

STERILE INSECT TECHNIQUE (SIT) FOR VECTOR AND PEST CONTROL: THE PARTIAL
STERILE CASE AND NONLINEAR CONTROL STRATEGIES FOR RELEASE

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The Sterile Insect Technique (SIT) is a biological control method that consists of releasing males that have been sterilized using ionizing radiation; these males will mate with wild females that will not produce viable offsprings.

In this talk we present a minimalist model for SIT, assuming that residual fertility can occur in the sterile male population after radiation. Taking into account that we are able to get regular measurements from the biological system along the control duration, such as the size of the wild insect population, we study different control strategies that involve either continuous or periodic impulsive releases. We show that a combination of open-loop control with constant large releases and closed-loop nonlinear control leads to the best strategy in terms of both number of releases and total quantity of sterile males to be released.

Additionally, we show that SIT fails if the residual fertility is greater than a threshold value that depends on the wild population biological parameters. Moreover, even for small values, the residual fertility induces the use of such large releases, that SIT alone is not always reasonable from a practical point of view. We provide applications against a mosquito species, *Aedes albopictus*, and a fruit fly, *Bactrocera dorsalis*.

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