

Progress Report

Evaluation of Methods for Management of Field Bindweed in New York Vineyards

Primary Investigator: Hans Walter-Peterson

Co-Primary Investigator: Bryan Brown

Objectives

The objectives of this project were to:

1. Determine the carryover effects of the 2018 treatments on hedge bindweed. Because of its perennial nature, it is important to understand not just how well the treatments worked in a given season, but also if they have any impact on regrowth of the weed in subsequent years.
2. Determine the feasibility of controlling field bindweed in vineyards using glyphosate, rimsulfuron, dichlobenil, hoeing, or an integrated approach. This is a continuation of the previous year's evaluation work, adding another herbicide to the list of treatments. Dichlobenil ('Casoron') is currently labeled for use with bindweed in New York.
3. Disseminate our findings to New York growers.

Methods

On June 5, 2019, we returned to the Finger Lakes Teaching & Demonstration Vineyard in Penn Yan, NY, to evaluate the carryover effects of our 2018 treatments, which included an untreated control and repeated applications of rimsulfuron ('Matrix', 2 oz/A + AMS at 2.5% v/v), glyphosate ('Roundup WeatherMax', 2% v/v), and hoeing on hedge bindweed (*Calystegia sepium*) and other weeds – primarily annual grasses. Treatments were implemented June 6, July 8, and August 2, with the exception that rimsulfuron was not applied on the final date due to label restrictions. Treatments were replicated four times. Weed groundcover and density in the three-foot-wide undervine strip was assessed using three 0.7 m² quadrats.

In 2019, a new on-farm trial in Branchport, NY was conducted to replicate the treatments evaluated in 2018, but on field bindweed (*Convolvulus arvensis*). Spray rates remained unchanged but application dates were June 10, July 12, and August 8. The repeated rimsulfuron treatment was not applied on the final date due to label restrictions. In addition, we evaluated dichlobenil ('CasoronCS', 1.4 gal/A) applied on May 17, immediately following hoeing. We also included an integrated treatment of hoeing, glyphosate, and rimsulfuron (this time at 4 oz/A + AMS at 2.5% v/v since only one application was made) applied on June 10, July 12, and August 8, respectively. Each plot consisted of one panel between posts, 25' in length. Treatments were replicated four times in a randomized complete block design. Weed groundcover and density were assessed 2 weeks after treatments. We also measured end-of-season weed biomass on September 19. Finally, we estimated the relative cost of each treatment through use of a partial budgeting analysis following Yeh et al. (2014). Although our applications were made with a backpack sprayer, the economic modeling assumed the use of a tractor-drawn directed sprayer

and an adjusted glyphosate rate ('Roundup WeatherMax', 44 oz/A). Similarly, our plots were quickly hoed by hand but the modeling assumed the use of a tractor drawn grape hoe.

Results

There were clear carryover effects from the 2018 treatments on the regrowth of hedge bindweed (Figure 1). Glyphosate and rimsulfuron had the strongest carryover effects, likely reflecting their systemic activity on the hedge bindweed root systems. Hoeing also reduced regrowth compared to the untreated control, but to a lesser degree. However, hoeing did not have a carryover effect on the other weeds, but glyphosate reduced regrowth to some degree, and rimsulfuron had the greatest effect – probably due to its residual activity in the soil.

The early application of dichlobenil was initially effective on field bindweed, but control was lost by mid-July (Figure 2). Control was similar for the other weeds present – primarily ground ivy (*Glechoma hederacea*), clover (*Trifolium* spp), and smartweeds (*Polygonum* spp). We used 1.4 gal/A, but up to 2.8 gal/A can be used, which likely would have provided longer-lasting control.

Over the season, the most complete control was offered by the glyphosate treatment, followed closely by the integrated treatment. Hoeing controlled weeds well-enough but rapid regrowth was seen from the field bindweed. Unlike the hedge bindweed in our 2018 trials, the field bindweed in this trial was not controlled by the rimsulfuron. This highlights the importance of accurate weed identification.

End-of-season weed biomass (the most reliable measure of how well a given treatment performed) showed that only the treatments that included glyphosate significantly controlled the field bindweed (Figure 3). Whereas, the treatments that included hoeing controlled the other weeds most effectively, followed by the glyphosate and rimsulfuron treatments respectively.

Similar to 2018, there was no visible injury from the rimsulfuron applications. Due to the timing of applications, it is unlikely that the grape roots were injured by rimsulfuron since no injury was seen in aboveground tissues.

Partial budget analysis showed that total costs for implementing each treatment were somewhat comparable (Table 1). However, the expense of the rimsulfuron and the slower tractor speed required for hoeing caused those treatments to be the most expensive. If we had used the maximum rate of dichlobenil, that treatment would have been the most expensive.

Conclusion

The most important finding this year was that while rimsulfuron was very effective on hedge bindweed, unfortunately it was not effective on field bindweed. We were successful in obtaining a 2(ee) exemption for New York grape growers to use rimsulfuron on hedge bindweed, but due to the lack of efficacy on field bindweed we will need to continue our educational efforts on correct weed species identification.

While dichlobenil did not offer season-long control, it controlled the field bindweed and other weeds for about two months, which may be satisfactory to some growers. And an increased rate would likely have extended control with no additional labor or equipment usage. Hoeing continued to demonstrate effective but short-term weed control.

Glyphosate and the integrated treatment that included glyphosate were the most effective treatments on the field bindweed. Since there was no statistical difference between their field bindweed control, but the integrated treatment controlled other weeds more effectively and was less injurious to the grapes, that treatment may be more appealing to growers, despite the slight increase in cost.

Figures and Tables

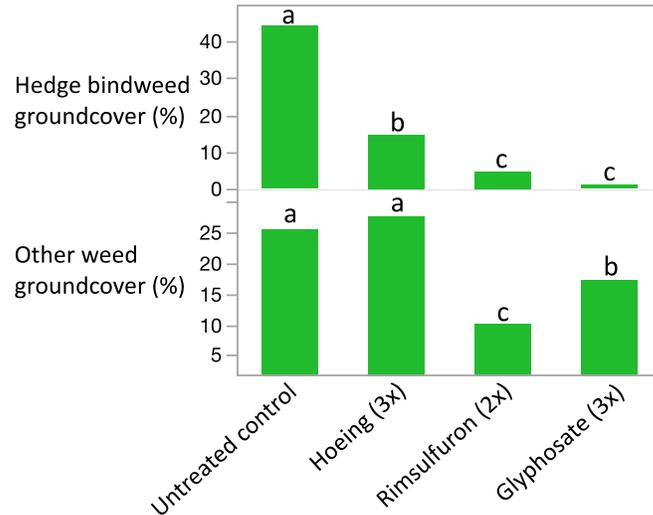


Figure 1. Carryover effects on hedge bindweed and other weeds as represented by percent groundcover on June 5, 2019, nearly one year after the treatments were implemented. The effect of treatments on weed density was similar to weed groundcover (data not shown). For each graph, bars with the same letter are not significantly different (Fisher's Protected LSD, $P \leq 0.05$).

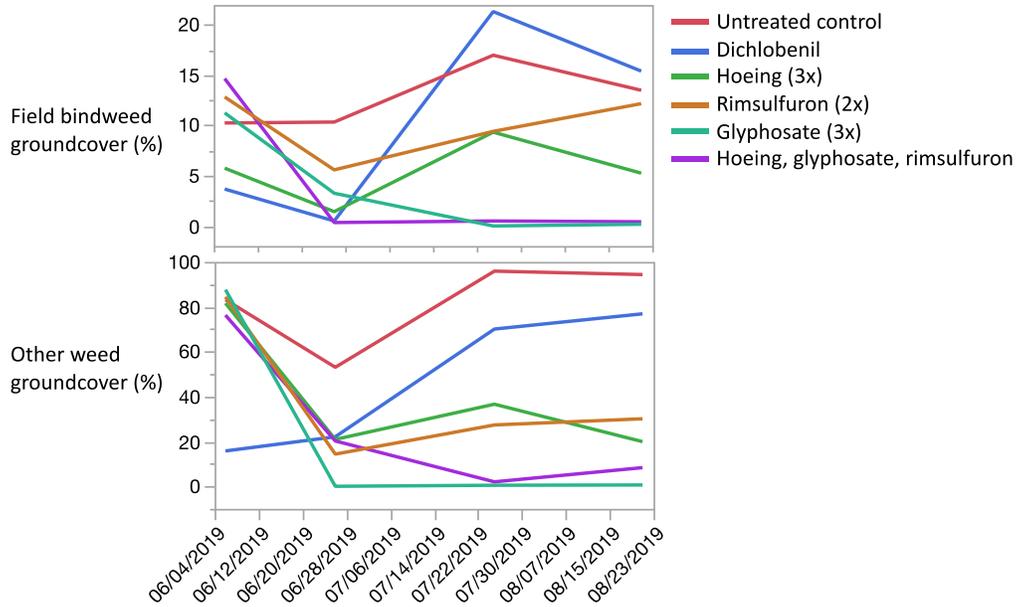


Figure 2. Effects of treatments on percent groundcover of field bindweed and other weeds over the course of the growing season. Treatments were applied on June 10, July 12, and August 8, with the exceptions that the repeated rimsulfuron treatment was not applied on August 8 due to label restrictions, and dichlobenil was applied on May 17 following hoeing. The effect of treatments on weed density was similar to weed groundcover (data not shown).

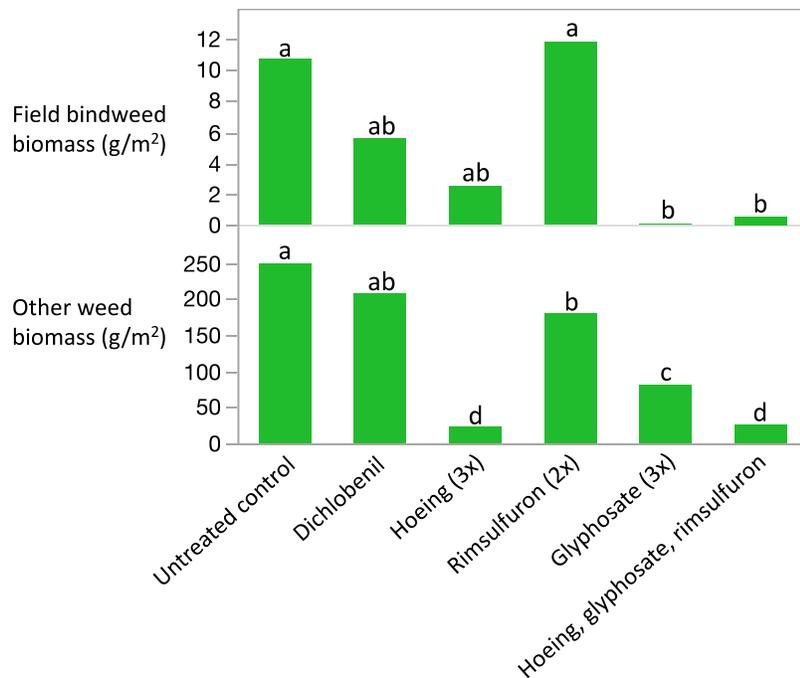


Figure 3. Effects of treatments on weed biomass at the end of the growing season. For each graph, bars with the same letter are not significantly different (Fisher's Protected LSD, $P \leq 0.05$).

Table 1. Partial budget analysis demonstrating total annual treatment costs. Labor was calculated at \$20/hr with a grape hoe operating at 1.5 mph and the sprayer at 3.0 mph. Hourly equipment rates were estimated from Yeh et al. (2014).

Treatment	Labor	Equipment	Herbicide	Total
\$USD/A				
Dichlobenil	\$9.78	\$9.44	\$66.00	\$85.21
Hoeing (3x)	\$47.67	\$49.79	\$0.00	\$97.45
Rimsulfuron (2x)	\$19.56	\$18.87	\$31.00	\$100.43
Glyphosate (3x)	\$29.33	\$28.31	\$14.42	\$72.06
Hoeing, glyphosate, rimsulfuron	\$35.44	\$35.47	\$20.31	\$91.22

Literature cited

Yeh AD, Gómez MI, White GB (2014) COST OF ESTABLISHMENT AND PRODUCTION OF V. VINIFERA GRAPES IN THE FINGER LAKES REGION OF NEW YORK-2013. Cornell University. Ithaca, NY.

APPENDIX

Impact statement: This project has demonstrated that rimsulfuron and glyphosate have carryover effects on hedge bindweed. We were successful in obtaining a 2(ee) exemption for New York growers to use rimsulfuron on hedge bindweed in grapes. We also found that even though the rimsulfuron was not effective on field bindweed, an integrated treatment controlled field bindweed as effectively as glyphosate, and with better control of other weeds, and with less visible injury to the grape leaves.

Publications

Brown B, Walter-Peterson H, Caldwell D (2019). Improving Control of Hedge Bindweed in Grapes: Preliminary Results. New York State Integrated Pest Management Program Project Report. <https://ecommons.cornell.edu/handle/1813/64538>

Brown B, Walter-Peterson H, Caldwell D (in press). Field Bindweed Control Programs for New York Grape Production. New York State Integrated Pest Management Program Project Report.

Presentations

Brown, B. An Integrated Approach to Weed Management in Grapes. Spring Grape IPM Meeting. CCE. Hammondsport, NY. 80 Attendees. (5/15/19).

Brown B, Walter-Peterson H, Caldwell D. Controlling hard-to-kill weeds in grapes. Lake Erie Regional Grape Program Winter Grower Conference. Fredonia, NY. 100 Attendees. (3/13/19).

We have started production on a video about the results of this project. This video will be completed during this third year of the project. The video will be posted to the FLGP YouTube page and promoted through multiple channels including newsletters and social media.