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About sterile insect control strategies in a two patches system

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Sterile Insect Technique is an autocidal method to control Vector of diseases and crop pest. It consists of releasing males sterilized by ionization, in a targeted area, that will mate with the wild females, resulting in a reduce, eventually a local elimination, of the wild population. However, migration of wild insects, from a non-targeted area, can be problematic and reduce the efficiency of SIT [1]. The control strategies should be adapted to take this issue into account. We consider a two patches system, where Patch 1 is the targeted area linked to another area, Patch 2, that needs not to be controlled. Wild and sterile insects can circulate between the two Patches, so that different issues have to be solved. Is it possible to find one or several strategies, and among them an optimal strategy, to reach elimination in patch 1? Should we control both patches? Using results related to monotone cooperative systems [2] and also tools from optimal control theory, we will show some theoretical responses [3]. We will also illustrate the theoretical results with numerical simulations and discuss the extension of our results.

Keywords: Sterile Insect Technique, patches, biological control, metapopulation model, monotone cooperative system, optimal control

References

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