WeLASER
Eco-innovative weeding with laser

Practice Abstract N. 43

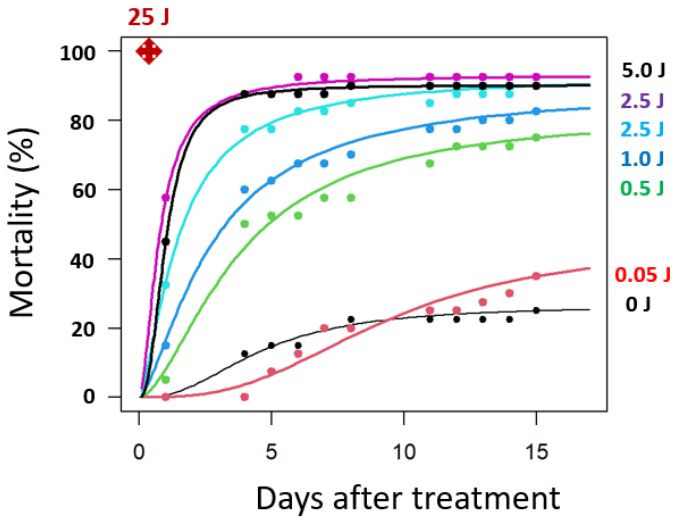
How do laser beams affect ladybugs?

Ladybugs

Ladybugs are small predator beetles. There are more than 5000 species of ladybugs. Ladybugs are beneficial insects because they reduce the number of plant-eating pests in crops. A ladybug can eat more than 5000 aphids in its lifetime. When fields are sprayed with pesticides, ladybugs may be harmed or killed. What happens if they are exposed to laser irradiation?

Experiment with the two-spotted ladybug

We exposed *Adalia bipunctata* (also called *Coccinella bipunctatta*, the two-spotted ladybug, or two-spotted lady beetle) to increasing dosages of laser energy 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 over 15 days after treatment (see the figure).



Results and Conclusion

The mortality of the ladybugs increased with increasing dosage. A dose of 25 J (79 J/mm^2), appropriate to kill weed seedlings, killed all ladybugs immediately. Even a dose of 0.05 J increased the mortality rate. Consequently, ladybugs are 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 like 500 plant/m^2. Therefore, the probability of hitting a ladybug is very little compared to other weed control means.

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