

How do laser beams affect larvae?

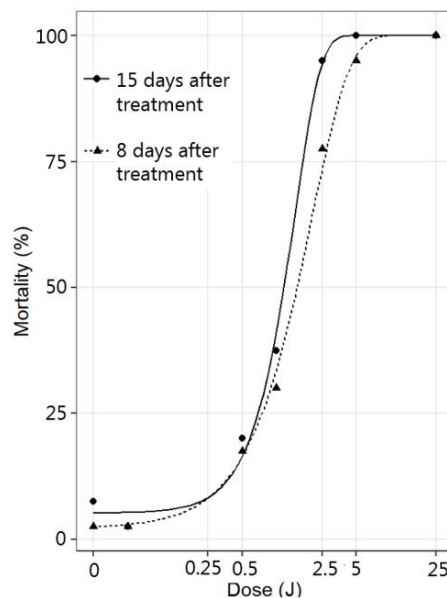
Larvae

Larva is a distinct juvenile form some animals undergo before metamorphosis into the adult stage. Insects typically have a larval phase of their life cycle. The appearance of caterpillars and butterflies' larvae are often significantly different from the adult form.

The insect *Tenebrio molitor* has often been used as a test organism in ecotoxicological studies. The larva of *T. molitor* (also called mealworms) is considered a pest due to its ability to consume stored flour, grains, or animal feeds (see the figure). The larva is white and reaches 2–2.5 cm in length. They gradually become yellow and then dark brown. They have three pairs of legs.

We conducted experiments exposing larvae of mealworms to increasing dosages of laser energy (Joule) from a collimated thulium-doped 2 μm 50 W fiber laser with a 2 mm beam diameter.

Afterward, we recorded the number of dead larvae 8 and 15 days after treatment (see the figure).



Results and Conclusion

The mortality of the larvae increased with increasing dosages. All larvae were dead after 15 days when exposed to a dose of 25 J, which could be used to kill weed seedlings. Even a dose of 0.5 J increased the mortality rate. The mortality did not change much between 8 or 15 days after treatment. Hence, the larvae were very sensitive to laser irradiation. However, only a tiny part of the total field (less than 1%) will be exposed to the laser treatment even with a high weed density. Therefore, the probability of hitting a larva is negligible compared to other weed control means.

Authors: UCPH

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ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

