



## Can gamma irradiation affect the reproductive system of insects? Exploring *Diabrotica speciosa*

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### 1. Introduction

The species *Diabrotica speciosa* is known to cause direct damage to agricultural crops due to its feeding habits and indirect damage by acting as a vector for viruses that affect various crops, especially legumes. The main method of control is the use of chemical products, which can leave residues in food and the environment. An alternative being explored for insect population control is the sterile insect technique. In this method, male insects are sterilized using gamma radiation and then released to promote competition and consequently reduce the population density of the target insect. However, there is still a gap in understanding the effects of radiation on the reproductive system of irradiated insects. Therefore, the aim of this study was to determine the sterilization dose and to perform a histological analysis of the male gonads.

### 2. Methodology

On the third day after hatching, the adults were exposed to gamma radiation (<sup>60</sup>Co) in doses ranging from 0 to 100 Gy, with an exposure rate of 0.808 KGy/hour. Each dose was applied 20 times. The sterilizing dose was determined based on the fertility of sexually mature females that were not exposed to radiation and were mated with irradiated males. Individual couples were placed in 'arenas' and provided with bean leaves (*Phaseolus vulgaris* L.) covered with moistened black gauze to facilitate oviposition.

The total number of eggs per dose, as well as the viability of these eggs and the fecundity rate, were recorded. The text adheres to conventional structure and formatting features, including consistent citation and footnote style. The grammar, spelling, and punctuation are correct. For histological analysis, three gonads per dose were dissected and fixed in 4% paraformaldehyde, following the staining protocol with Hematoxylin and Eosin. [1].

### 3. Results and Discussion

Male sterility occurred at a dose of 75 Gy. The insects had an average longevity of 12.5 days, compared to the control group's longer average longevity of 96.1 days. Histological analyses revealed cellular disorganization starting from the follicular cells and their respective differentiations, such as spermatogonia and spermatocytes. Research on reproductive behavior in irradiated insects is common, such as studies on beetles from the Scolytidae family. In this case, males showed a significant increase in mating success after being irradiated with doses of 15 and 30 Gy, while female egg production and the success of hatched eggs decreased compared to control beetles [2]. However, there is limited research on alterations in tissues, such as the gonads of these insects. At doses of 75 Gy (226.1) and 100 Gy (235.2), fecundity was higher compared to the control group, with an average of 105.4 eggs, respectively. However, viability exhibited a statistically significant difference compared to the control group.

### 4. Conclusions

The histological analysis of male gonads revealed disorganization in the testicular tissue, with wider gaps between germ cells observed at higher doses (75 Gy and 100 Gy). Insects exposed to sterilizing doses had an

average longevity of 12.5 days.

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### **References**

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