Abstract

Fumonisin contamination of maize grain starts in the field. Forecasting *Fusarium* infection and fumonisin synthesis could allow operators in the field to control contamination during the growing season and to make the best agronomic decisions for high quality yields while respecting the limits imposed by the European Union. A research project to develop a decision support system for the control of field-phase fumonisin contamination began in Italy in 2003. This paper presents a preliminary version of the engine of the decision support tool: FUMAgrain, a dynamic risk assessment model developed with data from the north of Italy. The structure of FUMAgrain is based on the pathosystem formed by maize, *F. verticillioides* and *Ostrinia nubilalis* (European Corn Borer). The elements of the pathosystem are simulated by three sub-models: (i) maize development, (ii) *F. verticillioides* infection and fumonisin synthesis, (iii) European Corn Borer wounding activity on maize grain. Inputs to the model are (i) planting date, (ii) hourly meteorological data including temperature, relative humidity, wind speed and rain intensity, (iii) information on the phenological development of the hybrid planted (flowering and dry-down), and (iv) information about the chemical treatment against European Corn Borer. FUMAgrain gives an initial risk alert at the end of flowering based on the meteorological conditions during this phase. A second alert follows maturation when an assessment is made from (i) maize grain moisture, (ii) European Corn Borer damage to the ear, and (iii) fumonisin synthesis risk. Following calibration and validation with data FUMAgrain demonstrated its good capability to simulate fumonisin synthesis in maize grain in Italy (calibration: $R^2 = 0.70$; validation: $R^2 = 0.71$) and its usefulness for determining the optimal harvest date while respecting grain safety levels required by the international market and limiting moisture content, hence drying costs.