

PS4-13. How difficult is weed management in sugarbeet with reduced herbicide inputs and alternative methods?

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This study addresses the need of reducing herbicide use, while maintaining a successful weed control in sugarbeet. The objectives were to determine weed control and sugar yield effects when reducing herbicide-sprayed area and increasing mechanical weeding intensity. Five strategies were field-tested between 2022-2024, full-herbicide application (Herbicide), band-herbicide with interrow hoeing (bandHerb-Hoe), reduced-band-herbicide with interrow hoeing (redbandHerb-Hoe), pre-emergence harrowing with camera-guided hoeing (preHarr-camhoe) and camera-guided interrow hoeing (camhoe). The latter three used also a weed-pulling machine, when weed control was insufficient. A fully weedy and a manual weed-free until canopy closure (manual) references were included in 2023 and 2024. Weed pressure assessed before weeding was higher in 2022, particularly on bandHerbHoe and redbandHerb-Hoe (> 60 plants m^{-2}). In 2023, weed pressure was more homogeneous across all plots (< 15 plants m^{-2}), being slightly higher in 2024 (< 20 plants m^{-2}). The final weed density after the last weeding operation was < 30 weeds m^{-2} . Weed control was lower in the crop row region (R) than in the inter-row area (IR). In 2022 and 2023, Herbicide plots showed a lower weed control than all other plots within the IR because soil moisture was too low for root herbicides to be effective. Weed control in IR was more effective during 2023 and 2024 on all treatments and no lower than for manual. The weedy plots depicted the huge white sugar yield reduction potential (i.e., at least 50%). All weeding strategies yielded similar white sugar production (~ 11 t ha^{-1} in 2022 and 2023, and ~ 14 t ha^{-1} in 2024), being similar to manual results. The weed-puller only achieved 20% weed control in average because it broke weed stems instead of uprooting them, in most cases. Sugar yields of bandHerb-Hoe and redbandHerb-Hoe slightly advantaged those of Herbicide and manual. These results demonstrate that weed management in sugarbeet can be successful with alternative methods, especially reducing the area sprayed and combining with interrow hoeing. However, site and climatic conditions are crucial for implementation of such weeding alternatives. Future research should refine traditional mechanical tools and compare them with advanced alternatives, such as spot sprayers and robotic weeders.