THE PHYTOTOXIC ACTION OF DEOXYNIVALENOL AND ZEARALENONE ON WHEAT SEEDLINGS

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In wheat, the fungus Fusarium culmorum can cause ear blight, seedling blight, foot- and rootrot and infected culms. It is well-known that Fusarium species are capable to produce mycotoxins in plant material. For Fusarium culmorum and Fusarium graminearum in wheat under West-European conditions, the toxins deoxynivalenol (DON) and zearalenone are reported to be the most important. Besides their noxious influence on vertebrates, these toxins also have a phytotoxic action. DON at a concentration of about 6 ppm inhibited strongly the growth of tomato seedlings, particularly roots (Ref. 1). The direct influence of DON and zearalenone on growth was investigated by growing wheat seedlings on a toxin containing medium.

The surface of seeds of four genotypes were sterilized in 1% calcium hypochlorite solution for 10 minutes, followed by several rinses in sterile distilled water. The seeds were incubated on wet filtrate paper under sterile conditions. A medium was prepared of 100% Murashige & Skoog salt mixture and 8 g/l purified agar, to which after autoclavation the toxin was added. The experimental unit consisted of a culture vessel of 180 mm, ϕ 16 mm, to which 12.5 ml of the medium was added. The toxin concentrations tested are given in Figure 1 and 2. After 48 hours, of each genotype four germed seeds were transplanted to the medium. The germlings were incubated at 16°C and exposed to light of 1000 Lux during 16 hours a day. During several weeks growth of coleoptile and roots were observed.

Deoxynivalenol retarded germination and reduced growth of coleoptile and roots in the range tested. The coleoptile growth reduction is illustrated in Figure 1. Root growth was inhibited very strongly by DON, resulting at a concentration of 3.6 ppm in a maximum length of only 15 mm. A concentration of 14.3 ppm DON inhibited seedling growth completely. A concentration of 5 ppm DON will be optimal to screen genotypes for tolerance to DON.

Also zearalenone decreased growth of coleoptile and roots in the range tested. The coleoptile growth reduction is shown in Figure 2. The root growth reduction shows a similar picture. A concentration of 26.4 ppm inhibited seedling growth completely. A concentration of about 20 ppm will be optimal to screen genotypes for tolerance to zearalenone.

References:

- 1 A. Bottalico, P. Lerario & A. Visconti, [Some experimental data on the phytotoxicity of mycotoxins], *Phytopath. Medit.* 19 (1980) 196-198

Figure 1: The reaction of coleoptile growth on deoxynivalenol

Figure 2: The reaction of coleoptile growth on zearalenone