Sex-structured dynamics of mosquitoes involving sterile males

Pierre-Alexandre Bliman[1,2], Daiver Cardona-Salgado[3], Yves Dumont[4,5,6], Olga Vasilieva[7]

[1] Sorbonne Université, Université Paris-Diderot SPC, CNRS, Inria, Laboratoire Jacques-Louis Lions, équipe Mamba, Paris, France

[2] Fundação Getúlio Vargas, Rio de Janeiro, Brazil

[3] Universidad Autónoma de Occidente, Cali, Colombia

[4] CIRAD, Umr AMAP, Pretoria, South Africa

[5] AMAP, Univ Montpellier, CIRAD, CNRS, INRA, IRD, Montpellier, France,

[6] University of Pretoria, Department of Mathematics and Applied Mathematics, South Africa

yves.dumont@cirad.fr, yves.dumont@up.ac.za

[7]Universidad del Valle, Cali, Colombia

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In many tropical and subtropical countries, the epidemic outbreaks of vector-borne viral infections such as dengue, chikungunya and zika, are strongly correlated with the presence and abundance of *Aedes* mosquitoes that act as vector transmitters of these viral diseases. In absence of vaccine, combatting mosquito population still remains the primary method for control of vector-borne diseases.

We here focus on one particular method for controlling the population of wild mosquitoes, known as Sterile Insect Technique (SIT), which consists of releasing males either sterilized by irradiation, or infected by Wolbachia, a natural parasite. In both cases, the released males will mate with wild females that will have no offspring, causing a decay in the wild mosquito population. In order to assess the impact of SIT on the population dynamics of wild mosquitoes, we propose a sex-structured model presenting interesting features, such as bistable behavior with respect to release intensity. We provide a threshold condition that governs the system evolution toward either positive equilibrium (showing considerable reduction of the wild mosquito population) or mosquito-free equilibrium (eradication) during continuous or periodic impulsive releases of sterile males. This threshold condition indicates how to plan the releases in order to achieve eventual extinction of the wild mosquitoes in the target locality, highlighting a trade-off between "affordable" intensity of the releases and "available" time and periodicity that allow to move the system state towards the basin of attraction of the mosquito-free equilibrium. Numerical simulations will be provided to illustrate our results and for discussions.

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