Ninth Workshop Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2018
Turin, Italy, February 7-9, 2018

A PREDATOR-PEST MODEL WITH ADDITIONAL FOOD TO THE PREDATOR - AN APPLICATION TO PEST CONTROL

Sourav Kumar Sasmal, Dibyendu Sekhar Mandal*, and Joydev Chattopadhyay

Agricultural and Ecological Research Unit, Indian Statistical Institute 203, B. T. Road, Kolkata 700108, India

sourav.sasmal@gmail.com, dsmandalrkmrc@gmail.com (*corresponding author, joydev@isical.ac.in)

The harmful effects of insect pests on human health and agricultural output are a major global concern. Frequent use of chemical pesticides as a means of pest control can have detrimental effects on the environment, resulting in water and soil pollution, food toxicity, resistance to pesticides, etc. As a result, there is an urgent need to develop a biological pest-control approach that would mitigate these harmful effects. The main purpose of the present study is to explore the interaction between strong Allee effects in the pest with other biological control mechanisms, such as providing additional food to the predator and pest culling as a means of proposing an efficient pest-control policy. To achieve this goal, local stability analysis around the equilibria, possible bifurcation and some basic dynamical features of the system was performed. Our work focuses on the basin of stability in multiple stable regions of the model, which yields the probability of convergence of each equilibrium for a given set of different initial conditions. The system exhibits bi-stability and tri-stability of the equilibria. Our findings indicate that providing additional food to the predator can be an efficient stand-alone pest control strategy, which can, if needed, be combined with other methods.

 ISBN: 978-989-98750-4-3