RELATIONSHIP BETWEEN THE VIABILITY OF MAIZE-POLLEN AND THE FERTILIZATION

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Introduction

The maize (*Zea mays L.*), a C_4 plant, is an exceedingly good cropper producing the highest green yield in equal areas; hence this is one of the most determining crop in Hungary and all over the world.

The best hybrid breeds are able to produce the highest yield and the primest quality among optimal environmental circumstances. The maize is an allogamic plant, thus the amount of yield is influenced by the viability of pollens responsible for fertilization.

The viability of pollen is genetically determined, but the environmental factors have great impact as well. We are discussing in this paper about the relationship between the viability of maize pollen and the fertilization. Corn pollens are classified into the so-called short-lived pollens' group **(Pfundt 1910, Holman-Brubaker 1926, Vasil 1961, Kozaki 1975 in Barnabás 1982)**

According to the studies of Dafni and Firmage (1999), several factors influence the viability of the pollen. During their research they classified these factors into three main groups; furthermore they found some other important, but not classifiable coefficients. They carried out the following specification as a result of their classification and analysis:

Environmental factors.
- ❖ Nitrogen degree of supply / doses of N
- ❖ Generation impacts
- ❖ Humidity
- ❖ Temperature
- ❖ Flowering time

Morphological aspects:
- ❖ Correlations between localization of the flower(s) and exposure to the environmental factors
- ❖ Blooming flower
- ❖ Bell-shaped protected anthers

Internal factors:
- ❖ Number of seeds
- ❖ Pollen metabolism
- ❖ Genetically inter-specific variability
- ❖ Conditions of microsporogenesis

Other factors and aspects
- ❖ Pollination vector defines exposure as well
- ❖ Insect attraction of the flower
- ❖ Age of the plant / flower /pollen-grain
- ❖ Loss of water before or after blooming
- ❖ Expectancy and duration of pollen storing

Several environmental factors can be influenced during cultivation, e.g. the N-availability and the water volume.

In our experiments we investigated the effect of N- availability on the viability of pollens.

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Methods

The experiments were carried out in Martonvásár (Hungary) in 2004. We used the parental lines of three Hungarian public cropping strains (Table 1.). The three experimental plots were supplied with different doses of nitrogen: 0, 80 and 120 kg/hectare N supply, respectively. We sowed on 13th May, and the flowering was from 3rd to 10th August.

Table 1.
Inbred and hybrid strains used in the experiment

Breed	Strain
Norma	NA
	NB
Maraton	MA
	MB
Gazda	GA
	GB

At the laboratory, the viability of pollen grains was examined, by painting with TTC-solution (triphenil-tetrazonium-chlorid) and by counting under microscope. The TTC reacts with one of the respiratory enzyme functioning in cells. If the pollen grain contains the enzyme, than the TTC paint it to red colour. The tint of the red colour depends on the activity of the enzyme. The pollen grains with light red colour are viable and fertile. The pink coloured grains are viable, but according to our experience they are not fertile. The respiratory enzyme in the pollen grains remained yellow is inactivated.
The measurements were repeated three times, with 30 minutes intervals and with 120 minutes total duration. After dispersing the solution we put the samples into a 37 °C thermostat for 15 minutes, to get the proper colour reaction.

Results

The results confirm our hypothesis that the N-supply has a positive effect on the viability preservation time of maize pollen. On the next figures, we can trace the change in the viability of pollens in one of the inbred (MB) and one of the hybrid parental strains (GA), depending on the different amount of N fertilization.

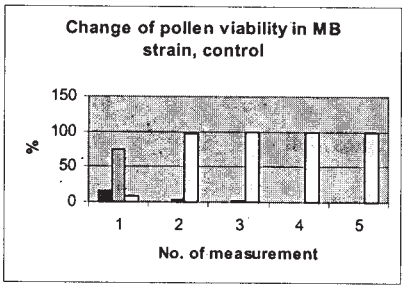

Figure 1.

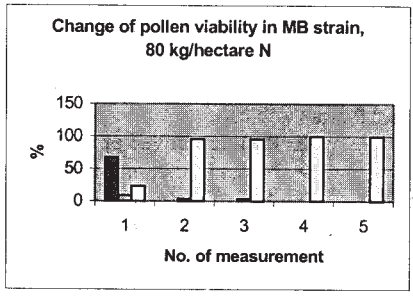

Figure 2.