Breeding maize for resistance to fusarium ear rot: impact of plant morphology for disease development and deoxynivalenol formation

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Red and pink ear rots caused by *Fusarium* spp. are important factors affecting the yield and its quality, mainly because of its contamination with mycotoxins produced by the fungi. In Poland, it is commonly caused by *F. graminearum* producing deoxynivalenol (DON) and zearalenone and by *F. verticillioides* which produces fumonisins. It was observed, that during the last years contamination of grain by these toxins increase also in Poland. The development resistant host genotypes strongly depends on availability of sources of resistance and information on host pathogen interactions. The resistance of maize to ear rots is very complex and depends on several components such as, resistance to initial infection by fungal degradation of silk tissues, resistance to fungal spreading being influenced by some traits as wax layer in grain or morphology and chemical compounds of the pericarp. The accumulation of toxins can also be affected by the plant genotype. Although selection is effective to reduce disease severity after inoculation with *F. graminearum*, additional genes seemed to affect grain DON concentration (i.e., ratios between DON concentration and disease severity (DON/DS) in grains depended on genotype) indicating that specific mechanisms are present in the plant affecting DON production by de fungus and additional genetic progress would be achieved by including grain DON concentration as a selection parameter.

Because of this, the aim of this study was to determine which plant traits play important role for red ear rot development and DON formation in grain and rachis. As a plant material 28 hybrids and their parental inbreed lines were used. Field experiment was conducted in three replications. For each genotype eight plants were inoculated with *F. graminearum* and 8 plants were used as a control in each replication. During silking time ear morphology was described: cobs length, silks length (separately, covered and not covered by husks), antocyanin content in silks. Because of different ears morphology - kernel inoculation method was used (9 11 days after silking). Disease development was visually assessed at harvesting time using 1 - 7 scale. Mycotoxin content DON content was evaluated separately in grain and cobs (rachis) samples with RIDA®QUICK SCAN using immunochromatographic tests. Relationships between disease severity, DON contamination, anthocyanin content and ear morphology were calculated using Pearson correlations.

Based on the obtained results it was possible to conclude that DON content (both, in grain and cobs) strongly correlated with disease severity. Disease severity and DON contamination, negatively correlated with anthocyanin content in silks and positively correlated with the length of silks which were not covered and covered by husks. In samples collected from the most resistant genotypes was it was low under natural infection and also after inoculation.

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