

Title The influence of modified atmospheres and their interaction with water activity on the radial growth and fumonisin B₁ production of *Fusarium verticillioides* and *F. proliferatum* on corn. Part II: The effect of initial headspace oxygen concentration

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Citation International Journal of Food Microbiology, Volume 113, Issue 3, 15 February 2007, Pages 339-345

Keywords *Fusarium verticillioides*; *Fusarium proliferatum*; Modified atmospheres; Headspace oxygen; Water activity; Fumonisin B₁

Abstract

This paper is the second in a series of two that describe the effect of modified atmospheres on the growth and mycotoxin production of *Fusarium verticillioides* and *Fusarium proliferatum* on corn. In this part, the effect of initial headspace (IH) oxygen concentration and its interaction with water activity (a_w) on growth and fumonisin B₁ production was investigated. In addition, the impact of vacuum packaging and in-cooperation of O₂ scrubbing sachets was also studied. It was observed that at all a_w values studied, reduction of IH O₂ concentration from 20 to 2% had no significant effect on the colony growth rate (g , mm d⁻¹) and lag phase duration (λ , d). However, g and λ were positively and negatively correlated to a_w . The IH O₂ concentration was determined to have a a_w dependent effect on the oxygen consumption rate. Although the maximum colony diameter (D_{max} , mm) decreased with the reduction of the IH O₂ level, the greatest mycelial density occurred at 10% IH O₂ for both isolates. This observation was accompanied by a trend of a decrease in the value of the IH O₂ level at which the most fumonisin B₁ was produced from 15 to 5% when the a_w was decreased from 0.976 to 0.930 for *F. verticillioides*. For *F. proliferatum* the optimum conditions for fumonisin B₁ production shifted from 20% at a_w 0.976 to 10% at both 0.951 and 0.930. Vacuum packaging and the in-cooperation of O₂ absorbing sachets completely inhibited the growth of both isolates. These results together with those reported in Part I of the study indicate that O₂ should preferably be completely excluded from modified atmospheres that are employed to protect stored corn from fungal growth and mycotoxin production.