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EFFECT OF PROPICONAZOLE (TILT 250 EC) AND *DRECHSLERA POAE* ON GERMINATION CAPACITY OF KENTUCKY BLUEGRASS

ABSTRACT

The effect of leaf spot and melting out disease and chemical control on seed quality of Kentucky bluegrass was investigated over two seasons in three treatments: natural infection, inoculation by *Drechslera poae* and Tilt 250 EC (propiconazole) application. Disease incidence in the treatment with natural infection was low and in the treatment with inoculation was much heavier. Application of propiconazole and occurrence of leaf spot and melting out disease not affected germination capacity of Kentucky bluegrass. Future experiments are needed to confirm obtained results.

Key words: leaf spot and melting out, *Poa pratensis* L., propiconazole (Tilt 250 EC), seed germination

INTRODUCTION

The importance of turf and forage grasses seed production significantly increased during last years. Kentucky bluegrass (*Poa pratensis* L.) is one of the most important species of grasses in many countries, including mid-Europe (Meyer 1982, Cagas 1996, 2000). However, it expresses low tolerance to some biotic stresses. The most obvious and harmful diseases of Kentucky bluegrass is leaf spot and melting out disease. Leaf spot and melting out disease causing by *Drechslera poae* occur during spring and fall under cold and wet conditions (Czembor 1999, 2002, 2003a, Vargas 1994). *Drechslera* species are known to be seed-borne pathogens and may play an important role in many major production region for certified seed. They may reduce the yield production by almost 20%. There is little information on levels of contamination of seed – lots or on the importance of the seed – borne phase in the transmission of *Drechslera* spp. Results obtained by Lam (1984a, 1984b, 1985) showed that the level of seed infection of *Lolium perenne* used in United Kingdom was low. *Drechslera* spp. did not significantly affected seeds germination capacity and it was no relationship between level of the seed infection and the incidence of infection in the field. Similar results for frequency of

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Drechslera spp. on seeds of *L. perenne* were obtained by Kućmierz and Gorajczyk (1991), Musiał (1996) and Wiewióra and Prończuk (2000).

All pathogens affected seed yield and quality due to lack of control of them. Efforts to reduce yield losses caused by fungal diseases are mainly based on the use of host resistance and of fungicides (Burpee 1993). The benzimidazole fungicides (benomyl and methyl thiophanate) and DeMethylation Inhibitor -triazole (DMI-triazole) group (fenarimol, propiconazole and triadimefon) are examples of good fungal growth inhibitors (Vargas 1994). Fungicides applied as a foliar spray to swards of grasses may reduce incidence of foliar diseases, increase the number of leaves per tiller and reduce the proportion of dead leaves. They may resulted in some unexpected increases in seed yield and in another times there was not possible to obtain seed yield and seed quality response. (Rolnston *et al.* 1985, Welling and Nordestgaard 1988, 1991, Cagas 1986, 1992, 1997, Lewis 1992, Welty 1991, Welty and Azevedo 1994 and Rijckaert 1995). This observations supports data obtained by Hampton and Hebblewaite (1984, 1985) and Hampton *et al.* (1985).

Results obtained by Czembor (2003a, b) showed the effect of fungicide Tilt 250 EC (propiconazole (250g l^{-1}) application and leaf spot and melting out disease on seed yield of Kentucky bluegrass during two years. In this study chemical control resulted in yield response in both years. An effect of *D. poae* on seed weight per plant was not observed. Fungicide application and *D. poae* not affected weight of head and thousand seed weight. Weight of head significantly correlated with weight of seeds per head.

Further research is recommended to determine the effect of chemical control on seeds germination capacity and on seeds mycoflora of grasses. Therefore the objective of this study was to evaluate the response of Kentucky bluegrass germination capacity on fungicide application and on *D. poae*.

MATERIAL AND METHODS

Seed samples

Seed samples were collected in the experiment conducted by Czembor (2003a,b) under field conditions in three treatments (A - natural infection, B - inoculation by *D. poae*, C - Tilt 250 EC application) during two years. The experiment was carried out using 6 cultivars (Limousine, Gol, Conni, Barvictor, Bartitia, Parade), 3 breeding lines (Chałupy, BA 130, RAH 1474) and 3 ecotypes (141049, 141429, 41637) of *P. pratensis* with different resistance levels to *D. poae.*

Germination capacity

Germination capacity was determined on the moistened filter at 10°C in darkness during the first 3 days and at 18°C during the next 28 days. For each seed-lot three replicates of fifty seed were tested. Germination was assessed as the percentage of seeds producing normal seedlings as defined by ISTA (International Seed Testing Association) Rules (Bekendam, Grob 1993). This assessment was done after 10 days (1^{st} account) and after 28 days (2^{nd} account).

Data analysis

Disease scores and seed germination were subjected to analysis of variance, and treatment means were compared using the Tukey separation test at P=0.01, 0.05 or 0.1.

RESULTS AND DISCUSSION

Leaf spot and melting out disease severity was assessed during spring and fall on a 1 - 9 scale (1 - 90% of leaf area infected and/or very well developed melting out). Spring assessment showed a significant effect of inoculation by *D. poae* (treatment B). The differences between disease assessment of the tested Kentucky bluegrass ecotypes, breeding lines and cultivars growing in the treatment with natural infection and in the treatment after inoculation were significant. Fungicide application significantly reduced *D. poae* infection only in comparison to treatments with inoculation.

In both years of the experiment on the seeds samples collected from all treatments D. *poae* occurred on the very low level (lower than 1%). Differences in germination capacity between tested cultivars, breeding lines and ecotypes during the first and second account were significant (Table 1). Also, some differences during the first and second account between years were observed.

Table 1

F-test for germination capacity of 6 cultivars, 3 breeding lines and 3 ecotypes of Kentucky bluegrass assessed in three treatments (with natural infection, with inoculation by *D. poae* and with fungicide application)

	df	F-values		
		I account	II account	abnormal
Genotype	11	9.83*	2.81*	2.28*
Treatment	2	7.47*	8.42*	Ns
G × T	22	Ns	Ns	Ns
Year	1	245.15*	77.28*	Ns
G × Y	11	5.53*	6.64*	1.92*
T × Y	2	9.58*	12.08*	4.18*
G × T × Y	22	Ns	Ns	Ns

* All evaluations were significant at $P < 0.01$ level

During the first year fungicide application and leaf spot and melting out disease have no influence on seed capacity on the moistened filter. The range of the seed germination frequency for the seed samples obtained from the plants growing in all treatments was 37.1% – 38.2% and 38.2% – 40.3% during the first assessment (after 10 days) and during the second assessment (after 28 days), respectively.

In the second year it was possible to observe some effect of the leaf spot and melting out disease occurrence on seed germination only during the first account (Table 2, Fig. 1). Seed capacity in the first account was 16.6%, 26.8% and 21.8% in treatments with inoculation by *D. poae*, application of fungicide Tilt 250 EC and control, respectively. Second assessment showed that seed germination in all treatments was in the range 27.2% - 31.9%.

The number of seeds produced abnormal seedlings was the same in all treatments (Table 1, Table 2).

Table 2

Comparison of germination capacity mean value assessed for 6 cultivars, 3 breeding lines and 3 ecotypes of Kentucky bluegrass in three treatments (A - natural infection, B - inoculation by *D. poae* and C - fungicide application) during two years

Germination parameters	Treatment A				Treatment B				Treatment C			
	Range	Mean	CV [%]	LSD Tukey	Range	Mean	CV [%]	LSD Tukey	Range	Mean	CV [%]	LSD Tukey
1st year												
I account	30.0-41.3	38.2	15.9	Ns	30.1-42.0	37.7	15.7	Ns	30.0-42.7	37.1	13.8	Ns
II account	32.0-42.2	40.3	13.8	Ns	38.0-42.7	39.9	15.2	Ns	30.0-43.3	38.2	13.1	Ns
Abnormal	3.78-10.89	5.2	61.6	Ns	4.6-12.0	6.2	63.6	Ns	2.0-14.0	6.4	76.1	Ns
2nd year												
I account	10.0-40.0	21.8	33.0	8.86	8.0-28.7	16.6	20.1	8.37	9.0-52.0	26.8	55.2	9.15
II account	37.3-48.8	45.5	23.5	Ns	39.3-61.3	53.1	18.14	7.14	23.3-56.6	43.2	24.7	8.03
Abnormal	3.3-13.3	7.2	52.7	Ns	3.3-13.3	6.2	71.3	Ns	2.7-7.3	4.7	45.4	Ns

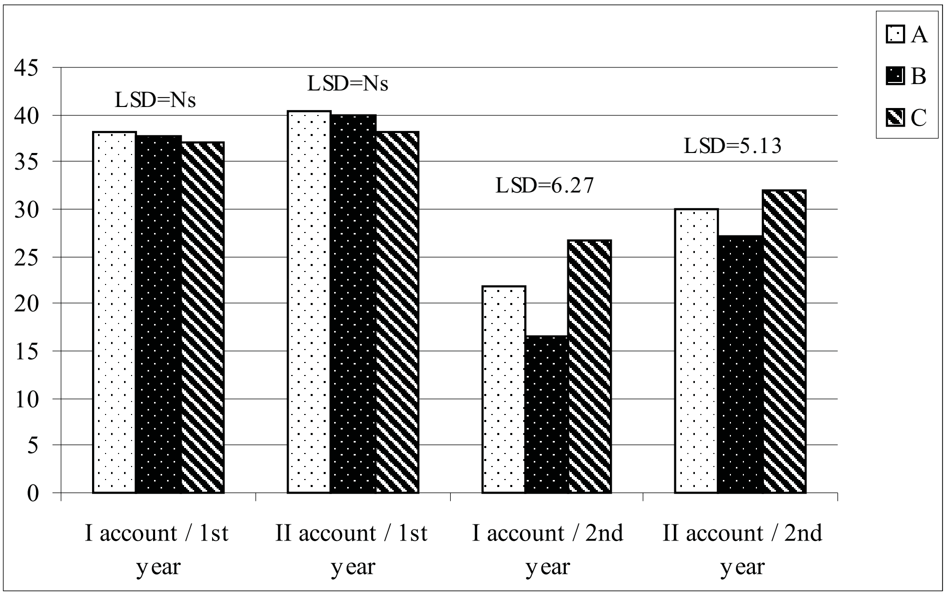

Fig. 1. Comparison of germination capacity mean value assessed for 6 cultivars, 3 breeding lines and 3 ecotypes of Kentucky bluegrass in three treatments (A - natural infection, B - inoculation by *D. poae*

Results obtained in the present study for Kentucky bluegrass showed that propiconazole application (active ingredient in the fungicide Tilt 250 EC) and leaf spot and melting out disease have no influence on seed capacity of Kentucky bluegrass. This observation supports the results obtained by Lam (1984a, 1984b, 1985) who found no relationship between *L. perenne* seed infection by *Drechslera* spp.

and seed germination. However, he did not observed the effect of fungicide on the disease severity and on the seed capacity. Some positive effects of fungicide application on seed production and seed quality of grasses is described by Cagas 1986, 1992, Horeman 1987, 1989, Dernoeden and McIntosh 1991, Lewis 1992, Welty 1991, Welty and Azevedo 1994, Rijckaert 1995.

He *et al.* (1995) tested the effects of triazole fungicide, propiconazole, on pollen germination and tube growth *Tradescantia virginiana*. Propiconazole inhibited pollen germination, cytoplasmic streaming and tube elongation. This suggest that application of the fungicide during flowering will have some influence on the seed yield. Further observation are still necessary to predict the relationship of seed yield and seed quality on fungicide dose and timing of application.

Therefore improved environmental quality, energy and resource conservation, and increased economic sustainability through better fungicide use is the long-term goal of many project and the knowledge about this is still re-evaluated.

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