

## **The Dynamics of an Integrated Pest Management Model with Refuge Effect**

Pest control has become increasingly difficult in crops as pests develop resistance to traditional methods. Recently, the combination of biological, chemical, and cultural, known as integrated pest management (IPM), has been used in order to control these pests at low levels. However, some of these pests are in refuge and are not exposed to these methods. Here, we introduce an IPM model with refuge effect to study how the refuge effect influences the dynamics of this system. We are particularly interested in the stability of this system and identify permanence of the system in order to apply this knowledge to the control of pests.