

POLLEN PRODUCTION OF NEW GENERATION INBRED MAIZE LINES

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Introduction

The majority of maize varieties and hybrids are able to produce adequate quantity of viable pollen under various ecological circumstances, and pollen production cannot be considered as a limiting factor as far as yield is concerned (Duvick, 1997, Westgate *et al.*, 2003). However, extreme abiotic stress factors may cause flowering asynchronism, reducing the chance of fertilization or may generate the production of less viable pollens in lower quantity.

Plants are the most susceptible to decreased water supply right before and during the process of flowering. Water deprivation often results in the disorder of pollen production or even the complete lack of it (Hall *et al.* 1980, Herrero and Johnson 1981), or may delay the development of style (Castleberry and Lerette 1979, Martinello *et al.* 1984). The response of genotypes depends on the extent of stress, and the inherited traits of the genotype under stress. Inbred lines are especially vulnerable to stress factors, which is manifested in pollen production and the viability of pollen grains as well.

Due to the negative correlation between pollen production and grain yield, the number of new inbred lines with tassels of insufficient size, characteristics and unsatisfactory pollen production has increased, risking safe seed production. Plant breeders often select for small tassel size to reduce the dominance of tassels over cobs (Fisher *et al.* 1987). Westgate and Basetti (1991) found that inadequate pollen production caused by small tassel size reduced yield during top cross seed production. According to Ulibelarrea *et al.* (2002) little information is available on the pollen production of modern hybrids, while tassels are significantly smaller than in the past.

Methods

In 2004 and 2005, the pollen production of eight inbred lines of Martonvásár was examined in three repetitions in split-split-plot arrangement in Martonvásár. Data were analysed using multifactorial analysis of variance in accordance with the instructions of Sváb (1967).

The soil of the field of experiment is clayey with residual forest soil. The size of plots was 3.8 m². Artificial fertilizer containing nitrogen, phosphorus and potassium in the rate of 1:1:1 was spread on the field in the quantity of 300 kg/ha. Chemical weed control was carried out before and after emergence, and mechanical weed control was also applied.

In July 2004 precipitation was 7.8 mm less than the 30 years' average, while the average monthly temperature was 1 °C lower than that. In July 2005 precipitation exceeded the 30 years' average with 23 mm, while the average monthly temperature was 0.7 °C lower than that. The distribution of rainfall was more favourable in July 2005. In 2004 there were 12 extremely hot days, while in 2005 there were 9 of it. Altogether, the wet weather of July 2005 with its average hot temperatures can be considered as more advantageous concerning the flowering of maize.

Pollen was collected in pollen bags in each plot from 5 plants of the same flowering stage. The collecting of pollen was started on the day when the first anthers appeared on the tassels' main branches. Measurements were carried out until there was no measurable quantity of pollen in the bags any more. Pollen was cleaned of impurities (anthers, insects, etc.) using fine-meshed screen.

Results and discussion

Our aim was to determine the pollen producing ability of the inbred lines examined and the effect of the year of production as an environmental factor on pollen production. The total pollen production of inbred lines as well as the duration of pollen production was analysed.

Genotype had significant effect on pollen production on an average of both experimental years (Fig. 1). The total average pollen production of the experiment is 3.853 g/5 plants. Line_1 proved to be the most productive with its pollen production of 7.5g, while line_7 gave the smallest amount of pollen (2,12 g) during the flowering period.

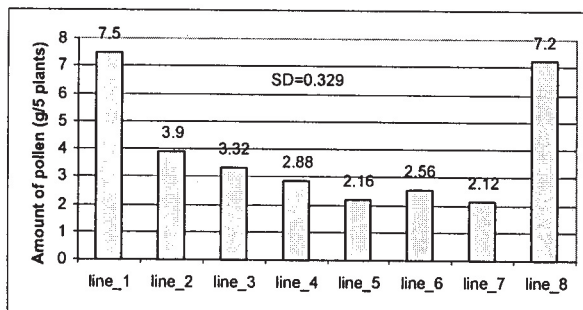


Figure 1: Pollen production of inbred lines.

The year of production also had a significant effect on pollen production. In the year 2005 significantly higher pollen production was measured (Fig. 2).

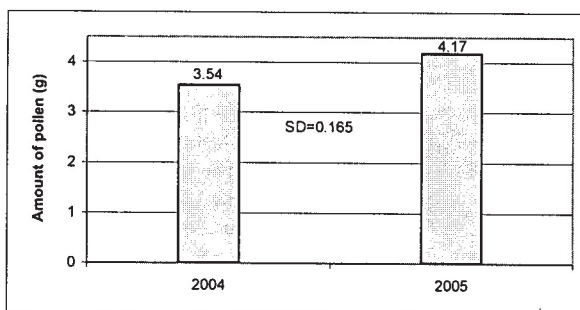


Figure 2: The effect of the year of production on the pollen production of inbred lines.

Concerning persistence significant difference was found among inbred lines on an average of the two years examined (Fig. 3). The average duration of measurable pollen shed was 6.792 days. Line_1 and line_8 were found to shed pollen for the longest time (7.5 days), while line_4 tasselled for the shortest period (6 days).

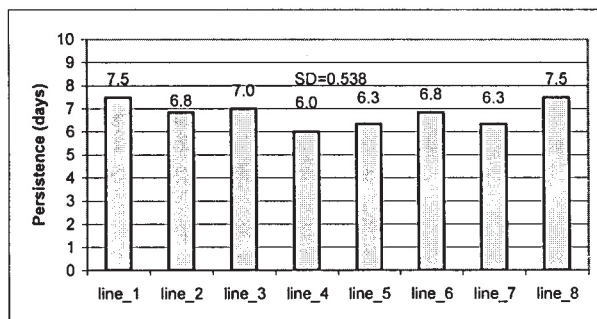


Figure 3: Persistence of inbred lines

The year of production had significant effect on persistence as well. In 2005 pollen shed lasted 1.2 days longer on average (Fig. 4).

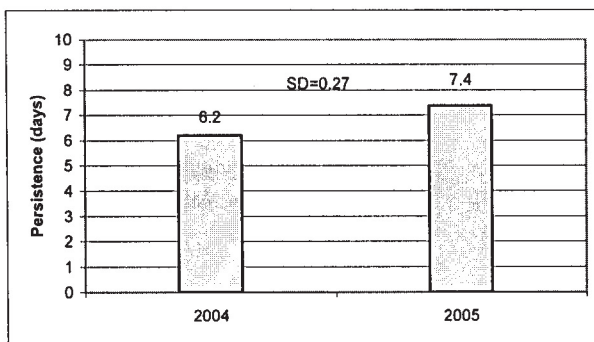


Figure 4: The effect of the year of persistence of inbred lines

Conclusions

The results of our two-year experiment show that the pollen production of the inbred lines examined was significantly influenced by both genotype and the year of production.

Similarly to the amount of pollen produced, genotype and the year of production had significant effect on persistence as well.

Wet and average hot July with more uniform distribution of precipitation promotes pollen production and the duration of pollen shed.

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