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Ivric Valaire Yatat Djeumen, Yves Dumont

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Yatat Djeumen[1] & Yves Dumont[2,3]
[1]University of Yaounde I. Cameroon
[2]CIRAD, UMR AMAP, St Pierre, F-97410, Reunion Island, France
[3]University of Pretoria, Department of Mathematics and Applied Mathematics, South Africa
ivric.yatatdjeumen@up.ac.za

According to the world health organization, the major vector-borne diseases (VBD) together account for around 17% of the estimated global burden of communicable diseases. Every year, there are nearly 700,000 deaths from VBD. It is important to emphasize that more than 80% of the global population live in areas at risk from at least one major VBD. Despite the progress in knowledge on VBD, for most of them, the major problem is the absence of effective drugs and vaccines. That is why, in the last decades, the development of (sustainable) vector control methods has become one of the most challenging issues to reduce the impact of VBD and, also, limit their spreading.

In this talk, we focus on the Sterile Insect Technique (SIT) within an epidemiological context [1], with a main focus on Dengue. SIT is a technique to control vectors of diseases by releasing sterile males only. However, sex-separation being a complex process, females can also be sterilized and released. Since only females are vectors, it could be problematic when arthropod viruses are circulating. We develop and study an entomological-epidemiological model that includes releases of sterile insects and mechanical control, i.e. the removal of breeding sites. Qualitative analysis of the model highlight a threshold number of treated males above which the control of wild population is always effective, using massive releases. We show that if R0, the basic reproduction number of the epidemiological model without SIT, is above a certain threshold, then, the epidemiological risk can only be controlled using (very) massive SIT releases. Otherwise, when SIT occurs, the SIT-R0, that shapes the stability property of the (periodic) disease-free equilibrium, can be taken below one using non-massive SIT releases. However, practically, it seems more efficient to consider massive releases, followed by small releases [2]. Of utmost importance, our results reveal that outside an epidemic period, the release of sterile females is not an issue, as long as the number of sterile males is above the critical threshold. Within an epidemic period, we show that the releases of sterile females do not really influence the SIT strategy, as long as their proportion (to the total amount of released sterile insects) is quite low, i.e. no more than 5% (IAEA standard requires 2%). Our theoretical results will be illustrated with an example based on an ongoing SIT project in Réunion island (France), where Dengue is circulating [1].

Key words: Vector-borne disease, Sterile Insect Technique, Sterile female, Mechanical control, Monotone system, Dengue

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