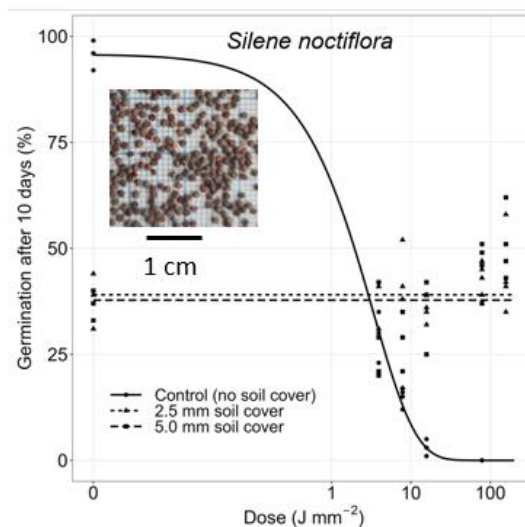


How does laser irradiation affect weed seeds?

Experiments with weed seeds

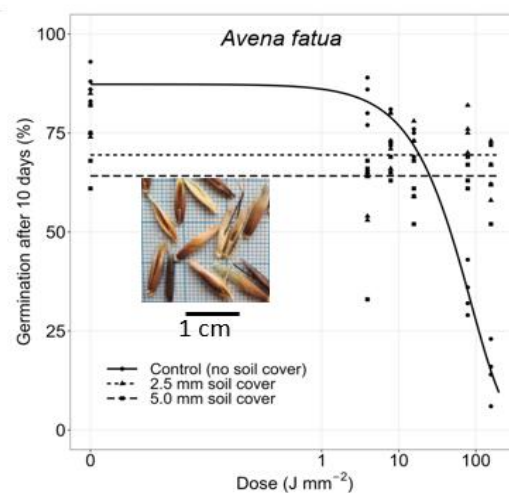
Farmers have addressed the question: Can laser also control weed seeds? We exposed seeds of weeds (*Alopecurus myosuroides*, *Anisantha sterilis*, *Avena fatua*, *Centaurea cyanus*, *Silene noctiflora*) to increasing dosages of laser energy. The species represented dicots and monocots with different seed sizes and morphology. We used a thulium-doped 50 W fiber laser with a wavelength of 2 μm and a diameter of 2 mm developed for weed control. The seeds were exposed to laser directly on the seed surface or after being covered with soil (2.5 or 5 mm).

The figure shows the results of dose-response experiments with small (*Silene noctiflora*) and large weed seeds (*Avena fatua*) 10 days after irradiation. The seeds were irradiated directly on the seed surface or after they had been covered with 2.5 mm or 5 mm soil. The straight lines show that there is no effect of the irradiation when seeds are covered with soil.



Results and conclusion

When small seeds of *S. noctiflora* and *C. cyanus* were irradiated directly on the seed surface, the germination ability was affected by the smallest doses. The seeds were completely burned at high doses (88 and 157 J mm^{-2}). However, generally, there was not a clear relationship between seed size and sensitivity to laser dose. Seeds covered with 2.5 mm or 5 mm soil were not significantly affected by the laser treatments except *C. cyanus* seeds. Increasing the laser dose on the seed surface resulted in increasing infection of fungi. Controlling weed seeds on the ground while weed seedlings are controlled with a laser robot may be possible in the future, but destroying or harming large weed seeds requires higher energy dosages than necessary to control weed seedlings (157 J mm^{-2}).



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