

The sterile insect technique: A novel tool for control of pepper weevil in greenhouse pepper crops



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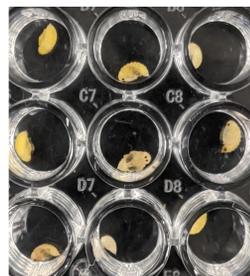
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Background

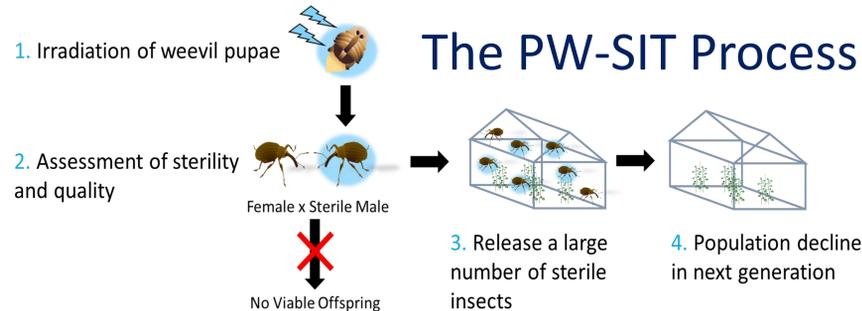
The pepper weevil (PW; *Anthonomus eugenii* Cano) is a major pest of greenhouse and field pepper crops. Pepper weevil larvae damage crops by feeding on the insides of fruit, causing yield losses upwards of 50% in severe infestations. The sterile insect technique (SIT) is a genetic strategy currently applied to manage a diversity of insect pests worldwide. By releasing millions of sterilized male insects into the crop, they can mate with wild females which then produce non-viable eggs. This can result in a dramatic reduction or even eradication of a pest. **The goals of this research were to; a) determine the dose of gamma radiation needed to achieve 100% sterilization of male and female PWs, and b) assess the impacts of irradiation on sterile male adult quality parameters and mating competitiveness against wild males.**

Methods

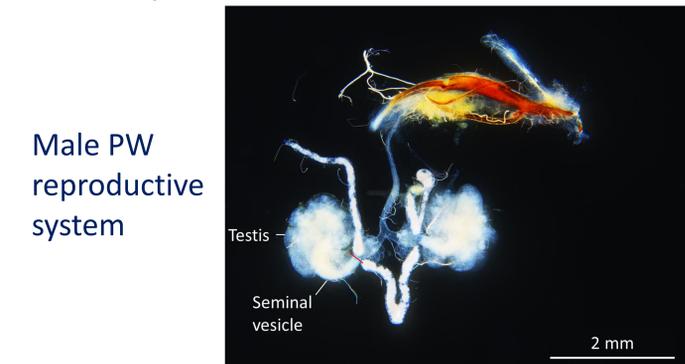
- 1 Extract PW pupae from infested peppers
- 2 Irradiate pupae with 50-110 Gy of gamma radiation
- 3 Pair the irradiated, emerged adult PWs with the opposite sex and provide peppers or leaf sachets for egg laying
- 4 Count egg production (fecundity), egg sterility, and adult offspring emergence from peppers
- 5 Test adult PWs for flight activity, and monitor daily for adult mortality
- 6 Dissect sterile males to sample for sperm production, and test mating competitiveness under lab conditions



PW Pupae

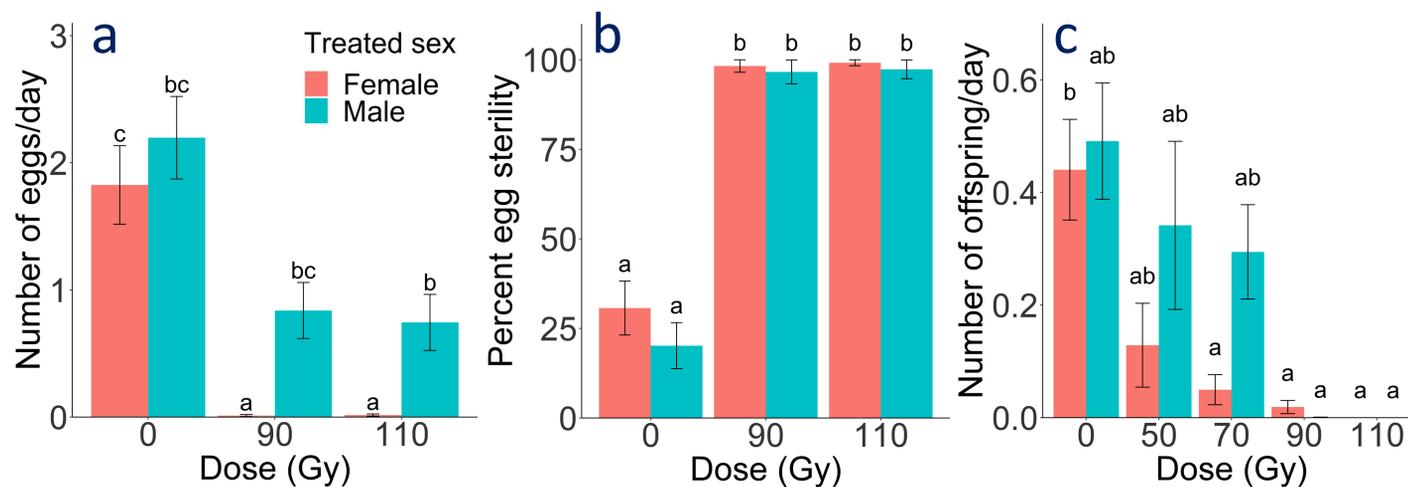


The PW-SIT Process



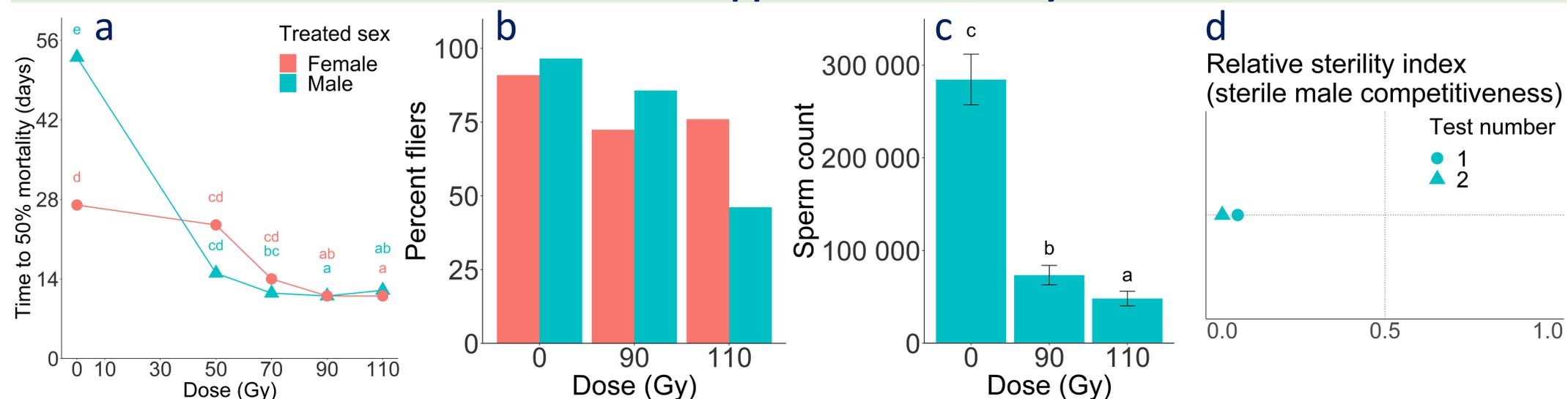
Male PW reproductive system

Irradiated Pepper Weevil Sterility



Mating pairs with a male or female irradiated at 110 Gy had significantly ($p < 0.05$) decreased mean (\pm SE) fecundity (a) and the eggs are nearly 100% sterile (b), and produced 0 offspring from peppers (c).

Irradiated Pepper Weevil Quality



Male PW irradiated at 110 Gy as pupae have significantly ($p < 0.05$) decreased longevity (a), spontaneous flight activity (b), mean (\pm SE) sperm production (c), and had low mating competitiveness (d).

Ultimately, PWs irradiated as pupae with a 110 Gy dose were effectively sterilized, and while quality parameters were negatively impacted, these sterile males could feasibly be used in a PW-SIT program for sustainably managing this pest. Future work should focus on improving sterile insect quality and testing the program in the field.