Incidence and severity of snow molds on winter cereals in Saskatchewan, 1985-1988[1]

B.D. Gossen and W.W. Reiter

Fields of winter wheat and fall rye in northern and central Saskatchewan were examined for snow mold incidence and severity each spring from 1985 to 1988. ***Coprinus psychromorbidus*** was found throughout the area, but damage was slight. ***Microdochium*** nivaleinfection was observed at trace to slight levels in all regions. ***Myriosclerotinia borealis*** was found exclusively in the northeastern grainbelt. It produced severe damage in that region in the winter of 1986-87. Low-temperature and desiccation injury were much more common in central and southern regions than was snow mold injury.

Can. Plant Dis. Surv. 69: 1, 17-19, 1989.

Des champs de blé d'hiver et de seigle d'automne dans le nord et le centre de la Saskatchewan ont fait l'objet d'une étude pour determiner la fréquence et la gravité de la rnoisissure nivéale chaque printemps de 1985 à 1988. On a retrouvé ***Coprinus psychromorbidus*** dans toute la region, mais les dégâts étaient faibles. On a signalé des niveaux d'infection infimes à faibles de ***Microdochium nivale*** dans toute la region. En revanche, ***Myriosclerotinia borealis*** se retrouvait exclusivement dans la ceinture à céréales du nord-est ou il a cause de lourds dégâts durant l'hiver 1986-1987. Les domrnages causes par les basses temperatures et la dessiccation étaient beaucoup plus courants dans le centre et le sud de la province que ceux causes par la moisissure nivéale.

Introduction

In the early 1980's. there was a rapid increase in the acreage devoted to winter wheat in Saskatchewan, expanding from approximately 34,000 acres in 1980 to over 800,000 acres in 1985 and 1986 (Anon. 1980, 1985, 1986). A large proportion of this increase occurred in the northeastern portion of the grainbelt, where prolonged snow cover frequently provides conditions conducive to snow mold development. In 1974, a survey of snow mold diseases of winter cereals in Saskatchewan demonstrated that snow molds were a potential constraint to production in the north (Smith 1975). Therefore, a study was initiated to assess the extent and severity of snow mold damage on winter cereals, and to determine the relative importance of the pathogens involved.

Methods

Surveys were made in April and May of each year from 1985 to 1988. Fields were generally selected at random. The organisms responsible for snow mold damage were identified on the basis of symptoms. The presence of the distinctive sclerotia produced by ***Myriosclerotinia borealis*** (Bubak & Vleug.) Kohn (syn. ***Sclerotinia borealis*** (Bubak & Vleug.)) was used to identify that pathogen (Figure 1). ***Microdochium nivale*** (Fr.) Samuels & Hallett (syn. ***Fusarium nivale*** (Fr.) Ces., ***Gerlachia nivalis*** (Ces. ex Sacc.) Gams & Muller) was identified by the salmon-pink spore masses on infected leaves. ***Coprinus psychromorbidus*** Redhead & Traquair (the Low-Temperature Basidiomycete) was identified by its abundant mycelium and the bleached appearance of infected foliage. Disease severity was rated as None, Trace < 1%, Slight = 1-10%. Moderate = 11-25%, and Severe > 25%.

Winter cereals planted directly into standing stubble generally resume growth in the spring more slowly than those planted on fallow or tilled stubble. Therefore, fields of winter wheat seeded on conventional fallow were more noticeable from the road than those seeded into standing stubble, and were probably represented disproportionately in the survey. Thus the method of survey introduced a slight bias. This had some significance since stubble-seeded fields have the potential to trap more snow than fallow fields. As a result, crops on stubble-seeded fields may be less susceptible to low-temperature injury (Fowler 1983) but more severely affected by snow molds. As well, ***M. nivale*** identification was difficult on occasion. The salmon-pink sporulation was not always conspicuous and this may have led to an underestimate of the importance of ***M. nivale.*** However, in those areas where disease injury was significant, seeding into standing stubble was rare and there was an abundance of material for identification of the pathogens involved.

Results and Discussion

In April and May of 1985, 83 fields of winter cereals in central and northern Saskatchewan were examined. Snow mold damage was generally rated as none to trace, with damage observed only in protected areas where snow accumulation was greatest. C. ***psychromorbidus*** was the predominant pathogen throughout the survey area. ***M. nivale*** was found at trace levels in all regions. C. ***psychromorbidus*** caused severe damage in only one field in the survey, located in Crop District (C.D.) 5. The field was completely surrounded by bush, and had been used for alfalfa production for five of the previous eight years. Approximately 40% of the field was severely damaged. The only other significant snow mold injury occurred in the Hudson Bay region (C.D. 8), where ***M. borealis*** killed 5-10% of the plants in 2 of 8 fields. ***M. borealis*** was not observed in any other region. This level of infection was not sufficient to cause yield losses (Fowler ***et al.*** 1976). However, the relatively high level of infection by ***M. borealis,*** in a low-disease year and in a region where there was a large acreage of winter

[1] ***Contribution No. 988, Research Station, Agriculture Canada, 107 Science Crescent, Saskatoon, Saskatchewan, S7N 0X2.***

Accepted for publication September 15, 1988.

wheat, indicated that the potential for snow mold damage was high. Trace levels of infection by a ***Typhula*** spp. were noted in one field, also in the Hudson Bay area.

Low-temperature injury was observed in many fields in the spring of 1985. In the Saskatoon, Prince Albert and Tisdale regions, approximately 50% of the winter wheat fields examined suffered substantial low-temperature injury. An estimated 30% of fields in the Canora area (C.D. 5) had significant damage, while in the Hudson Bay, Nipawin and Maidstone areas (C.D. 8 & 9), 10% of the acreage examined showed injury. Damage on fall rye was substantially lower than on winter wheat.

In 1986, 31 fields of winter cereals were examined in the central and northern grainbelt. Trace amounts of snow mold damage caused by C. ***psychromorbidus*** were observed in seven fields. Low-temperature and desiccation injury was observed in approximately 50% of the fields examined.

In the spring of 1987, 54 fields of winter cereals were examined. Damage due to ***M. borealis*** was moderate to severe in 10 of 20 fields examined in the Hudson Bay area. Approximately 20% of the acreage in this area was plowed down as a result of stand reduction. Trace levels of ***M. borealis*** infection were found throughout the northeast (C.D. 5 & 8). Snow mold injury caused by C. ***psychromorbidus*** was observed at low (trace to slight) levels throughout the northern grainbelt (C.D. 8 & 9), and at trace levels in the central grainbelt (C.D. 5 & 6). No snow mold was observed in the southwest (C.D. 3 & 4).

In 1988, 35 fields were examined. In the northeastern grainbelt, snow mold damage ranged from trace to slight. Injury in low-lying areas was often severe, but damage occurred at trace levels in the open. ***M. borealis*** was the principal pathogen observed throughout the northeast. Low-temperature damage was apparent in most of the fields in the Saskatoon area (C.D. 6). Only two of 14 fields in this area showed even trace levels of snow mold damage. Fields south of Saskatoon were not sampled, but casual observation indicated that a combination of low-temperature injury and early-season drought had resulted in substantial stand reduction in many fields.

In summary, ***Myriosclerotinia borealis*** caused significant damage in one of four years. This pathogen has the potential to be an important factor limiting winter cereal production in the Hudson Bay region (C.D. 8), which is an important production area for winter cereals in Saskatchewan. It was also the most damaging pathogen observed in winter cereals in the northwest (C.D. 9) in 1974 (Smith 1975). In contrast, ***Coprinus psychromorbidus*** was the most important snow mold pathogen observed in a recent study in Alberta (Gaudet and Bhalla 1988), and ***M. borealis*** was isolated only infrequently. In Saskatchewan, C. ***psychromorbidus*** and ***Microdochium nivale*** were found at low levels (trace to slight) on winter cereals throughout the survey area, but rarely caused any significant stand loss. Low-temperature and desiccation injury were the most important factors determining survival of winter wheat in the southern and central grainbelt.

Literature cited

1. Anon. 1980. Prairie Pools Variety Report. Prairie Pools Inc., Regina, Saskatchewan.
2. Anon. 1985. Prairie Pools Variety Report. Prairie Pools Inc., Regina, Saskatchewan.
3. Anon. 1986. Prairie Pools Variety Report. Prairie Pools Inc., Regina, Saskatchewan.
4. Fowler, D.B. 1983. Causes and assessment of winter damage in winter wheat. Extension Div., University of Saskatchewan, Saskatoon, Publ. 474.
5. Fowler, D.B., L.V. Gusta, K.E. Bowren. W.L. Crowle, E.D. Mallough, D.S. McBean, and R.N. McIver. 1976. Potential for winter wheat production in Saskatchewan. Can. J. Plant Sci. 56:45-50.
6. Gaudet, D.A. and M.K. Bhalla. 1988. Survey for snow mold diseases of winter cereals in central and northern Alberta, 1983-87. Can. Plant Dis. Surv. 68:15-18.
7. Smith, J.D. 1975. Snow molds of winter cereals in northern Saskatchewan in 1974. Can. Plant Dis. Surv. 55:91-96.

Acknowledgements

This work was supported in part by an Economic Regional Development Agreement grant for research on winter wheat.

Figure 1. *Myriosclerotinia borealis* on winter wheat. Note bleaching and prominent sclerotia (Photo by W. McFadden).

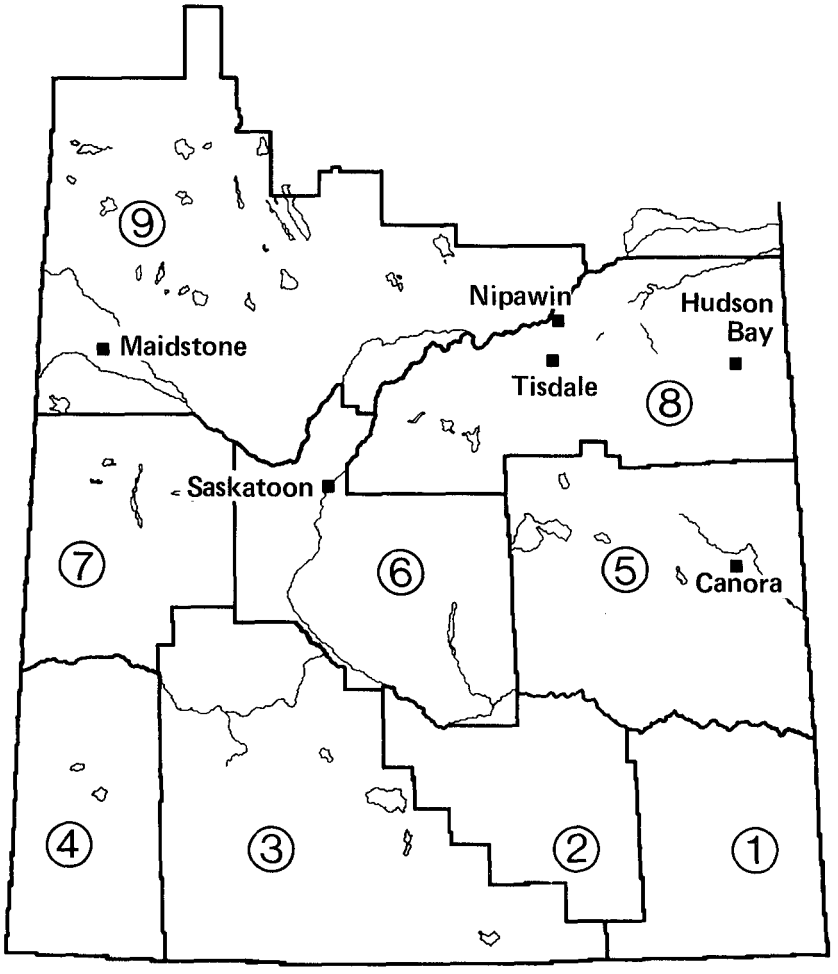

Figure 2. Crop districts in the grainbelt of Saskatchewan.