The Sterile Insect Technique against fruit flies.
Some new mathematical results
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The sterile Insect Technique (SIT) is an old autocidal method used to control
Vectors of diseases and crop pests. This is a biological control method that
consists of releasing males sterilized by ionization that will mate with the wild
females, resulting in a decay, eventually a local elimination, of the targeted
wild population. While conceptually very simple, SIT is very challenging to
implement in the field. Thus, mathematical modeling and simulations can be
helpful to anticipate numerous issues.

We consider the Sterile Insect Technique against fruit fly, that is known to
mate more than once, contrary to mosquitoes. In addition, since female fruit
fly can remate, they may remate more rapidly if the first mating is done with
a sterile male. Last but not least, depending on the dose of irradiation, sterile
males are not necessarily 100% sterile, such that we may have some residual
fertility [¹]. In this talk, I intend to present a mathematical model with single
and double matings, that gathers all these issues in order to study their impact
on SIT success [²]. We show that there exists a threshold parameter for the
residual fertility that depends on parameters, like, the basic offspring number,
the refractory periods between two matings, the death-rate and eggs deposit-
rate from single- and double-mated females.

We illustrate our theoretical results with the oriental fruit fly, bactrocera
dorsalis, for which a SIT project is ongoing (AttracTIS, funded by the Ecophyto
program) and discuss future developments [³].

References
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