

Fusarium Head Blight Prediction Center

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Fusarium head blight (FHB) of wheat has become a growing problem in the Midwest. Direct losses in the Midwest between 1998 and 2000 totaled \$356 million dollars, with Ohio alone losing \$102 million, according to a study by the Department of Agribusiness and Applied Economics at North Dakota State University. These direct losses are multiplied as they go far beyond producers and also affect flour millers, bakers, retailers, and ultimately consumers.

FHB, also known as scab, is the result of infection by a fungus, *Fusarium graminearum*, and can result in excessive yield loss and mycotoxin contamination. Mycotoxins such as vomitoxin (deoxynivalenol or DON) are produced by the fungus in grain and are detrimental to animal and human health.

The severity of scab infection varies greatly from year to year due to differences in weather conditions. Scab fungi overwinter and survive between crops in infected grain and grass stubble, chaff, and cornstalk residue left on the soil surface. Severe infection occurs during the flowering stage and shortly afterward when warm, wet weather prevails. Two to three days of light rain during this period will initiate epidemics. If the weather is dry during this critical period, the grain crop will be essentially scab-free.

In Ohio, during years of favorable weather, the incidence of infected heads has been as high as 100 percent in some fields. In these cases, more than 50 percent of the grain in the head has been destroyed. Other effects of scab include floret sterility, poor test weights due to shriveled grain, and yield loss.

Currently, there are no wheat varieties with a high degree of resistance to *F. graminearum*, although some varieties have a moderate level of resistance. Until varieties can be developed with resistance, it is up to the producer to use Best Management Practices to avoid costly outbreaks of the disease.

An accurate disease warning system would provide valuable time for grain producers, grain buyers, and food processors to deal with the prognosis of epidemic disease and the potential for handling and processing toxin-contaminated grain. In the event that an efficacious fungicide would be labeled for scab control, the risk prediction system could be used to support application decisions and prevent the unnecessary application of pesticides when the risk of disease is low.

OBJECTIVES

The overall objective of the Fusarium Head Blight Prediction Center was to develop a relatively simple disease-risk assessment model using readily accessible weather information that would be applicable over a large geographic area. An additional objective was to organize the risk models in a user-friendly fashion by means of the World Wide Web so they could be used by wheat growers and the wheat industry.

CHALLENGES

Fusarium Head Blight is a devastating disease of wheat that occurs throughout the more humid, temperate regions of the United States. Currently, there are no resistant wheat varieties, and management practices are only partially effective. Development of a disease forecasting system is the next best way to deal with Fusarium Head Blight.

These systems are never 100% accurate, because they are mathematical predictions representing a multitude of variables that determine disease progress. Problems that limit the accuracy of forecasting models include variables associated with the pathogen (residue levels in fields, crop rotations, rain and wind dispersal of spores), the wheat plant (range in flowering dates, susceptibility, flowering duration, and head height), and weather (duration of relative humidity, rainfall, and temperature range).

ACHIEVEMENTS

The Fusarium Head Blight Prediction Center web site at <http://www.wheatscab.psu.edu/> is an expansion of Ohio's head scab forecasting model that uses wheat flowering dates and weather data to predict the level of head scab risk in 23 states in the eastern United States. The system was developed in conjunction with scientists at Pennsylvania State University, using more than 100 location-years of weather and disease severity data from many locations in the United States.

THE FUTURE

The Fusarium Head Blight Prediction Center is the first and largest early warning system of its kind in the nation. The system is a joint project involving Ohio State University Extension, Pennsylvania State University, Purdue University, North Dakota State University, South Dakota University, and the U.S. Wheat and Barley Scab Initiative.

OARDC scientists will continue to work with scientists across the Midwest to develop management practices and plant varieties to control Fusarium Head Blight. The Fusarium Head Blight Prediction Center will be a nucleus for epidemiological studies and will provide a medium for dissemination of FHB information to wheat producers.



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Photos courtesy Ken Chamberlain