

1998 GEOGRAPHICAL DISTRIBUTION AND SEVERITY OF ORCHARDGRASS CHOKE IN THE WILLAMETTE VALLEY

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Introduction

Epichloe typhina is a damaging endophytic fungus that can be found in several grass species, including orchardgrass. Symptoms are manifested near the time of flowering, when growth of the fungus physically prevents ("chokes") the emergence of the grass inflorescence by growing out through the enveloping leaf sheaths to form a yellowish-orange growth on the external plant surface. Ascospores produced from this fungus tissue can infect other plants by entering through the pith of cut stems soon after harvest. There is no evidence that this strain of *E. typhina* is seed-borne in orchardgrass.

Although the disease is not economically significant to the use of orchardgrass as forage, it has a severe effect on orchardgrass seed production. In France incidence of choke commonly reaches 30% in an orchardgrass field by the fourth year of seed production, making the stand unprofitable. In the Willamette Valley, where fields commonly remain productive for a decade or more, orchardgrass choke was until recently unknown. This situation has changed, however, with the recent appearance of the disease in the Willamette Valley. First noticed as a single, unconfirmed specimen from a post-harvest field in 1996, the presence of the disease was verified in several fields of one cultivar in 1997. The discovery was made shortly before harvest, however, and there was not time enough for a thorough survey of orchardgrass fields in 1997.

This survey was conducted to determine the geographical distribution and severity of choke among cultivars grown in the Willamette Valley. We also obtained data regarding the potential for this disease to increase under Oregon conditions.

Methods

Thirty-seven orchardgrass fields were arbitrarily selected from the 1998 certification program to include a range of cultivars and the geographic extent of production in the Willamette Valley. An additional 9 fields were included in a second survey to determine distribution of choke in fields within a 2½ mile radius of the heavily-infested fields that had been observed in 1997. Seven of the fields for the Valley-wide survey were also in this area, so that we surveyed 16 fields in the vicinity of the observed 1997 infestation. The total of all fields surveyed (46) included 12% of the orchardgrass acreage, and 29 of the 53 cultivars grown under certification for 1998.

Fields were surveyed between June 12 and June 27, 1998, by examining 40 samples, each 2.75 square feet, along 4 diagonal transects in each field. All stems for which the choked portion was included inside the sampling frame were counted. The percentage choked tillers was calculated based on estimates of the number of total tillers per sampling area. If all 40 samples were negative for choke, but other choked stems were seen in the field, the field was assigned a percent choke of <0.05%. If no choke was observed, a value of 0% was recorded.

When the disease was first discovered here just prior to harvest in 1997, the three infested fields were immediately surveyed for incidence of choke. In the 1998 survey the same three fields were surveyed on transects taken in the same location as the 1997 transects, so that a comparison could be made between choke levels in 1997 and 1998.

Results

Choke was detected in 70% (26 of 37) of the arbitrarily selected orchardgrass fields in the Valley-wide survey (Fig. 1). About half of the fields had choke levels of 0.05 to 10%, and 4 of the 37 fields had more than 10% diseased tillers. The disease was detected all six counties surveyed (Benton, Lane, Linn, Marion, Polk and Yamhill).

In the area within a 2½ mile radius of the 1997 disease observation, 14 of the 16 orchardgrass fields surveyed were infested to some degree with choke disease. Five of these fields were infested at >10% diseased tillers. The most severely-affected fields (>20% diseased) were in very close proximity to each other and were all of the same cultivar, but had been planted in several different years between 1991 and 1995. Another cultivar in this area had disease incidences varying from 0 to 8% among the 8 fields planted to it.

When data from the three fields sampled in both years (1997 and 1998) were analyzed statistically, we found choke increased significantly during this 1-year period. The increases from 1997 to 1998 in these three fields were: from 13 to 35% (2.7-fold), from 9 to 19% (2.1-fold) and from 3 to 10% (3.3-fold).

This survey demonstrates that choke disease in orchardgrass, unknown in Oregon before 1997, is now established and widespread in the Willamette Valley. This disease has the potential to be a very serious problem for orchardgrass production in the US for two reasons: 1) disease level and yield loss are directly correlated; 2) the rapid year-to-year increase in incidence observed in Europe can occur in Oregon, at least under some conditions.

It should be noted that although orchardgrass choke reduces seed yield, it does not reduce the quality of forage seed produced. Previous research shows that the pathogen is not generally seedborne in orchardgrass, and even if it were, it

does not affect vegetative growth of the orchardgrass plant. And whereas other closely related endophytic fungi are known to produce alkaloids toxic to grazing mammals, such does not appear to be the case for *E. typhina* in orchardgrass. We submitted two samples of tissue from heavily choked orchardgrass to A.M. Craig and J.T. Hovermale at the Oregon State University Veterinary Diagnostic Laboratory, where it was determined that the plant tissue contained no detectable ergovaline and <300 ppb lolitrem B (toxicosis is observed in animals feeding on material containing greater than 1800 ppb lolitrem B). These results are from a single cultivar and therefore may not be representative of all infected cultivars, but there is currently no evidence that choked orchardgrass has significant toxin levels.

Factors controlling disease increase and spread in the area are not yet known. We noted examples of adjacent fields, both of the same cultivar, that differed markedly in choke incidence. The weather, particularly rainfall and humidity, at harvest is known to be important in infection, and these fields may have been harvested under different weather conditions the previous year.

It is clear that choke disease of orchardgrass is now well-established in this region, and its impact can only be minimized by developing and incorporating disease management procedures into cultural practices for this crop.

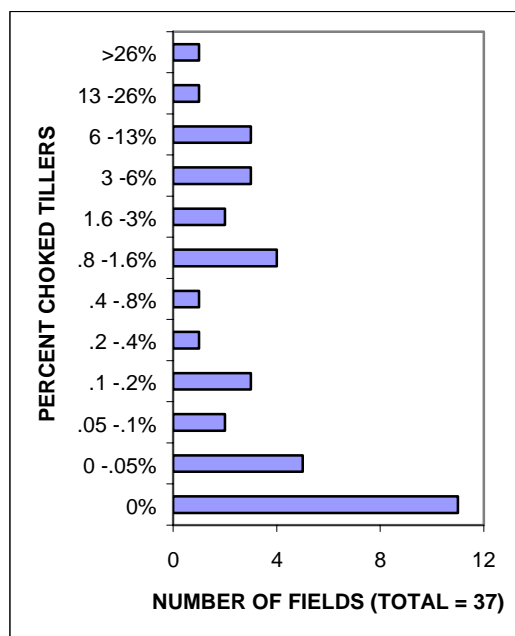


Figure 1. Distribution frequency of choke incidence (% tillers affected) in 37 arbitrarily-selected fields of Oregon's Willamette Valley in 1998.