Epidemiology of Septoria Leaf Blotch on Spring Triticale in West Lithuania

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Abstract

The effects of environmental conditions on the dynamics of Septoria leaf blotch, *Septoria nodorum* (Berk.) E. Castell et. Germano, incidence and severity on the spring triticale cv. Gabo were studied in 2000 and 2001 in littoral lowland of Lithuania. Disease assessments were carried out once a week from GS 31–32 to GS 81–83 on the three primary leaves. At milk ripening stage (GS 75) the incidence of Septoria on F leaves reached 44.9% in 2000 and 97.7% in 2001. The disease severity was 3.5% in the first year, and 11.5% in the second year. Comparison of 2 years' data revealed that whether conditions had a marked effect on the manner of disease development.

Keywords: spring triticale; Septoria leaf blotch; *Septoria nodorum* (Berk.); incidence; severity; development

INTRODUCTION

During the past decade increased more sustainable approaches, which are based on an understanding of environment in which pathogens operate their ecology and interaction between hosts' plants, understanding of population dynamics (WROBEL & BUDZYNSKI 1994). The Baltic region is an area with redundant humidity with mean 840 mm precipitation over year. In such environments with higher amount of precipitation there is a higher risk to plants pathogens development (GORAL & ARSENIUK 1991; DISKOPP & HINDORF 1994). Although triticale, as hybrid between wheat and rye, tends to show a high degree of fungal disease resistance, *Septoria* spp. is the most common and sometimes severe disease on triticale (LEATH *et al*. 1993; CUNFER 2000). The aim of this study is to determine the dynamics of Septoria leaf blotch development on spring triticale and the impact of weather conditions on disease development.

MATERIALS AND METHODS

Field experiments were carried out in the littoral lowland of Lithuania in 2000 and 2001 on a cultivated gleyic albeluvisols loamy soils with the following agrochemical characteristics: soil acidity pH_{KCl} – 5.4–4.9, available P_2O_5 – 102–107 mg/kg and K_2O – 158–186 mg/kg, humus content – 2.62%. Seed rate was 4.5 million/ha, sowing dates April 17, 2000 and May 3, 2001. 60 kg P_2O_5/ha and 60 kg K_2O/ha was applied before sowing, and 60 kg of N at the end of tillering stage. A randomised complete block split plot design with four replicates was used. Observations of Septoria blotch on spring triticale (× *Triticosecale* Wittmack) cv. Gabo were carried out once a week from GS 31–32 to GS 81–83 on three upper leaves. Severity of leaf diseases was assessed using a percentage scale, which indicates affected area of leaf in percent. Disease incidence was measured visually as percentage of total affected leaves. Weather data were recorded by automatically operated weather stations Hardy Metpoles. The raw data of disease incidence and severity were transformed using the arcsine of the square root transformation.

RESULTS AND DISCUSSION

Weather. Weather conditions have a marked effect on foliar disease development. In the first experimental year after sowing before the GS 31 in May there was a period without precipitation, the air temperature was

10.4°C (mean 5.6°C). In the same period in 2001 the amount of precipitation was close to many years' mean 44 mm and the air temperature 6.18°C. Mean monthly temperature of May was similar both years and did not deviate markedly from the mean. The same slightly lower than the mean temperatures were in June in both years. While in 2000 precipitation during June was close to the mean, in 2001 it was twice as much (266%). July in 2000 was cooler and drier than in 2001, when precipitation exceeded the mean 11%, temperature was higher than the mean and did not drop below 15°C even at night. Very important period for septoria development was period from the start of tillering to the beginning of flowering. The distribution and characteristics of the rainfall were different (Figure 1). Average air temperature in 2000 was 12.5 and in 2001 13.35°C. Total precipitation was 60.3 and 138.3 mm, respectively. From seedling emergence till GS 65 there were 17 days with precipitation of amount 64.6 mm in 2002, and 26 days with 202.3 mm in 2001. Such weather characteristics determined the epidemiology of septoria. Disease progress is shown along with rainfall records over the same periods.

Development of Septoria. Septoria is spread by rain-splash, which carries spores from lower leaves of the plant to the upper leaves. Period after sowing till May 17 in 2000 was without rain and such situation depressed development of Septoria. While in 2001 just one week after emergence there were five days with precipitation and later periodically there were days with rainfall which could create suitable conditions for the development of primary infection in triticale. There was a rainstorm on May 23 in the second experimental year. In this case disease outbreaks at the flowering stage can be directly related to heavy rain events together with later following warm weather. Hence rainfall quality and quantity had a significant effect on the rate of disease increase with time.

Early sowing did not have any effect on increased disease incidence via primary infection cycle in the first year, because there were great weather fluctuations in the initial growth stages, which can explain slower rate of Septoria development in 2000. Notwithstanding that septoria was detected on triticale in 2000 at earlier growth stages than those in 2001 and we could expect a high disease severity. Worse conditions later in the season prevented from sharp development of the disease, however average severity on all three leaves at the end of milk stage was close to 11% in both years. The same severity of Septoria on F2 leaves in both years was 10.5% at the GS 75 and GS 71 in 2000 and 2001, respectively. However on upper leaves the differences were related to more rapid increase in the infection rate in 2001. Contrary to the prevalent opinion that septoria diseases are more serious during the period of cool wet weather (DISKOPP & HINDORF 1994), our observations showed a more significant occurrence in warmer season. The higher incidence of Septoria in 2001 during July suggests that the inoculum density and potential were expressing later and were therefore more able to increase disease incidence rapidly during the milk stage. Incidence of Septoria reached 100% on the second leaves F1 at the

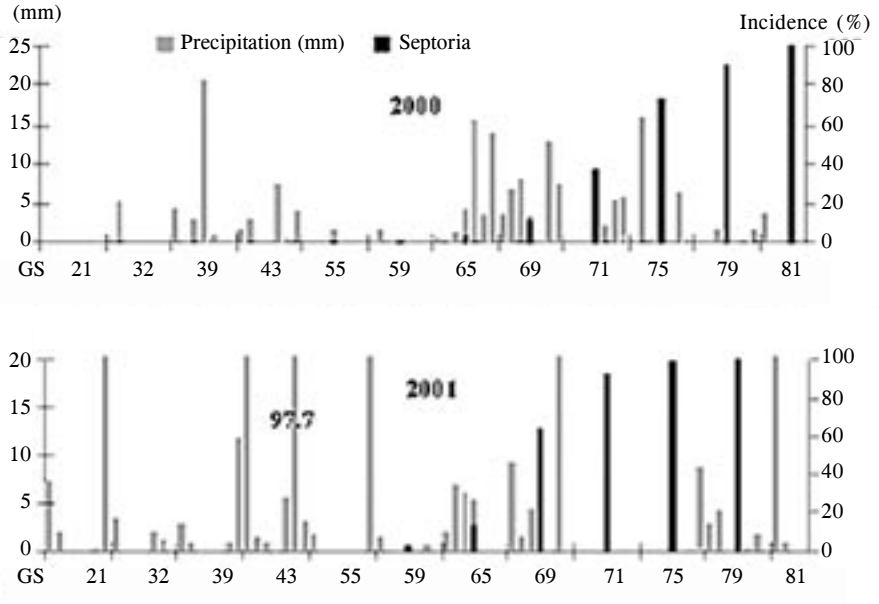

Figure 1. Incidence (%) of leaf blotch over spring triticale growth period depending on precipitation amount (mm)

GS – growth stages
Precipitation calculated daily, disease incidence measure once at week

Table 1. Development of leaf blotch on flag (F), second (F1) and third (F2) leaves during two growing seasons. I – incidence (%), S – severity (%), Vėžaičiai 2000–2001

Grow stage	Septoria 2000						Septoria 2001					
	F		F1		F2		F		F1		F2	
	I	S	I	S	I	S	I	S	I	S	I	S
GS 43	0	0	0	0	0	0	0	0	0	0	0	0
GS 55	0	0	0	0	1.6	0.2	0	0	0	0	0	0
GS 59	0	0	0	0	3.3	0.4	0	0	0	0	6.6	0.06
GS 65	0	0	0	0	10.0	0.4	0	0	0.1	0.01	38.3	1.2
GS 69	1.6	0.1	9.9	0.6	21.1	1.1	19.9	0.6	76.6	3.5	98.2	7.4
GS 71	1.6	0.1	26.6	1.9	82.5	4.7	83.3	5.01	100	10.7	94.4	10.5
GS 75	44.9	3.5	89.8	7.5	91.1	10.5	97.7	11.5	100	11.1	–	–
GS 79	83.1	8.5	98.2	14.2	–	–	100	16.1	100	13.3	–	–
GS 81	100	10.2	100	17.5	–	–	–	–	–	–	–	–

beginning of dough stage at 2000, while in 2001 all second leaves were affected at the beginning of milk stage. Rapid disease development in 2001 determined a longer period with 100% Septoria incidence on the F1 leaves, which created favourable conditions for the dispersal of inoculum to flag leaves. Due to these conditions all leaves withered earlier than usual in 2001. Although in 2001 Septoria had reached heavier severity at a later growth stage, it did greater damage to crops than in 2000.

Conclusions

1. Over the experimental period Septoria leaf blotch, *Septoria nodorum* (Berk.) E. Castell et. Germano, was one the most common diseases in spring triticale crops.

2. Differences in septoria development were mainly determined by the amount of rainfall from 21 to 65 growing stage of spring triticale.

3. Response of Septoria causal agent to weather conditions revealed that the pathogen was sensitive to droughty in 2000.

4. Large amount of precipitation that occurred in GS 41–55 could cause outbreaks of diseases in 2001.

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