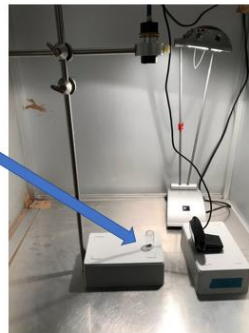


How do laser beams affect beetles?

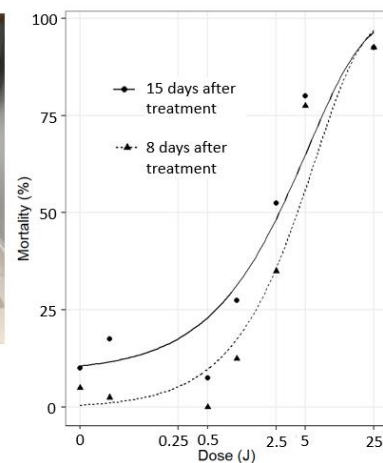
Beetles

Beetles belong to the order Coleoptera and are insects characterized by having their front pair of wings hardened into wing cases. There are about 400,000 beetles described, and Coleoptera is the largest of all orders, constituting almost 40% of described insects and 25% of all known animal species. Beetles are found virtually in every habitat. Beetles often feed on fungi and plants and break down plant debris and animals. Some beetles are agricultural pests, while others are beneficial insects (e.g., ladybirds or ladybugs) eating plant-sucking insects like trips and aphids that damage crops. The *Tenebrio molitor* beetle, is a large one reaching 25 mm in length. It has often been used as a test insect in ecotoxicological studies as it is easy to propagate, feed and keep indoors in laboratories.

We exposed *T. molitor* beetles 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 beetles 8 and 15 days after treatment (see the figure).



Tenebrio molitor beetles in a glass tube were exposed to different laser energy dosages



Results and Conclusion

The mortality of the beetles increased with increasing dosages. All beetles were dead after 15 days when exposed to a dose of 25 J appropriate to kill weed seedlings (see figure). At low dosages, the mortality increased between 8 and 15 days after treatment, while the beetles almost immediately died at the highest dosages. The *T. molitor* beetle is a big one with wings hardened into thick wing cases. Therefore, it is likely that smaller beetles that are less protected would be more sensitive to laser irradiation (see Practice Abstract 43). 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 in the field. Therefore, the probability of hitting a beetle with the laser beam is low.

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Date: 15 April 2023

