Evaluation of spring wheat resistance to *Fusarium* seedling blight and head blight

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Abstract: Twelve Polish spring wheat cultivars and 18 spring wheat accessions (nursery name: 4th SRSN, CIMMYT, Mexico), were tested in the year 2001 for *Fusarium* seedling blight and components of resistance to *Fusarium* head blight by applying a highly aggressive fungal isolate producing deoxynivalenol (DON). Resistant wheat cultivars were used as controls. The mean leaf infection score (on a scale of 0–5, where 0 = no infection, 5 = very strong infection) in CIMMYT lines was lower than in Polish spring cultivars. Root infection scores were higher than leaf infection scores both in CIMMYT lines and in Polish cultivars. Three CIMMYT lines were the most susceptible to *Fusarium* seedling blight, according to the leaf and root infection scores which reached up 4.0 and 4.7, respectively. The means of head infection score and percentage of *Fusarium*-damaged kernels was smaller in CIMMYT lines than in Polish spring cultivars. We found large differences between the evaluated wheat genotypes for trichothecene content. In infected kernels, the mean DON accumulation in CIMMYT lines was lower than that in Polish cultivars. The lowest DON level was observed in the line IPG-SW-16 and in Polish cv. Banti. The highest DON content of inoculated wheat was observed in cv. Olimpia (27.4 mg/kg). This cultivar had also the highest ergosterol content (52.3 mg/kg). Head infection score was positively correlated with all parameters examined (kernel weight per head, percentage of *Fusarium*-damaged kernels, DON, 3-acetyldeoxynivalenol, 15-acetyldeoxynivalenol, and ergosterol content). No correlation was found between resistance to *Fusarium* seedling blight and *Fusarium* head blight.

Key words: *Fusarium culmorum*, *Fusarium* toxins, head blight, seedling blight, spring wheat.

Abbreviations: 3-Ac-DON, 3-acetyldeoxynivalenol; 15-Ac-DON, 15-acetyldeoxynivalenol; DON, deoxynivalenol; FDK, *Fusarium*-damaged kernels; FHB, *Fusarium* head blight; FSB, *Fusarium* seedling blight; HLK, healthy looking kernels; KWH, kernels weight per head; LSD, least significant difference; PDA, Potato Dextrose Agar.

Introduction

Fusarium culmorum (W.G.SM.) Sacc. is one of the most frequent *Fusarium* species pathogenic to wheat and other cereals. It can infect host plants at various growth stages – seedlings, heading and flowering – and consequently cause significant economic cereal crop losses (Chełkowski & Mańka, 1983; Arseniuk et al., 1991; Sharen & Czembor, 1991; Góral & Czembor, 1993; Wiśniewska & Chełkowski, 1996). The initial source of *Fusarium* inoculum is the soil, where the pathogen survives either as saprophytic mycelium or as thick-walled resting spores (chlamydospores), depending on the *Fusarium* species (Parry et al., 1995). Seedlings attacked during emergence often turn brown and die off because of foot rot so that *Fusarium* seedling blight (FSB) results in less dense cereal stands. Later in the growing season, air-borne inoculum usually in the form of conidia or ascospores may infect cereal heads, causing *Fusarium* head blight (FHB). There are several different species of *Fusarium* that cause these diseases (*F. culmorum*, *F. avenaceum*, *F. graminearum* and *F. nivale*). *Fusarium culmorum* is most destructive to older plants, whereas *F. avenaceum* and *F. graminearum* are more damaging the seedlings. Seedling infections result primarily from seed-borne and soil-borne mycelium and spores. FSB causes death of seedlings before or shortly after emergence. Moist soil in the fall favours infection of the plant, but dry soil and high levels of nitrogen fertilizer favour the progress of the disease in spring. It is important to distinguish between the seedling disease and other potential problems, such as insects, herbicide injury, or soil compaction. The infection of the seed by *Fusarium* results in a reduction of germination capacity as well as seedling blight, root and foot rot (Daamen et al., 1991; Arseniuk et al., 1993; Chełkowski, 1998). *F. culmorum* produces numerous phytotoxic metabolites, includ-

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