

**Title** Interaction of fungicide seed treatments and the Fusarium-maize (*Zea mays* L.) pathosystem

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### Abstract

Maize stand losses and seedling blights due to *Fusarium* spp. continue to be one of the most economically important diseases in maize production. Consequently, all maize seed is treated with a mixture of fungicides that improves seedling emergence and yield. Data on the interaction between *Fusarium* spp. and seed treatment fungicides are limited. The effectiveness of seven fungicide active ingredients against seed-borne *F. verticillioides* was assessed under controlled environmental conditions. In addition the effects of fungicide seed treatments on seedling blight development and early season growth and physiology of maize were evaluated in the field at two locations in Iowa. Under controlled environmental thiabendazole, captan, ipconazole and triticonazole significantly reduced ( $P=0.0306$ ) the recovery of *F. verticillioides* from seeds and decreased infection of shoots and radicle tissues by the fungus in both experiments. In field experiments at V2, the incidence of *Fusarium* infection in plants grown from fungicide treated seed was lower than the control. The incidence of each *Fusarium* spp. isolated changed with time: at growth stage V2, *F. graminearum* was predominant while incidence of *F. subglutinans* and *F. verticillioides* increased as the growing season progressed at both locations. The distribution of each species among plant tissues also varied; *F. graminearum*, *F. oxysporum*, and *F. solani* were predominantly isolated from roots and mesocotyl tissues, whereas *F. proliferatum*, *F. verticillioides* and *F. subglutinans* were more frequently isolated from crown tissues. Fungicide seed treatments significantly reduced the proportions of roots, mesocotyl and crown sections colonized by *F. graminearum*, *F. subglutinans* and *F. verticillioides*. A significant relationship between the severity of mesocotyl rot at V2 and severity of crown rot at V6 was observed and there was some evidence of a relationship between crown rot at V6 and stalk rot at R6 at one location. Photosynthetic performance, as measured by chlorophyll fluorescence, significantly decreased with increased incidence of *Fusarium* spp. at growth stages V2 and V4 and with greater root, mesocotyl, crown and stalk rot disease severity. This work provide more knowledge about the pathology of fungicide seed treatments against seed-borne *F. verticillioides* and against colonization of soil-borne *F. graminearum*, *F. oxysporum*, *F. proliferatum*, *F.*

*solani* , *F. subglutinans* and *F. verticillioides* . Furthermore, this study provides evidence of the benefits of fungicide seed treatments on mid-late season crown rot and late season stalk rots.