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Correlation between maize genotypes and the stalk rot caused by maize *Fusarium*

Csaba Szőke[1*], János Pintér[1] and Csaba L. Marton[1]

Introduction

The stalk strength of maize is of vital importance for the success of maize production. Stalk strength depends on two factors: the mechanical structure and the occurrence of stalk rot caused by various *Fusarium* and *Macrophomina* species. When attacked by these species the stalk tissues are destroyed by the cell-wall decomposing enzymes of the fungi (SZÉCSI 1975, LORENZO et al. 1997, SZŐKE et al. 2006). Substantial differences in resistance to fusarium stalk rot have been observed in various maize hybrids and inbred lines (JUGENHEIMER 1940, MESTERHÁZY 1981, KOVÁCS et al. 1988, LEDENCAN et al. 2003).

This paper discusses the major role of *Fusarium* species in the damage caused by stalk rot in maize.

Keywords: maize, stalk rot, *Fusarium graminearum*, resistance

Material and methods

Six SC hybrids and their twelve parental lines were inoculated with *Fusarium graminearum* isolate (FG36) in 2005 and 2006. This isolate was chosen after preliminary pathogeneity tests on ten different *F. graminearum* isolates. The collection and processing of the samples was begun on October 29th. One severely infected and one slightly infected hybrid were chosen and stalk tissue extracts were prepared from naturally infected and artificially inoculated samples. These were used to measure the activity of the CMC-ase enzyme using a modified version of the method reported by Dingle.

Results

The results indicated that the genotype and the level of infection had the greatest effect on the investigated traits in the two experimental years. Stalk infection was more severe in 2005, probably due to the weather conditions during flowering and harvesting. The relative values of infection after artificial inoculation are illustrated in *Figure 1*, averaged over the six hybrids and twelve parental lines. Six of the lines exhibited above-average infection. Two of these (C, G) were used as the female parent in the hybrids, while the other four (B, D, H, L) were male components. Among the female components, lines A and K exhibited the least infection. Among the hybrids, two genotypes (MV2 and MV4) had an above-average level of infection.

Both of these hybrids involved female components that became severely infected. Although line L had a substantially higher value of infection than the average of the lines (being the most severely infected of the male lines), hybrid MV6 had the second smallest negative deviation from the hybrid mean. In hybrids MV1 and MV3, which exhibited

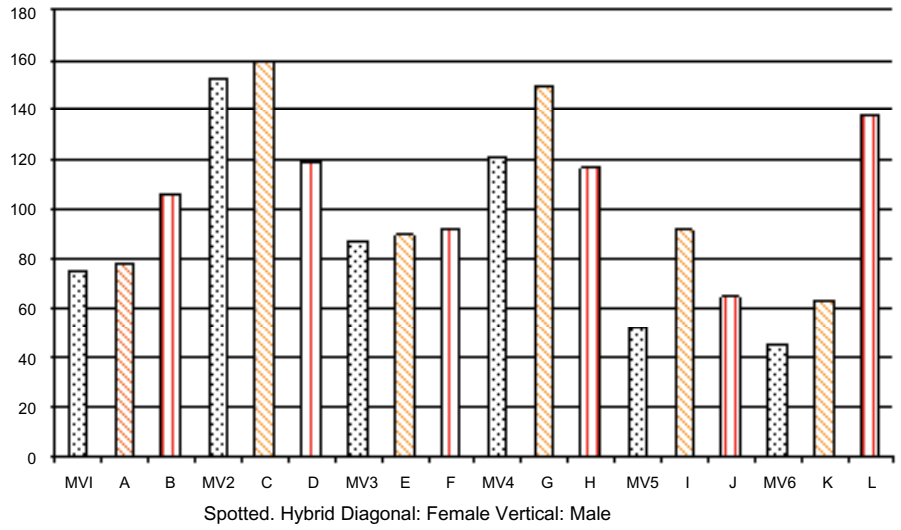

Figure 1: **Level of *Fusarium* stalk infection relative to the experimental mean (100%) for the hybrids and their female and male parental lines**

[1] Agricultural Research Institute of the Hungarian Academy of Sciences, Brunszvik Street 2, H-2462 MARTONVÁSÁR

[*] Contact: M.Sc. Csaba SZŐKE, szokecs@mail.mgki.hu

below-average infection, the female component suffered less severe infection than the male component. The lowest level of infection was recorded for hybrid MV5, which was the only hybrid where the female component was more heavily infected than the male. The relative values of artificial infection for the female and male parents and for the hybrids were used to calculate correlation coefficients between the female and male parents and the hybrids. The female parent-hybrid correlation coefficient was found to be r = 0.88, while the male parent-hybrid correlation coefficient was r = 0.39. Similar values were reported by Georgiev (1977) and MARTON (2002). These results suggest that the inheritance of resistance to *Fusarium* stalk rot is more closely correlated with the resistance of the female component.

The CMC-ase enzyme activity measurements gave the following results: in the case of the MV7 hybrid, which was least infected in the field, the enzyme activity of the tissue extract was lower than that of MV2, the hybrid that was damaged to the greatest extent by the *Fusarium graminearum* isolate in the field and which had significantly higher enzyme activity (*Figure 2*). This suggests that isolates with greater cellulase activity are more aggressive cell-wall decomposers, and that there is a correlation between the cellulase activity of the isolates and their aggressiveness. This will be clarified in further experiments.

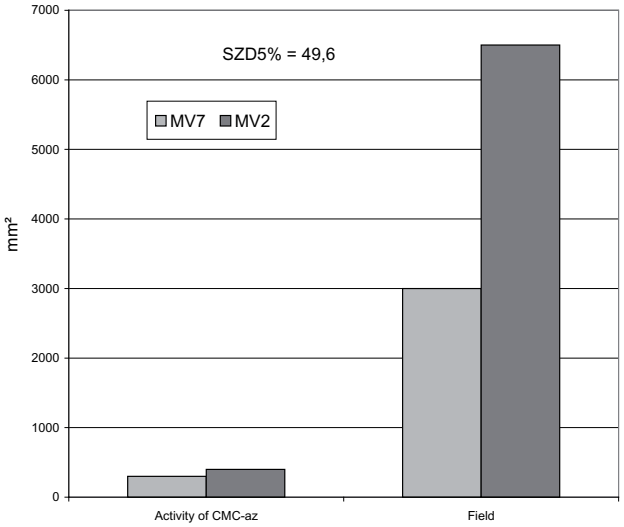

Figure 2: **CMC-ase enzyme activity of the isolates and the area of the lesion developing in the stalk as the result of field infection (MARTONVÁSÁR 2006)**

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