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Stability of resistance to *Fusarium* head blight and *Fusarium* toxin accumulation in winter wheat lines over different environments

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Fusarium head blight (FHB) resistance of advanced winter wheat breeding lines was evaluated for three years in two locations (six environments). Lines were selected from breeding programs of Polish breeding companies based on their increased FHB resistance. They did not contain any FHB resistance genes from exotic resistance sources e.g. Sumai 3. Lines were sown in field experiments located in Cerekwica, Western Poland, and in Radzików, Central Poland. Three *Fusarium culmorum* isolates - two of DON-chemotype and one of NIV-chemotype - producing deoxynivalenol (DON), nivalenol (NIV) and zearalenone (ZEN) were applied for inoculum production. Wheat heads were inoculated at flowering stage with a mixture of conidial suspensions of the isolates, using the same mixture at both localities. Severity of head infection by *F. culmorum* was assessed (combined type I and II of FHB resistance). After the harvest, the frequency of *Fusarium*-damaged kernels (FDK) was visually assessed (type III of resistance). Wheat grain was analyzed for concentration of *Fusarium* mycotoxins (type V of resistance) and ergosterol (ERG) which is marker of fungal biomass amount in kernel (type III of resistance). Zearalenone was quantified using AgraQuant®ZON test kit. Trichothecenes of group B (DON and derivatives and NIV) were quantified using gas chromatography technique. Ergosterol amount was measured using HPLC technique.

In all six environments, we found significant differences between lines in all studied types of resistance. Lines showing moderate resistance to FHB and toxin accumulation were identified. Their reaction was stable over different environments. We found significant correlations between different years and locations for the most of variables; however, correlation coefficients varied depending on weather conditions.

Variables describing different types of FHB resistance correlated significantly. The highest coefficients were found for correlations: FDK vs trichothecenes B concentration and ERG vs trichothecenes B concentration. The lowest were coefficients for correlation between ZEN concentration and the other variables.

Audience Take Away:

- It is possible to identify winter wheat lines with stable FHB resistance (including mycotoxin accumulation in grain) without introduced resistance genes from exotic sources
- Most of the resistant lines possessed high yielding potential only slightly lower than the best (susceptible) lines
- In studied population of winter wheat phenotypic markers (head infection, kernel damage) were good predictors of mycotoxin (trichothecenes) concentration in grain, which does not work in other cereals e.g. triticale.

Biography

Master of Sciences degree in the field of Plant Pathology, at the Agricultural University in Warsaw. MSc thesis title: "Fusarium head blight of wheat, rye and triticale". Doctor of Philosophy degree in the field of Agricultural Sciences, at the Plant Breeding and Acclimatization Institute in Radzików. PhD thesis title: "Importance of primary inoculum sources for epidemics of *Septoria nodorum* blotch of triticale." Research work in Department of Plant Pathology on fungal diseases of cereals: *Septoria nodorum* blotch and *Fusarium* head blight. Leading of research programs on *Fusarium* head blight of wheat, durum and triticale and creating of initial material for breeding of disease resistant wheat. Leading of laboratory working on diseases of cereals (*Fusarium* head blight of wheat, durum and triticale; *Fusarium* ear rot of maize), fungal metabolites analysis (mycotoxins, ergosterol, endotoxins) and faba bean diseases.