

Targeted Carolina Geranium and Black Medic Control in Strawberry

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Summary

An autonomous vehicle was used to apply targeted Stinger (clopyralid) applications on black medic and Carolina geranium. Stinger effectively controls black medic if applied early but only suppresses Carolina geranium. The smart spray system effectively targeted weeds while significantly reducing herbicide use. Future research will focus on improving the detection models and modifying the herbicide delivery system to improve overall control.

Smart Spray System

The Weed Science team developed a smart spray system that uses AI to detect and identify black medic and Carolina geranium and subsequently apply Stinger (clopyralid) only where the weeds occur. The smart spray system was mounted on an autonomous vehicle (Figure 1). On-farm trials were conducted to compare banded and targeted herbicide applications.

Figure 1. The autonomous vehicle used to apply targeted clopyralid applications on black medic and Carolina geranium in strawberry fields.

Black Medic

Black medic is a troublesome weed that emerges in row middles and transplant holes. The seeds are not controlled by fumigants and Stinger is the only registered post-emergence herbicide with sufficient activity on this species if applied early in the season (Figure 2).



Figure 2. The size black medic should be when Stinger (clopyralid) is applied. Note, weeds this small require detailed scouting to detect.

The smart spray system detection precision was 90% overall accuracy was relatively low (0.5) primarily due to the weeds occurring beneath the strawberry canopy and the false detection of strawberry flowers as weeds. Both limitations can be overcome with equipment modifications.

Low (0.33 pts/acre) and high (0.66 pts/acre) label rates were compared with no difference in crop damage or efficacy on black medic observed.



Herbicide use was reduced by 77-94% with the smart spray system but weed damage (Figure 3) and overall control was also lower with targeted applications compared to banded applications. This was primarily

attributed to the lack of weed detection and canopy penetration. We are confident that changes in nozzle orientation combined with improved AI models will overcome these limitations.

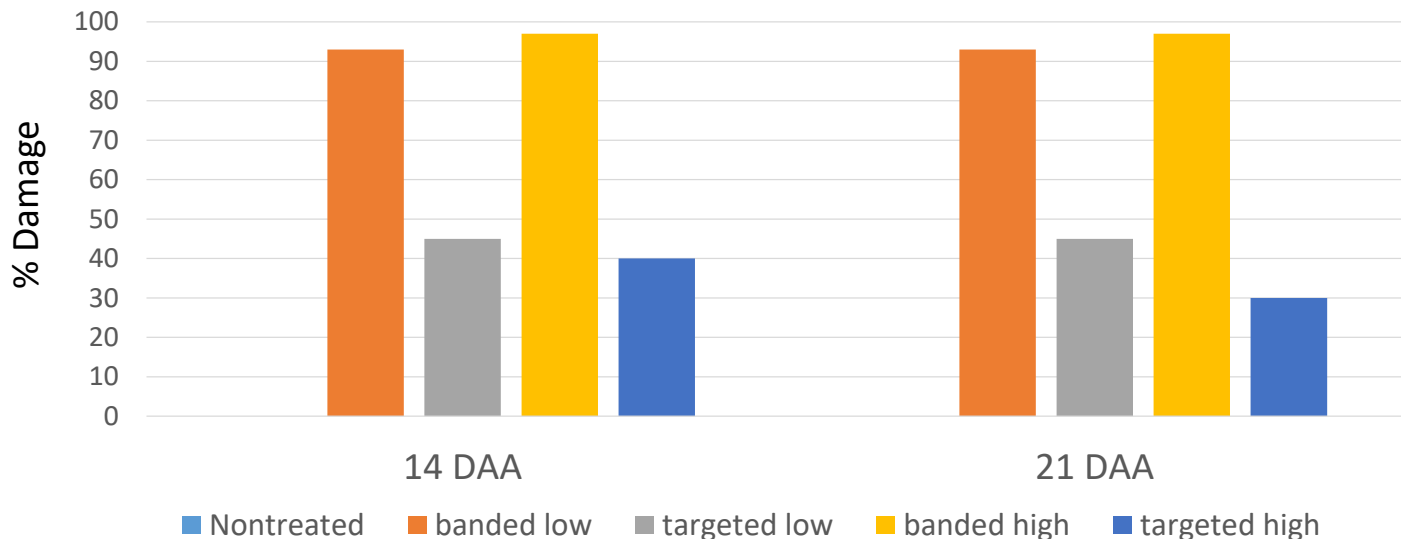


Figure 3. Percent black medic damage caused by 0.33 (low) and 0.66 (high) pints/acre of clopyralid applied using banded applications (broadcast over the bedtop) or targeted applications (applied only where weeds occurred).

Carolina Geranium

Carolina Geranium is one of the most common and troublesome weeds that emerge in strawberry row middles and transplant holes. The seeds are not controlled by fumigants and Stinger (clopyralid) is the only registered post-emergence herbicide that can suppress this species if applied early in the season (Figure 4).



Figure 4. The ideal Carolina geranium size for Stinger (clopyralid) applications. Stinger tends to suppress rather than control Carolina geranium.

Trials were conducted at GCREC to compare Carolina geranium control with handweeding, banded applications of Stinger, and targeted applications of Stinger. Banded applications broadcast Stinger over the bedtops whereas targeted applications applied Stinger only where weeds occurred. The Stinger applications occurred when Carolina geranium had 2-3 leaves, was the same height as the strawberry canopy, or when it overtopped the strawberry canopy.

Detection of Carolina geranium with the targeted spray system was high with an average across application periods of 80%. Weed detection improved over time as the weed grew larger.

Handweeding was the most effective management approach and tended to have the highest yields. Use of the targeted spray system reduced herbicide use by 55-90% with the greatest reductions observed at the smallest weed stage. No crop damage was observed following herbicide application. Carolina geranium was suppressed but not controlled. Further

research is needed to optimize Stinger efficacy on this species.

Takeaways

Stinger is the only registered post-emergence herbicide option for black medic and Carolina geranium. Stinger is highly effective on black medic if applied early. It is less effective on Carolina geranium but still provides significant suppression. Targeted herbicide applications were an effective option to minimize herbicide use. Modifications are needed to improve weed detection and herbicide penetration of the canopy. Future research will focus on techniques to enhance overall weed control.

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