

On Mathematical Modelling of Plant-Insect Interactions

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Plants and Insects are studied since decades, but, most of the time, separately. In Agronomy, plants are studied in order to improve crop yields while insects are studied in order to control their (negative or positive) impacts on crop yields. It is well known that plants and insects are always in interaction but, surprisingly, they are very few mathematical models of these interactions. For instance, in many biological pest control models, the plant compartment is not present, even if it is well known that plants have developed many defenses strategies against their predators that may change Pest control strategies....

Based on recent published works [1, 3] and ongoing projects, the aim of this talk is to present examples of Plant-Insect interactions and their modelling. We intend to show how mathematical models can help to understand how to improve yields, or control antagonistic and mutualistic interactions. Finally, I would like to show possible coupling between plants mock-ups, builded with AMAPstudio [2], and insects mathematical models.

References

- [1] A. Lebon, L. Mailleret, Y. Dumont, and F. Grognaud. *Direct and apparent compensation in plant-herbivore interactions*, Ecological Modelling, Online. <http://dx.doi.org/10.1016/j.ecolmodel.2014.02.020>
- [2] Griffon S., de Coligny F. AMAPstudio: an Editing and Simulation Software Suite for Plants Architecture Modelling. Ecological Modelling. Online. <http://dx.doi.org/10.1016/j.ecolmodel.2013.10.037>
- [3] A. Mathieu, Y. Dumont, F. Chiroleu, P-F. Duyck, O. Flores, G. Lebreton, B. Reynaud, S. Quilici. *Predicting the altitudinal distribution of an introduced phytophagous insect against an invasive alien plant from laboratory controlled experiments: case of *Cibdela janthina* (Hymenoptera : Argidae) and *Rubus alceifolius* (Rosaceae) in La Réunion*, BioControl. Online. <http://dx.doi.org/10.1007/s10526-014-9574-y>