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**On nonlinear pest/vector control via the sterile insect technique: impact of residual fertility.**

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Summary: We consider a minimalist model for the sterile insect technique (SIT), assuming that residual fertility can occur in the sterile male population. 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, i.e., when releases are adjusted according to the wild population size estimates, leads to the best strategy in terms of both number of releases and total quantity of sterile males to be released. Last but not least, we show that SIT can be successful only if the residual fertility is less than a threshold value that depends on the wild population biological parameters. However, 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 and thus requires to be combined with other control tools. We provide applications against a mosquito species, *Aedes albopictus*, and a fruit fly, *Bactrocera dorsalis*, and discuss the possibility of using SIT when residual fertility among the sterile males, can occur.

**MSC:**

[92D45](#) Pest management

[34A37](#) Ordinary differential equations with impulses

**Keywords:**

[pest control](#); [vector control](#); [sterile insect technique](#); [residual fertility](#); [closed-loop nonlinear control](#); [control failure](#); [impulsive periodic release](#)

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