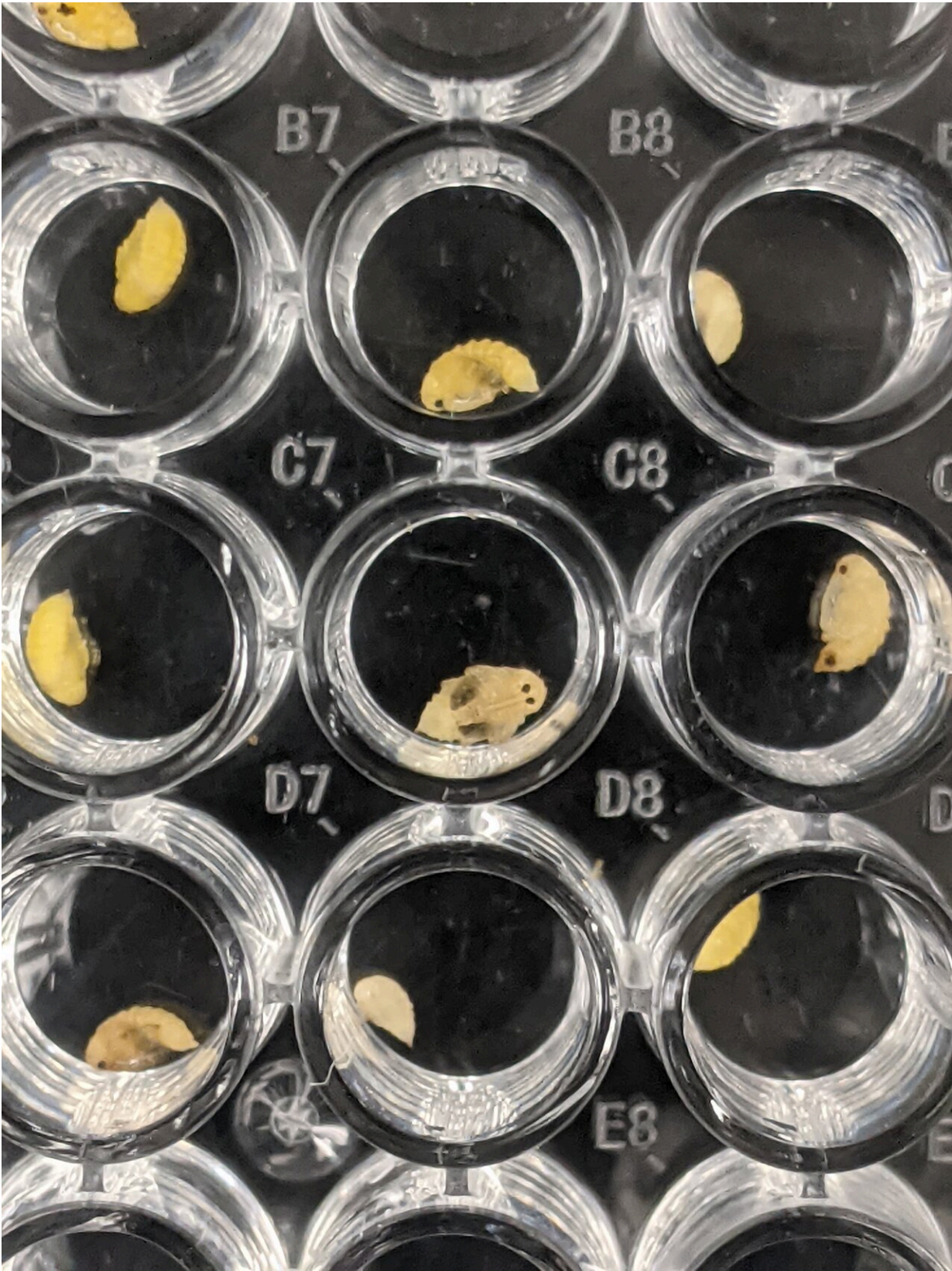


# Protecting the peppers: Unlocking the potential of the sterile insect technique

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Tray of *Anthonomus eugenii* pupae. Credit: Jacob Basso, University of Guelph

For the first time, researchers in Canada have investigated the use of the sterile insect technique for controlling populations of the pepper weevil, *Anthonomus eugenii*, an economically significant crop pest in North America.

[The paper](#), published in *Pest Management Science*, revealed compelling findings on the use of gamma irradiation as a sterilization technique to improve the sustainability and effectiveness of pepper weevil management worldwide. The study was a collaboration between Bruce Power, Nordion Inc., the University of Guelph, Agriculture and Agri-Food Canada, and the Fruit and Vegetable Growers of Canada.

*A. eugenii* poses a significant challenge to pepper growers across much of North America, causing millions of dollars worth of crop damage annually. The [beetle larvae](#) damage the flowers and immature fruit of capsicum plants, with infestations causing yield losses of up to 90%. Managing *A. eugenii* populations is particularly challenging as the development of beetle larvae takes place in the protective confines of pepper fruits.

Roselyne Labbe, Greenhouse Entomologist at Agriculture and Agri-Food, Canada, and corresponding author of the study, explained the challenges in identifying effective strategies to manage populations of *A. eugenii*. "In prior research, we found that few conventional, reduced-risk, or microbial pesticides could effectively knock down adult populations of the pepper weevil on greenhouse pepper crops."





Rows of bell peppers at Agriculture and Agri-Food Canada's Harrow Research and Development Centre, Harrow, Ontario. Credit: Jacob Basso, University of Guelph

"Even assessments of parasitoids (insects which can be used to control pest populations biologically) that attack larval stages of the pepper weevil had limitations, as they sometimes had trouble accessing hosts deep within the pepper fruit cavity," she said.

The team, led by Jacob Basso, a researcher at the University of Guelph, turned their attention to the [sterile insect technique](#) (SIT), a genetic control method where large numbers of sterile insects are released into

the wild to reduce the reproductive success of the pest.

Labbe noted, "The sterile insect technique seemed promising as prior research was conducted with this technique for control of the cotton boll weevil (*Anthonomus grandis*), a congeneric of pepper [weevil](#)."

Key to a successful SIT program is the selection of an appropriate radiation dose for sterilization of the target species. The authors note, "It is critical to determine the minimum radiation dose at which insects are effectively sterilized but maintain their ability to successfully find and mate with wild individuals."





Pepper Weevil (*Anthonomus eugenii*). Credit: Jacob Basso, University of Guelph

An analysis of the effects of different gamma radiation doses on *A. eugenii* pupae revealed that irradiation of both males and females at 110 Gy resulted in completely sterile individuals that could not contribute to offspring production if released in field sites.

The researchers noted that the lifespan of the irradiated beetles at this dosage was reduced to under two weeks and therefore recommended that *A. eugenii* SIT programs should schedule repeated releases of sterile insects no more than two weeks apart, to compensate for their mortality.

For the sterile insect technique to become a viable *A. eugenii* management strategy for growers, numerous practical considerations need to be addressed. Labbe noted, "We still need to examine the dispersal capability of irradiated weevils in the field and, crucially, to evaluate sterile males for their mating competitiveness against non-irradiated male weevils."





Row of bell pepper plants. Credit: Jacob Basso, University of Guelph

The team now hopes to apply SIT to control other pests of horticultural crops. "There is still quite a bit of information lacking in these regards. We are, for instance, interested in applying this strategy for control of lepidopteran pests that routinely invade greenhouse crops," said Labbe.

**More information:** Jacob V Basso et al, Assessing the sterility and quality of gamma-irradiated pepper weevils, *Anthonomus eugenii* (Coleoptera: Curculionidae), toward the development of the sterile insect technique, *Pest Management Science* (2023). [DOI: 10.1002/ps.7898](https://doi.org/10.1002/ps.7898)

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