Effect of Relative humidity on germination of ascospores and macroconidia of Gibberella zeae and deoxynivalenol production

Marco, Beyer, J. A. Vereet and Wafik S. Ragab

Abstract:

Cereals are frequently infested by mycotoxin-producing fungi such as Gibberella zeae. G. zeae produces sexual spores (ascospores, dispersed by wind) and asexual spores (macroconidia, dispersed by rain droplets) to infect host plants. The production of the mycotoxin deoxynivalenol (DON) and the germination of ascospores and macroconidia of G. zeae were studied at 20 °C in relation to relative humidity (RH). The DON contents of wheat heads and autoclaved rice grain samples, artificially inoculated with ascospore or macroconidia suspensions of equal spore density, were determined at 35 days after inoculation by high-performance liquid chromatography (HPLC). The average DON production 35 days after inoculation was much lower on rice (3.95±1.34 mg kg⁻¹) than on wheat heads (302.30±57.46 mg kg⁻¹). Macroconidia inoculi produced more DON than ascospore inoculi at relative humidities >90%, but less DON between 53% and 80% RH. At RH ≤53%, no significant differences in DON production were observed between macroconidia and ascospore inoculi. DON production increased with RH irrespective of spore type. Germination of ascospores and macroconidia was monitored during incubation above six constant humidity solutions ranging from 30% to 93% RH. Ascospores only required a RH ≥53%, whereas macroconidia required RH of ≥80% for germination. The different humidity requirements of the two spore types for germination are discussed as a potential reason for the differential DON production of ascospore and macroconidia inoculi in relation to humidity. The results indicate that DON contamination levels partly dependent upon the interaction of spore type and RH and may confer an ecological advantage to G. zeae over other Fusarium head blight pathogens.

Keywords:

Contamination level; Fusarium graminearum; Humidity; Mycotoxin; Spore type; Wheat

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