Incidence and severity of net blotch of barley and distribution of Pyrenophora teres biotypes in the Canadian prairies in 1976[1]

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Net blotch was found in most barley *(Hordeurn distichurn, H. vulgare)* fields sampled in three prairie provinces. Disease severity was generally very light in six-rowed barley throughout the area sampled and in two-rowed barley in Alberta. Two-rowed barleys in Manitoba and Saskatchewan had moderate levels of disease. One biotype of *Pyrenophora teres* predominated in Manitoba, another in dlberta; and both were common in Saskatchewan. A third biotype was found only in eastern Manitoba and in two fields in Alberta.

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On a constaté la presence de la rayure reticulee dans la plupart des champs d'orge *(Hordeurn distichum, H. vulgare)* echantillonnes dans les Prairies. La maladie était generalement tres benigne chez l'orge a six rangs et a deux rangs, partout et en Alberta respectivement, et modérée chez cette derniere au Manitoba et en Saskatchewan. Un biotype de *Pyrenophora teres* dominait au Manitoba, un autre en Alberta, et les deux se rencontraient en Saskatchewan. Un troisieme n'etait reparidu que dans l'est du Manitoba et dans deux champs en Alberta.

Introduction

Three biotypes of *Pyrenophora teres* (Died.) Drechsl., causal agent of net blotch of barley *(Hordeurn distichum* L., *H. vulgare* L.) have been reported to occur in western Canada **(5,6).** The distribution of N- and VN biotypes, which produce typical net blotch symptoms on foliage, was widespread in the prairies, while the S-type which produces spot-like symptoms, was restricted to the eastern half of Manitoba. Previously (1), culture **102** of *P. teres,* an N-type isolate, was thought to be typical of this pathogen in western Canada. Since breeding for net blotch resistance in barley had concentrated only on resistance to N- biotypes, it was necessary to determine both the distribution and the relative importance of the three biotypes in the prairies to assess the need to change future breeding programs. Although the **1974** surveys gave an indication of the distribution and proportion of *P. teres* biotypes, the data were based on a relatively small number of fields found infected that year, because of the generally dry conditions. Consequently, there was a need for more comprehensive data on the distribution of *P. teres* biotypes and the surveys described herein were carried out. The severity of net blotch infection was also recorded during sampling.

Materials and methods

Surveys of commercial barley fields were conducted in **1976** to assess the incidence, severity and distribution of net blotch. The routes followed were similar to those used in **1974** (5), but a larger area of Alberta was included in the major survey, and the number of fields sampled in both Alberta and Saskatchewan was increased. Methods of disease assessment, sampling, pathogen isolation and differentiation of *P. teres* biotypes were the same as those described previously **(4,** 5). Herta and C.I. **9214** were used in place of Fergus and **C.I. 5791,** respectively, as the two-rowed and resistant checks in the four-cultivar barley series used to differentiate *P. teres* isolates. The three-province survey was carried out from July **24** to **30;** the Winnipeg region was surveyed on July **27** and July **29.**

Results and discussion

Manitoba, Saskatchewan and Alberta survey

The route followed, some reference points and the location of the 1 **14** fields sampled is shown in Fig. 1. Net blotch was found in **87 (76%)** of the fields examined (100% of **44** two-rowed fields and **61%** of 70 six-rowed fields). Variation in symptoms was similar to that described previously **(5).** Disease severity ratings, based on the total area affected on the top two leaves, were primarily in the trace to very light range in six-rowed barley in all three provinces with the exception of two fields near Killam, Alberta, which had severe infections. Two-rowed barley fields had light to moderate levels of net blotch in Manitoba and Saskatchewan and very light levels in Alberta. Plants in most fields sampled were at the milky-ripe to soft dough stages of growth. N-, VN-, and S-type isolates, respectively, comprised **58%, 39%** and **3%** of the total number of *P. teres* isolates. N-type isolates accounted for almost all those found in Alberta, more than half of those in Saskatchewan, but they were rare in Manitoba. VN-type isolates were the predominant type found in Manitoba, were common in Saskatchewan, but were not found in

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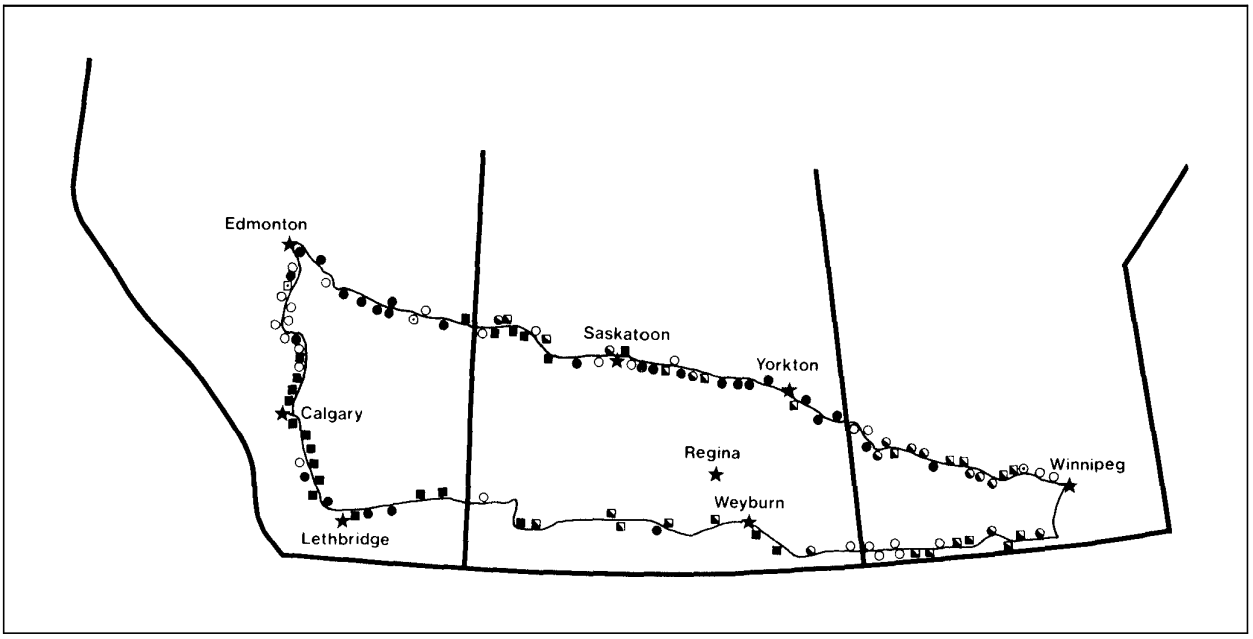

Fig. 1. Distribution of barley fields infected with net blotch (*Pyrenophora* teres) in Manitoba, Saskatchewan, and Alberta. Two-rowed barley – O no net blotch found; DN-type isolate found; ◪ VN-type isolate found; ⊡ S-type isolate found. Six-rowed barley – O no net blotch found; ● N-type isolate found; O VN-type isolate found; ⊙ S-type isolate found.

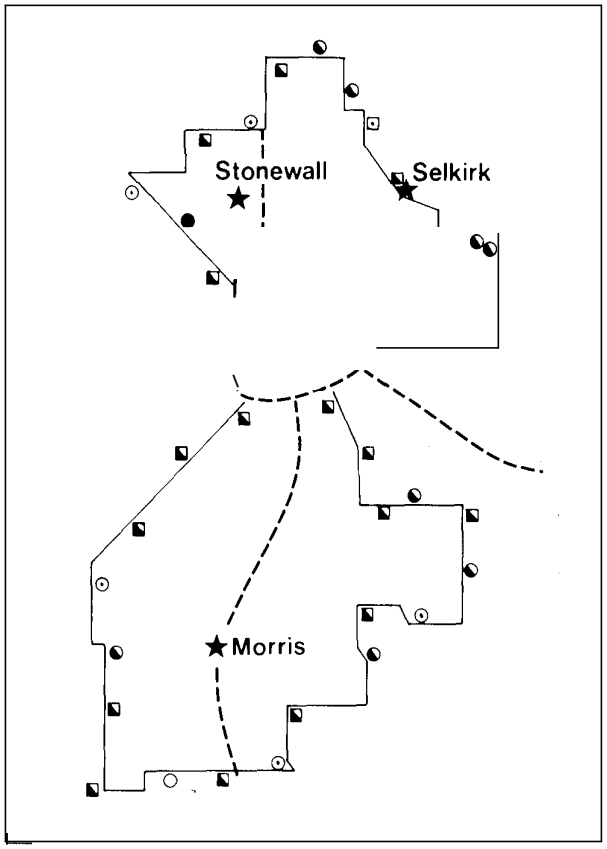

Fig. 2. Distribution of barley fields infected with net blotch (*Pyrenophora* teres) in the Winnipeg, Manitoba region. Two-rowed barley – □ no net blotch found; ■ N-type isolate found; OVN-type isolate found; □ S-type isolate found. Six-rowed barley – O no net blotch found; ● N-type isolate found; OVN-type isolate found; OS-type isolate found.

Alberta. For the first time, S-type isolates were found outside the province of Manitoba, namely in two fields in Alberta.

Winnipeg region survey

The locations of the 35 fields sampled are shown in Fig. 2. Plants in most fields were sampled at the milky-ripe to soft dough stage of growth. Net blotch was found in 33 (94%) fields and the biotype distribution of ***P. teres*** was: N-type, ***3%;*** VN-type, 76%; and S-type, 21%. Disease severity levels ranged from a trace to very light in six-rowed barley fields and were predominately light in two-rowed fields with several having moderate levels of infection.

The results of these surveys are in general agreement with those carried out in 1974. They indicate that net blotch of barley is common and widespread on the Canadian prairies and that distinguishable biotypes of the causal organism, *P.* ***teres,*** exist throughout this region. The much larger number of fields from which the net blotch causal agent was recovered in 1976 in comparison to 1974, gives a more complete indication of the distribution of *P.* ***teres*** biotypes: in Alberta N-types predominate, VN-types (found in the 1974 survey) and S-types can occur; in Saskatchewan both

N- and VN-types are common, no S-types have yet been found; in Manitoba VN-types predominate, S-types are relatively common in the eastern half of the province and N-types are rare. Although the distribution of VN-type isolates suggests a natural spread westward from Manitoba and an apparent displacement of N-types, it is not clear how S-type isolates became established in Alberta, as they are otherwise known to occur only in eastern Manitoba. These were likely introduced to the Winnipeg region on exotic barley seed (5), but it is uncommon for commercial barley seed to be shipped from eastern Manitoba to Alberta. It is possible that seed of experimental barley originating near Winnipeg and contaminated with the S-biotype was sent to Alberta. However, most barley seed used in the two major western Canadian co-operative tests is produced at Brandon, Manitoba and Lethbridge, Alberta, where no S-type isolates of *P.* teres have yet been found.

An estimate of yield losses due to net blotch was made by applying a formula developed for scald of barley (3). For this purpose disease severity data obtained in the surveys was converted to percent leaf area affected in the top two leaves (1). On this basis, losses in infected fields were: 3-9% and below 1% for two-rowed and six-rowed barley, respectively, in Manitoba and Saskatchewan and below 1% for both types of barley in Alberta except for two six-rowed fields with a loss of 12-17%. The 1976 growing season, like that of 1974, was much drier than normal in many parts of the barley-growing regions of the prairies and this likely had the effect of decreasing severity of leaf diseases. It did not, however, appear to have much effect on disease incidence, which was much higher than in 1974. In particular, the incidence of net blotch was virtually 100% in the two-rowed barley fields sampled. The higher incidence of net blotch and the higher levels of disease severity in two-rowed than in six-rowed fields suggests that two-rowed barley is more susceptible to net blotch, at least under the types of field conditions encountered in 1976. Although the presence and distribution of *P.* teres biotypes has been mapped in a large extent of the prairies, some important barley-growing regions such as the Peace region in Alberta and the area of Saskatchewan north of Saskatoon have not been sampled. These regions should be surveyed in the future to fully assess the occurrence and distribution of *P. teres* biotypes in western Canada.

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