STEM EYESPOT ON INTRODUCED FESTUCA SPP. IN ALBERTA AND BRITISH COLUMBIA[1]

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Abstract

A 1969 survey indicated that the stem eyespot of creeping red fescue, Festuca rubra L. subsp. rubra caused by Phleospora idahoensis Sprague was widespread and locally severe on seed crops in the Beaverlodge district of northern Alberta. In the adjoining seed growing area around Dawson Creek and Fort St. John in British Columbia, where crop concentration is lower, there was less disease. Disease severity may be related to cropping intensity which is higher in the more humid cleared parkland than on the open prairie. The disease may cause considerable losses. This is indicated by a decline in seed yields averaging 29% from moderately to severely infected stems in three crops. The disease was found on all cultivars of creeping red rescue (F. rubra subsp. rubra), Chewings fescue (F. rubra subsp. commutata Gaud.), tall fescue (F. arundinacea Schreb.), and meadow fescue (F. pratensis Huds.) at Beaverlodge. It was present on 'Olds' and 'Boreal' cultivars of creeping red fescue at Olds, Alberta. The 'Olds' cultivar may be one of the sources of infection or susceptibility, for most commercial creeping red fescue seed crops of the north because most are derived from this strain. However, the disease may have spread to the introduced fescues from the native ones on which the pathogen appears endemic. The possibilities of controlling the disease are discussed.

Introduction

A stem eyespot of creeping red fescue (Festuca rubra L. subsp. rubra) due to Phleospora idahoensis Sprague (4) was found causing damage to seed crops of this grass in northern Alberta in 1967 and 1968 (3). In late July 1969, a disease survey was made in the main red fescue seed growing area, which extends west and north. from Grande Prairie in Alberta and over the border into British Columbia. Some crops were surveyed between Dawson Creek and Fort St. John in the latter province. Plots of Festuca spp. and cultivars were examined at Research Stations at Beaverlodge and Lacombe, at Olds Agricultural College in Alberta, and at Prince Georqe Experimental Farm in British Columbia. The survey was part of a more extensive study of the distribution of the disease on introduced and native Festuca spp. in Western Canada and northwestern U.S.A.

Results

Disease incidence

An estimate was made of the percentage of infected culms in each crop on samples plucked at random on one or more transects. The acreage of the field was also estimated (Table 1).

Thirty-two of the 47 Alberta crops had more than 50% of stems infected; whereas only one of 13 crops in British Columbia reached this level. Both common and the 'Boreal' (1) cultivars of red fescue were infected. Infection percentage could not be closely correlated with age of the crop. Some crops in their first year of seed production showed as high incidence as those which had "run out" or those which had been rejuvenated (1). Crops on open prairie in the Codesa, Belloy, and Wahnam localities, 30 miles north of Grande Prairie, showed a much lower incidence than those in the Beaverlodge, Valhalla, and Hythe triangle in cleared parkland and bush. At Prince George Experimental Farm, B.C., there were no symptoms on 10 cultivars of creeping red fescue and Chewings fescue, F. rubra L. subsp. commutata Gaud. No disease was found on stands of red fescue at seven locations on embankments and cuttings on Highways 16 and 93 south from Prince George to Banff. The disease was absent from a plot of 'Olds' cultivar at Lacombe Research Station, but a light infection was found in the 'Olds' and 'Boreal' cultivars at Olds Agricultural College and on the regrowth from two broken 'Olds' crops in the Olds area in

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Table 1. Incidence of infected culms in crops of creeping red fescue surveyed in northern Alberta and northern British Columbia in 1969

Alberta			British Columbia		
Infection (%)	Number of crops	Total acreage	Infection (%)	Number of crops	Total acreage
0	4	320	0	11	857
0-0.5	4	122	0-0.5	1	4
0.6-25	6	440	0.6-25	0	0
26-50	1	50	26-50	1	40
51-90	10	840	51-90	0	0
91-100	22	905	91-100	0	0

Alberta. Disease ratings were made on plots of cultivars of four Festuca spp. at Beaverlodge Research Station on 22 July 1969 (Table 2).

The disease was found on all Pestuca species. The identity of the fungus was confirmed on 'Manade' tall fescue by isolating the fungus (3). Slight infections were found on 12 parent clones of the 'Boreal' cultivar of red fescue grown in isolation. The disease was also found on spaced plants of F. altaica Trin. collected adjacent to Mile 240 of the Mackenzie Highway just south of the 60th parallel in north Alberta. Stem lesions very similar to those on creeping red fescue were present on timothy (Phleum pratense L.), bromegrass (Bromus inermis Leyss.) and on Agropyron sp. growing as impurities in heavily infected crops of red fescue in the Beaverlodge district. We have been unable to confirm that these spots were cuased by P. idahoensis, but a fungus with similar cultural characters was isolated from bromegrass and timothy. Like most isolates made from creeping red fescue these did not sporulate in culture (3).

Table 2. Disease ratings for stem spot on cultivars of four Festuca spp. at Beaverlodge Research Station, 22 July 1969

Species and cultivar	Country† of origin	Average rating* 1966 seeding	Average rating* 1967 seeding
F. rubra rubra			
Olds	Canada	1.6	1.0
Boreal	Canada	1.8	1.3
Reptans	Sweden	2.3	1.4
Ruby	Neth.		0.8
Steinacher	Germany		1.4
Taborska	Czech.		1.5
Roznovska	Czech.		1.3
Levocska	Czech.		0.2
F. rubra commutata			
Golfrood A	Neth.		0.5
Golfrood B	Neth.		0.3
F. arundinaceae			
Manade	France	2.1	0.7
Fawn	U.S.A.		0.6
Alta	U.S.A.		0.4
F. pratensis			
Bergamo	Neth.		0.5
Mommersteeg Hay	Neth.		0.1
Trader	Canada		0.3
Mewa	Poland		0.4
Ola	Poland		0.4
Dina	Poland		0.1
Sequana	France	0.6	0.4
Barenza	Neth.	0.2	0.4
Mimer	Sweden	0.1	0.2
Dufa A	Neth.	0.5	**0.3**
Sceempter	Neth.	0.3	**0.3**
R.v.P.	Belgium	0.3	0.1
AS-9	Sweden	0.3	0.8
s-53	G.B.	0.2	1.0
Dufa B	Neth.	0.5	0.0
Roznovska	Czech.		0.1
Levocska	Czech.		0.1
SK-6	Poland		0.3

* 10 plants were rated per plot on a 0 to 4 scale, where 0 is no disease and 4 very severe disease.

† Neth. = The Netherlands; Czech. = Czechoslovakia; G.B. = Great Britain.

Effect of the disease OR seed yield of creeping red fescue

Samples of red fescue stems were collected at random from three crops in the Beaverlodge area during the survey and separated into categories according to severity of the disease (Table 3). The following 4-point scale was used:

0 - No spots on stem, sheath, or inflorescence.

1 - Rare spots on stem, sheath, none on inflorescence.

2 - Few spots on stem, sheath, rare on inflorescence.

3 - Many spots on stem, sheath, and inflorescence, or moderate spotting of stem and sheath and culm girdled.

Table 3. Effect of P. idahoensis infection on seed yield of samples of creeping red fescue from three heavily infected crops

Sample	Seed yield in grams per culm in infection categories: 0	1	2	3	% decline in yield*
1		0.65 (53)**	0.55 (95)	0.48 (77)	12.7
2			0.88 (38)	0.63 (62)	28.4
3			0.63 (55)	0.34 (142)	46.0

* $\frac{\text{Category 2 - Category 3}}{\text{Category 2'}} \times 100$

** Figures in brackets indicate number of culms in each infection category.

Yield declined as disease severity increased in all crops. It was not possible to find crops showing all categories of infection at the time of the survey.

Discussion

The 1969 survey indicated that the disease was widespread and locally severe on crops of red fescue in the Beaverlodge, Valhalla and Hythe triangle in northern Alberta but less severe in the Dawson Creek and Fort St. John areas in British Columbia, where the concentration of this crop was lower. The severity of the disease appeared to be higher in the more humid cleared bush and parkland than on the open prairie. Creeping red fescue, however, is more commonly grown in the parkland areas, and cropping density and frequency may have been the cardinal epidemiological factor rather than the higher humidity.

When the disease is severe a considerable decline in seed production may be expected (Table 3). We were unable to compare yields of uninfected stems with diseased ones but the yields from the first sample suggest that the seed yield in infected crops would decline as the disease became more severe. There was a tendency for severely infected crops to ripen prematurely and shatter; this would add to crop losses.

Unploughed remnants of crops of the 'Olds' cultivar were found to be infected in the Olds district. This cultivar may have been one source of infection or susceptibility for the northern seed growing district since most of the acreage grown today originates from this introduction (1). There were no fields of this cultivar in the Olds locality for more extensive examination. Recent studies (unpublished) have shown that the fungus is present on native Festuca spp. in Western Canada and northwestern U.S.A. This finding supports the suggestion that the native species may have been the original source of inoculum for introduced fescues (3).

All species of Festuca appeared to be susceptible to the disease but the cultivars of F. pratensis appeared less susceptible generally than those of other species. Since the plots which were rated were isolated from large concentrations of other heavily infected Festuca spp. and were of small size, the ratings probably do not give a true assessment of varietal resistance. Further studies of varietal resistance under field conditions are therefore indicated.

The only method of disease control which seems applicable to this disease at present is the removal of infected crop debris by burning or flaming of stubbles, as practised in the grass seed growing areas in Oregon, Washington, and Idaho (2). Both common red fescue and 'Boreal', which are commonly grown, are susceptible and to replace these with resistant varieties is a long term process. There is little information on the effects of burning crop debris on the physiology and seed yield of creeping red fescue, so adequate controlled experimentation is required before large scale field burning is attempted.

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