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Abstract:

"*Diaphorina citri* or Asian citrus psyllids (ACP) are small insects that live on citrus trees and feed on young stems, sprouts, and leaves during all stages of development. This insect is also the major vector of the most serious citrus plant disease known as Huanglongbing (HLB or Citrus Greening) that affects citrus production in various parts of the world [1,2], in particular in Colombia, South Africa and also in La Réunion, a French overseas department. There is no cure for this infectious plant disease, and the major control efforts are centered on controlling the local ACP populations.

In this presentation, I will focus on Pheromone control. Following [3], we develop a model based on the behavioral and biological features of this particular insect species, and special attention is paid to the ACP mating behavior. Through qualitative analysis and applying an open-loop control approach, we identify the threshold in terms of two external parameters related to the pheromone traps, the amount of pheromones to be released and the male-killing rate, to ensure local elimination of the wild psyllid population. We also show that a feedback or closed-loop control with periodic assessments of the wild population sizes is applicable and then deduce that a mixed-type control, combining the open- and closed-loop control approaches, provides the best results. We present several simulations to illustrate our theoretical findings and to estimate the minimal amount of pheromones and time needed to reach the local elimination of wild psyllids. Finally, we discuss possible implementations of our results as a part of Integrated Pest Management programs.

This is a joined work done with Prof. Olga Vasilieva (U. of Cali, Cali, Colombia) and Dr. Daiver Cardona-Salgano (U. Autonoma de Occidente, Cali, Colombia) [4]

References:

- [1] J.V. da Graça, L. Korsten, Citrus Huanglongbing: Review, Present Status and Future Strategies. In: Naqvi S.A.M.H. (Eds.) Diseases of Fruits and Vegetables Volume I. Springer, Dordrecht, 2004.
- [2] J. M. Bové. Huanglongbing: a destructive, newly-emerging, century-old disease of citrus. *Journal of Plant Pathology*, 88:7-37, 2006
- [3] R. Anguelov, C. Dufourd, Y. Dumont, Mathematical model for pest–insect control using mating disruption and trapping, *Appl. Math. Model.* 52: 437-457, 2017.
- [4] Daiver Cardona-Salgado, Yves Dumont, Olga Vasilieva. Pheromone trapping for control of Asian citrus psyllid, *Diaphorina citri* Kuwayama (Hemiptera: Liviidae). 2023. arXiv preprint arXiv:2310.12608, [hal-04252868](https://arxiv.org/abs/2310.12608). Submitted.