Title Modeling effects of environment, insect damage, and Bt genotypes on fumonisin accumulation in maize in Argentina and the Philippines

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Abstract

Fumonisins are common contaminants of maize (*Zea mays* L.) grain products, especially in countries where maize is a major constituent of the diet and are harmful to human and animal health. There is a need to better define environmental conditions that favor fumonisin accumulation in the grain of maize. The impacts of biotic and abiotic factors, and hybrids containing the Cry1Ab protein from *Bacillus thuringiensis* (*Bt*), were associated with fumonisin accumulation in the grain of maize across contrasting environments in Argentina and the Philippines between 2000 and 2002. Average fumonisin concentrations in grain samples varied from 0.5 to 12 $\mu g\ g^{-1}$ across field locations in Argentina, and from 0.3 to 1.8 $\mu g\ g^{-1}$ across locations in the Philippines. The ratio of fumonisin B1 to fumonisin B2 was <3.0 in four of nine locations in Argentina, which proved to be due to a higher prevalence of *Fusarium proliferatum* in those locations. Most of the variability of total fumonisins among maize grain samples was explained by location or weather (47%), followed by insect damage severity in mature ears (17%), hybrid (14%), and with the use of Bt hybrids (11%). In Argentina, where conditions were more favorable for accumulation of fumonisin in the years considered, fumonisin concentrations were lower in Bt hybrids compared to their genetic isolines by an average of 40%. A model was developed to predict fumonisin concentration using insect damage to ears and weather variables as predictors in the model. Four periods of weather around silking were identified as critical for fumonisin concentrations at harvest. The model accounted for 82% of the variability of total fumonisin across all locations in 2 years of the study.