Paper ID: 418
Theme 2. Grassland production and utilization
Sub-theme 2.7. Seed production, storage, availability and quality

Seed shedding of *Lolium multiflorum* in dependency on application of preparations controlling plant ripening process

Barbara Golińska and Piotr Goliński*
Department of Grassland and Natural Landscape Sciences, Poznan University of Life Sciences, Poznan, Poland
*Corresponding author e-mail: pgolinsk@up.poznan.pl

Keywords: Italian ryegrass, Preparations controlling plant ripening process, Seed production, Shedding

Introduction

The seed shedding susceptibility is specific biological feature of grasses (Hampton and Fairey, 1997; Simon *et al*., 1997), which occurs particularly in the species of *Lolium-Festuca* complex. *Lolium multiflorum* is a grass distinguished by highest susceptibility of seed shedding (Golińska, 2009). It is the main reason of up to 60% of seed yield losses during harvest of seed plantations of this grass (Coolbear *et al*., 1997). In order to prevent seed losses by shedding the investigations are necessary to improve the efficiency of grass seed production. One of the possibilities is using of preparations which physically or physiologically control the ripening process of plant and decrease the seed shedding susceptibility. The aim of this study was to assess the effects of different preparations controlling the plant ripening process on seed shedding and yielding of *Lolium multiflorum*.

Materials and Methods

In 2009-2010, in Szelejewo Plant Breeding Division (51º51' N, 17º09' E), which belongs to Danko Ltd., two one-factorial experiments with *Lolium multiflorum* cv. Turtetra grown for seeds in the first year of utilization were set up in a plot block-design with three replicates (plot size 5 m x 25 m). The experiment was situated on Cambisols soils (pHKCl – 5.9, N_t – 0.1%, P_2O_5 – 220 mg/kg, K_2O – 102 mg/kg, Mg – 67 mg/kg). In August 2008 and 2009 seeds were sown in the rate of 400 seeds/m^2 at row spacing of 25 cm. Fertilisers were applied each year at a rate of: N – 80 kg/ha, P_2O_5 – 50 kg/ha, K_2O – 80 kg/ha. During plant ripening process the effects of application of different preparation treatments: 1/ control – without application; 2/ synthetic latex 550 g/ha (Elastiq 550 EC); 3/ synthetic latex 825 g/ha (Elastiq 550 EC); 4/ di-1-P-menten 666 g/ha (Spodnam 555 SC); 5/ di-1-P-menten 999 g/ha (Spodnam 555 SC); 6/ diquat as dibromide 400 g/ha (Reglone 200 SL); 7/ No. 2 + No. 6; 8/ No. 3 + No. 6; 9/ No. 4 + No. 6; 10/ No. 5 + No. 6 were tested. Elastiq and Spodnam were applied in BBCH 83 (early dough growth stage of seed maturity) and Reglone in BBCH 85 (soft dough growth stage of seed maturity) using tractor spreader. In BBCH 85 and 87 (hard dough stage of seed maturity) on the collected samples of 30-40 ears from each plot the seed shedding susceptibility, using prototype testing machine, were evaluated. The testing stand simulated by the same intensity the shattering of 5 randomly selected ears and collected fallen seeds. The seed shedding susceptibility were determined according to the ratio of fallen seed weight to the total weight of seeds obtained from 5 tested ears and expressed as percentage. Additionally, in BBCH 87 tensile strength of rachilla using prototype measuring stand (Goliński, 2009) were evaluated. The basic element of this stand was a testing machine for measuring tensile strength of biological material in the range of 30 N to 300 mN designed on the basis of a sub-assemblies of the Höttinger Baldwin Messtechnik (HBM) Company. The components of the machine included force tensiometric sensors of appropriate nominal ranges, special measuring amplifiers with analogue/digital convertors of 24 bit resolution. The amplifiers were connected serially by RS-485 interface of bus-type configuration allowing easy switching between sensors. Each AS 104C amplifier was equipped in flash-type memory irrespective of the power supply. The tensile strength of rachilla were measured using the special platform equipped in a PW 4 MC 3 sensor of the latest generation. Seed yield per each plot was evaluated using a Wintersteiger plot combine harvester from the area of 50 m^2 following drying, cleaning and weighing. Seed germination capacity was tested according to ISTA. Tests of the main effects were performed by F-tests. Means were separated by the LSD and were declared different at the $P<0.05$ level.

Results and Discussion

The preparations controlling the plant ripening process determined the seed shedding susceptibility of *Lolium multiflorum* (Fig. 1). In comparison to the control, the application of Elastiq 550 EC and Spodnam 555 SC decreased the seed shedding of *Lolium multiflorum* in BBCH 87. The use of Reglone 200 SL increased seed shedding because of desiccation effects on plants. The lowest seed shedding were determined in the case of Spodnam 555 SC 1.8 l/ha + Reglone 200 SL

2.0 l/ha treatment by 17.7% compared to the control. The good effects of seed shedding reduction were obtained also in treatments No. 5 and No. 8., by 14.8% and 12.2% compared to the control, respectively. It turned out that the increase of Elastiq 550 EC and Spodnam 555 SC doses resulted positive on seed shedding of *Lolium multiflorum*.

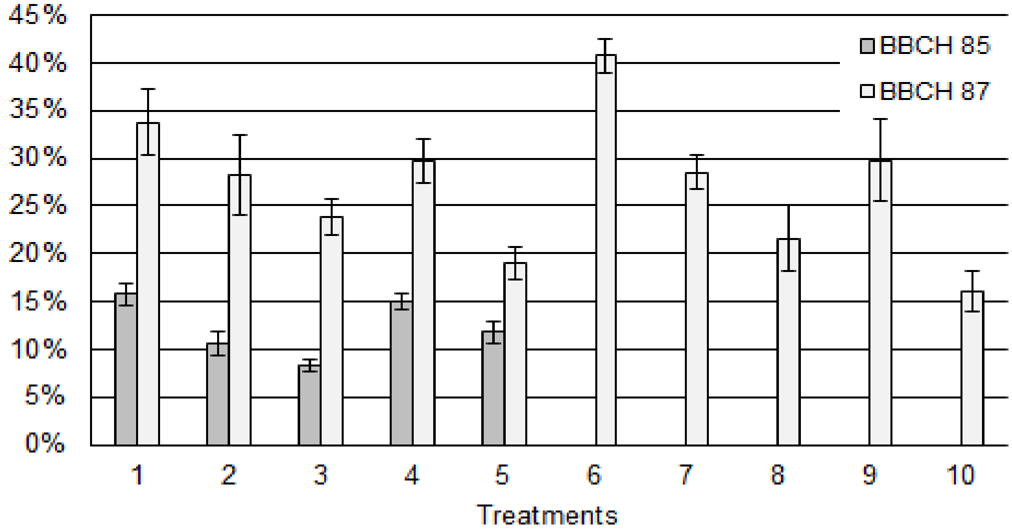

Fig. 1: Effect of preparations controlling plant ripening process on seed shedding susceptibility of *Lolium multiflorum*

The results in Table 1 show that the tensile strength of rachilla of *Lolium multiflorum* was influenced by the preparations controlling the plant ripening process. In comparison to the control, the exclusive application of Elastiq 550 EC and Spodnam 555 SC increased significantly the tensile strength of rachilla of *Lolium multiflorum* in BBCH 87. Application of Reglone 200 SL decreased the analyzed feature, but in treatments combined with Elastiq 550 EC and Spodnam 555 SC the tensile strength of rachilla was increased. The preparations controlling the plant ripening process had positive effect on yielding of *Lolium multiflorum*. The highest harvestable seed yield (1845 kg/ha, by 39.7% compared to the control) was obtained after application of Elastiq 550 EC 1.5 l/ha + Reglone 200 SL 2.0 l/ha (treatment No. 8). It was the results of combine effects: 1/ decreasing seed shedding and higher tensile strength of rachilla as a consequence of Elastiq and 2/ the accelerating and evening out the natural seed maturity process and the better threshing conditions of the plantation as an impact of Reglone as confirmed by Simon *et al*. (1997). The preparations controlling the plant ripening process differed no significantly the seed germination capacity of *Lolium multiflorum*.

Table 1: Effects of preparations controlling plant ripening process on tensile strength of rachilla and seed yielding of *Lolium multiflorum*

Treatments		**Tensile strength of rachilla in BBCH 87 (mN)**	**Harvestable seed yield (kg/ha)**	**Seed germination capacity (%)**
1	Control – without application	32.9	1321	91.0
2	Elastiq 550 EC 1.0 l/ha	48.3	1481	90.7
3	Elastiq 550 EC 1.5 l/ha	81.8	1494	88.3
4	Spodnam 555 SC 1.2 l/ha	37.6	1499	90.7
5	Spodnam 555 SC 1.8 l/ha	43.7	1455	88.0
6	Reglone 200 SL 2.0 l/ha	24.0	1374	88.3
7	Elastiq 550 EC 1.0 l/ha + Reglone 200 SL 2.0 l/ha	39.3	1746	93.7
8	Elastiq 550 EC 1.5 l/ha + Reglone 200 SL 2.0 l/ha	64.7	1845	94.7
9	Spodnam 555 SC 1.2 l/ha + Reglone 200 SL 2.0 l/ha	32.3	1686	90.7
10	Spodnam 555 SC 1.8 l/ha + Reglone 200 SL 2.0 l/ha	34.5	1655	88.3
LSD (0.05)		8.05	200.8	ns

Conclusion

The preparations controlling the plant ripening process determined the tensile strength of rachilla, susceptibility to kernels shedding and consequently seed yield of *Lolium multiflorum*. The lowest seed shedding in BBCH 87 was determined in the application of Spodnam 555 SC 1.8 l/ha + Reglone 200 SL 2.0 l/ha. The highest seed yield was obtained after application of Elastiq 550 EC 1.5 l/ha + Reglone 200 SL 2.0 l/ha. No negative effect on seed germination capacity occurred after application of preparations controlling the plant ripening process of *Lolium multiflorum*.

References

Coolbear, P., M. J. Hill and Win Pe. 1997. Maturation of grass and legume seed. In: Fairey D. T. and J. G. Hampton (eds). *Forage seed production*, vol. 1. *Temperate species.* CABI. Wallingford. pp. 71-103.

Golińska, B. 2009. Investigations on seed retention strength in spikelets of Lolium multiflorum. *Grassland Science in Poland* 12: 37-46.

Goliński, P. 2009. Investigations on tensile strength of plant material using a modern measuring stand. *Grassland Science in Poland* 12: 47-60.

Hampton, J. G. and D. T. Fairey. 1997. Components of seed yield in grasses and legumes. In: Fairey D. T. and J. G. Hampton (eds). *Forage seed production*, vol. 1. *Temperate species*. CABI. Wallingford. pp. 45-69.

Simon, U., M. D. Hare, B. Kjaersgaard, P. T. P. Clifford, J. G. Hampton and M. J. Hill. 1997. Harvest and postharvest management of forage seed crops. In: Fairey D. T. and J. G. Hampton (eds). *Forage seed production*, vol. 1. *Temperate species*. CABI. Wallingford. pp. 181-217.