.
 - a. Diseased areas in fields usually definitely delimited, soil usually not strongly acid Take-all
 - b. Diseased areas in fields less sharply delimited, soil usually strongly acid Coastal foot rot
 2. Black scurf absent on bases of stems
 - a. Diseased areas evident chiefly on outside of stem bases as light brown sunken areas Fusarium foot rot
 - b. Diseased areas evident chiefly inside of crowns as brown discoloration and sometimes also on outside of stem bases Crown rot
- B. Diseased plants usually not stunted, their stem bases and lower leaf sheaths showing oval diseased areas with more or less fungus scurf.
1. Diseased areas light tan-colored on outer sheaths in early spring to black with fungus scurf on stem bases later in season Cercospora foot rot
 2. Diseased areas white to tan-colored in late winter or spring, later becoming covered with abundant white to light brown fungus scurf White foot rot
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Table 4

A Simplified Key Making Use
of Gross Microscopic Details (for Students)

A. Conidia but no perithecia present

1. Spore-masses usually present throughout season, conspicuous, pink or whitish; spores colorless, multi-septate, sickle shaped; scurf on stem bases absent Fusarium species
2. Spore-masses nearly always present throughout season, rather delicately velvety, black or dark gray; spores dark colored, multi-septate, cylindrical or narrowly ellipsoidal, straight or slightly curved; scurf on stem bases sometimes present
..... Helminthosporium species
3. Spore masses present only in early spring, inconspicuous; spores needle-like, colorless, multi-septate, slightly curved; scurf on stem bases present and composed of black cubical cells making an epidermis-like structure Cercospora herpotrichoides

B. Perithecia but no conidia present. Perithecia (sometimes scarce early in season) in basal sheaths; ascospores, long, cylindrical, colorless, septate; scurf on stem bases present and composed of black, compacted, mycelial strands Ophiobolus graminis

C. Neither conidia nor perithecia present in Oregon. Scurf on lesions white to grayish, never black, composed of slightly tinted mycelial strands and irregular loosely connected stromatic cells (resembling Rhizoctonia)
..... Gibberella cerealis*

* Identification not entirely certain.