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PIV-53 - Tomasz GÓRAL - *Fusarium* head blight and *Fusarium* toxins accumulation in grain of winter wheat breeding lines inoculated with *Fusarium culmorum*

Fusarium* head blight and *Fusarium* toxins accumulation in grain of winter wheat breeding lines inoculated with *Fusarium culmorum

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Fusarium head blight (FHB) is a disease of cereals caused by fungi of genus *Fusarium*. These fungi produce toxic metabolites – mycotoxins, with phyto- and zootoxic potential. There are several types of resistance to FHB: type I – to infection, type II – to the spread of *Fusarium* in the ear, type III – to the kernel damage by *Fusarium*. Other types are the tolerance to FHB or toxins (DON) (type IV) and type V – resistance to the accumulation of toxins (trichothecenes) in the grain through their chemical modification or blocking of synthesis.

In order to obtain the forms of winter wheat that combine different types of resistance 77 lines were evaluated in field experiments in two locations. Among them there were five resistant checks: ‘20828[Fhb1-]’, ‘A40-19-1-2’, ‘Arina’, ‘Fregata’, ‘UNG 136.6.1.1[Fhb1+]’; five lines with Fhb1 gene from crosses of winter wheat cultivars with ‘Sumai 3’; six susceptible checks; three lines with high accumulation of trichothecenes; three high yielding cultivars ‘Artist’, ‘Patras’ and ‘RGT Kilimanjaro’. Wheat heads were inoculated with the spore suspension of *F. culmorum* isolates producing DON, NIV and ZEN. *Fusarium* head blight index (FHBi) was evaluated. The proportion of *Fusarium* damaged kernels (FDK) was determined visually by dividing the sample on healthy looking kernels and with symptoms of *Fusarium* damage. Using the technique of gas chromatography and immunoenzymatic tests the contents of the DON and acetyl derivatives, NIV and ZEN in the grain were analysed.

Average FHBi was 14.6%; at the range of 3.6 – 453.2%. The least infected were lines ‘S43[Fhb1+]’, ‘Fregata’ cv., ‘20828 [Fhb1-]’, ‘S32[Fhb1+]’, ‘S38[Fhb1-]’, ‘A40-19-1-2’, ‘UNG 136.6.1.1’, ‘S10[Fhb1+]’, STH 032, STH 2041, KOH 275 and the most infected were six susceptible checks. The average value of the FDK amounted to 14.4%; at the range of 1.5 – 41.5%. The least damaged kernels had lines ‘S 43[Fhb1+]’, ‘S38[Fhb1-]’, ‘S10[Fhb1+]’, ‘POB 679/03’, ‘S 32[Fhb1+]’, ‘POB 170/04’. The most damaged were kernels of susceptible checks and three cultivars ‘Artist’, ‘Patras’ and ‘RGT Kilimanjaro’. There was a significant linear relationship between the FHB index and the proportion of *Fusarium* kernel damage – $r = 0.771$, $p < 0.001$. Chemical analyses showed the presence of *Fusarium* toxins DON, 3AcDON, NIV and ZEN in the grain samples. Average concentrations of DON, 3AcDON, NIV and ZEN were 6.777 mg/kg (0.750-19.750 mg/kg), 0.303 mg/kg (0.050-0.950 mg/kg), 5.146 mg/kg (0.750-22.600 mg/kg), 1115 mg/kg (147-6875 mg/kg), respectively. Lines differed significantly in terms of content of toxins in the grain. The lowest concentration of toxins was detected in grain of resistant checks ‘S32[Fhb1+]’, ‘S38[Fhb1-]’, ‘S10[Fhb1+]’, ‘S30[Fhb1+]’, ‘S43[Fhb1+]’, ‘20828[Fhb1-]’ and breeding lines ‘POB 0616’, ‘POB 0111’, ‘POB 0211’, ‘POB 6793/03’, ‘NAD 13015’, ‘POB 170/04’, ‘POB 457/07’, ‘NAD 13024’. The highest concentration of toxins was detected in grain of five susceptible checks, cultivar ‘Artist’ and breeding lines ‘DM 2566/11’, ‘KBP 08 13’, ‘LAD 463/05’, ‘C 3779/10’.

It was possible to identify lines combining resistance to FHB (type I + II), to kernel damage (type III) and the low accumulation of *Fusarium* toxins (type V).

Keywords: *Fusarium*, wheat, toxins, trichothecenes, zearalenone

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