Cleveland State University
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A Math Model for the Pest Control on a Broccoli Crop

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https://csuohio.zoom.us/j/91945126460

Bio: Prof. Carrillo received his Ph.D. from Centro de Investigacion en Matematicas, Mexico, in 2012. His dissertation focused analytic modelling applied to predator-prey models with age structure. Currently, he is assistant professor in the Department of Mathematics and Physics in the Autonomous University of Aguascalientes in Mexico. Prof. Aleman received his PhD from Centro de Investigacion en Matematicas, Mexico, in 2014. His dissertation focused on discrete models for heterogeneous cancer tumors. Currently, he is assistant professor in the Department of Mathematics and Physics in the Autonomous University of Aguascalientes in Mexico.

Abstract: In this work we propose an ode model that aims to abstract the most important characteristics of the larvae pest called Diamond Back Moth (DBM) that affects the broccoli crop. DBM is a major plague because it feeds on the broccoli leaves, affecting its growth and causing economical losses. For this reason, it is important to have a mathematical and in-silico model that allows us a more efficient pest control based on the DBM growth dynamics. Our model considers two control mechanisms used for farmers to reduce the DBM population. They are a) the biological pesticides which consist of a toxin that kills the DBM larvae, and b) other biological control such as insects which are natural predators or parasites DBM eggs. These two pest control strategies are far less toxic than the chemical pesticides. In our model, we assume exponential growth, and also, that there is migration from the surroundings at a constant rate. Finally, we use the data provided by a local company that uses the biological pesticide Bacillus thuringiensis and the Diadegma and trichogramma wasp to control the growth of the DBM. The provided data were used to determine the parameters of our model. We present the solutions of the adjusted model. Such solutions approximate the data sets and show an advance in this direction.