World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:9, No:03, 2015

Spatio-Temporal Pest Risk Analysis with 'BioClass'

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Abstract : Spatio-temporal models provide new possibilities for real-time action in pest risk analysis. It should be noted that estimation of the possibility and probability of introduction of a pest and of its economic consequences involves many uncertainties. We present a new mapping technique that assesses pest invasion risk using online BioClass software. BioClass is a GIS tool designed to solve multiple-criteria classification and optimization problems based on fuzzy logic and level set methods. This research describes a method for predicting the potential establishment and spread of a plant pest into new areas using a case study: corn rootworm (Diabrotica spp.), tomato leaf miner (Tuta absoluta) and plum fruit moth (Grapholita funebrana). Our study demonstrated that in BioClass we can combine fuzzy logic and geographic information systems with knowledge of pest biology and environmental data to derive new information for decision making. Pests are sensitive to a warming climate, as temperature greatly affects their survival and reproductive rate and capacity. Changes have been observed in the distribution, frequency and severity of outbreaks of Helicoverpa armigera on tomato. BioClass has demonstrated to be a powerful tool for applying dynamic models and map the potential future distribution of a species, enable resource to make decisions about dangerous and invasive species management and control.

Keywords : classification, model, pest, risk
Conference Title : ICAFC 2015 : International Conference on Agricultural and Food Chemistry
Conference Location : Rome, Italy
Conference Dates : March 05-06, 2015