

## **Weed Management Using Diode Laser Treatments**

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Herbicides have been the main weed management scheme in agriculture fields for several decades. However, due to environmental, health, and economic concerns on the impact of applying excessive amount of these chemicals, and the fact that certain weed species are becoming herbicide resistant, alternative approaches must be investigated. Advances in robotics and deep learning technologies provide an opportunity to explore alternative approaches to weed control, like using a robotic platform to detect and remove weeds in the field. One of the alternative methods of removing weeds is using blue diode lasers because of their portability, availability, low power demand, and cost effectiveness. Two weed species response to diode laser treatments was investigated in three experiments. The first experiment involved treating the two weed species with four different laser powers to determine the time it takes to completely cut the weed stem. The second experiment involved monitoring status of two species of weeds for a week after treating them with two different laser dosages at constant application times of 1s, 2s, and 3s. The third experiment was like the second, but with two lasers (5.1W, and 6.1W) at constant treatment times of 0.5s, 1s, and 1.5s. The results showed that the diameter of weed stem, laser power, treatment duration, and distance between the laser and weed had a significant role in elimination of the weed, with weed species having no significance. Furthermore, the results showed promise in killing the weeds by exposing the stem to laser beam without necessarily cut it completely, with 75% effectiveness at 0.5s treatment time, and 100% effectiveness at 1.5s treatment time using a 6.1W blue diode laser.