

Mathematical properties of optimal control strategies on mosquito population models for fighting against arboviruses

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In the fight against vector-borne arboviruses, an important strategy of control of epidemic consists in controlling the population of the vector, *Aedes* mosquitoes in this case. Among possible actions, a technique consists in releasing sterile mosquitoes to reduce the size of the population (Sterile Insect Technique). This talk is devoted to studying the issue of optimizing the dissemination protocol for each of these strategies, in order to get as close as possible to these objectives. Starting from a mathematical model describing the dynamic of a mosquitoes population, we will study the control problem and introduce the cost function standing for sterile insect technique. More precisely, we analyze the optimality conditions in order to extract mathematical properties of the optimizers which allows us to set up efficient numerical schemes. In a second step, we will consider a model with several patches modeling the spatial repartition of the population. We suppose that we can release on all patches but want a reduction of the population only on a part of the patches. We mathematically prove that it is not necessary to release sterilized mosquitoes on the patches where we do not need a reduction of the population if the migration is small enough. Finally, we will illustrate our results with numerical simulations.

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- [2] Y. Dumont, M. Duprez, Y. Privat. *Impact of patches connection on optimal population sit control*. in preparation, 2022.