Predicting weed emergence in maize crops under two contrasting climatic conditions

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Abstract

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Keywords: weed emergence; empirical models; maize; thermal time; growing day degrees; *Abutilon theophrasti*; *Xanthium strumarium*; *Datura* spp.; *Sorghum halepense*; *Echinochloa crus-galli*

Summary

Predictive empirical models of the timing of emergence were developed for ten major weed species in maize crops. Monitoring of seedling emergence was performed over two years in two maize fields located in Central Spain and Tagus Valley in Portugal. Thermal time was used as the independent variable for predicting cumulative emergence. Different non-linear growth curves were fitted to the data sets of cumulative percent emergence for the different species, sites and years using genetic algorithms. Based on their emergence patterns, weed species were arranged into three groups. Species with early-season emergence (*Abutilon theophrasti*, *Xanthium strumarium*, *Datura stramonium*, *Datura ferox*, *Sorghum halepense*, *Digitaria sanguinalis* and *Echinochloa crus-galli*) reached 70% emergence with less than 700 growing day degrees (GDD). Species with whole-season emergence (*Cyperus rotundus* and *Solanum nigrum*) started early their emergence processes but the emergence continued throughout the maize life-cycle; they required up to 1300 GDD to reach 70% emergence. The only species with late-season emergence was *Sonchus oleraceus*; it required more than 1300 GDD to reach 70% emergence. The results obtained in our experiments have shown a good synchrony between the predictions obtained in different years in the same site. However, no single model was able to predict the timing of emergence in two sites with different environmental conditions, challenging the hypothesis that a single general model, based on temperature only, can be used to predict weed emergence in different geographical locations.