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Dynamical modelling and complex dynamics for the control of pest leafhopper with generalist predatory mite in tea plantations

The tea green leafhopper *Empoasca onukii* Matsuda (Hemiptera: Cicadellidae) is one of the important insect pests threatening the tea production. Both nymph and adult of *E. onukii* suck the tea buds, leaves, and shoots and make wounds in tea plants, which finally leads to the symptom from blade curling, bronzing, shriveling, necrosis to stand loss, even severe hopperburn, affecting the quality and yield of the tea. The pesticides were the commonly applied which caused the undesirable pesticide residues on brewed tea. A potential biological control agent, the mite *Anystis baccarum*(L.) is a significant predator of the leafhopper in various agricultural systems. Based on the field experiment and data, we propose a predator-prey model with a generalist predator and aim to understand the dynamics of leafhopper pest *E. onukii* and predatory mite *A. baccarum* for the purpose of finding a plausible control mechanism. In this talk, I will present the bifurcations and complex dynamics of the model, which include saddle-node bifurcation, Hopf bifurcation, Bogdanov-Takens bifurcation, and even bifurcation of nilpotent singularities of codimension 3. In the end, I will present the bifurcation diagrams to explain and interpret the complex dynamics of the model. This is a joint work with Lilin Chen, Mingsheng You and Huaiping Zhu.