Experimental control of bindweed in established blueberry plantings: Year 2 (2025)

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Growers in Massachusetts struggle to control the rhizomatous perennial weed hedge bindweed *(Calystegia sepium*), especially in perennial cropping systems (Kolmanič et al., 2020). Once established, it is difficult to control through herbicides, mulches, or tillage (Besancon et al., 2022; Kolmanič et al., 2020; Sideman, 2024; Willeke et al., 2015). Last summer, research was conducted at the UMass Research Orchard in Belchertown, MA, exploring the efficacy of new weed control tactics on hedge bindweed: quinclorac applied pre- and post-emergence and nitrification inhibitors used to slow nitrification (Bley and Gannett, 2025). In these trials, the pre- and post-emergence quinclorac application in the spring resulted in significantly slower emergence of hedge bindweed and lower weed canopy cover compared to the mulch-only or nitrification inhibitor + mulch treatments. There were no further differences in weed growth, however we observed altered root morphology in quinclorac-treated bindweed. This motivated a second year of research, since quinclorac is a systemic herbicide and can be slow to provide full control of an established perennial weed.

The 2025 (year 2) research tested the efficacy of a second year of quinclorac applications and the potential of abrasive weeding to manage an established population of *C. sepium* in highbush blueberries. Here, quinclorac treatments remained the same, but nitrification inhibitor treatments were removed from the study since there were no effects from their use in year 1. Nitrification inhibitor treatments were replaced with abrasive weed management treatments (Forcella et al., 2011, 2023; Wortman, 2015). Abrasive weed management is an emerging technology primarily pioneered at the University of Minnesota. An abrasive material, often crushed walnut shells, corn gluten meal, sand, or fertilizers (Perez-Ruiz et al.), is applied using a sandblaster connected to an air compressor set on the back of an all-terrain vehicle or wagon, with or without a grit hopper (Forcella et al., 2018). The material is applied to the weed canopy with about 500 kPa of pressure. The abrasive action and destruction of meristematic tissue caused by the pressurized application causes seedling plant death (Forcella et al., 2011). This tool is still in development, but may have utility in high value perennial cropping systems where the lignified stem of the crop provides selectivity relative to the vegetative stems of herbaceous weeds (Forcella et al., 2020, 2023).

Methods

Plot layout remained the same as in 2024 (Bley and Gannett, 2025) except nitrification inhibitor treatments were replaced with abrasive weeding treatments. There were 7 different treatments, each replicated 5 times, for a total of 35 plots, organized as a randomized complete block design. Plots were mulched in 2024 and did not receive additional mulch in 2025. Treatments (Table 1) included high (12.6 oz/A) and low (6.3 oz/A) rates of quinclorac (Quinstar 4L, Albaugh), each applied pre-emergent and post-emergent with crop oil concentrate included at 2 pints per acre. These treatments also included one pre-emergent application of flumioxazin (Chateau EZ, Valent) at 12 oz/A and two post-emergent applications of glufosinate (Rely 280, BASF) at 56 oz/A. There were two additional quinclorac high and low treatments where the second glufosinate treatment was replaced with two additional abrasion treatments. Three controls were included: a mulch-only control, a mulch + abrasion treatment, and a grower standard control consisting of only the pre-emergent flumioxazin application and the two post-emergent glufosinate applications. All plots received two applications of fluazifop (Fusilade, Syngenta) at 12 oz/A for the first

Table 1. Treatment descriptions of 7 treatments included in a highbush blueberry planting in Belchertown, MA exploring quinclorac and abrasion treatments to control hedge bindweed.

Treatment:	Mulch only	Current practice	Abrasion	Quinclorac (low rate)	Quinclorac (high rate)	Abrasion & quinclorac (low rate)	Abrasion & quinclorac (high rate)
March 28th	flumioxazin	flumioxazin	flumioxazin	flumioxazin & quinclorac	flumioxazin & quinclorac	flumioxazin & quinclorac	flumioxazin & quinclorac
May 1st	← all plots treated with fluazifop →						
May 15th				quinclorac	quinclorac	quinclorac	quinclorac
May 19th	← all plots treated with fluazifop →						
May 29th	← all plots treated with glufosinate →						
June 26th		glufosinate	abrasion	glufosinate	glufosinate	abrasion	abrasion
June 30th	← all plots fertilized with ammonium sulfate →						
July 2nd			abrasion			abrasion	abrasion

application and 8 oz/A for the second application to help control grasses that were becoming pervasive. All plots also received the first application of glufosinate to help knock down aboveground broadleaf weed growth, and one fertilizer application of ammonium sulfate at 12 oz/bush.

Weed emergence was monitored weekly using photos of weed cover within a square foot, randomly placed within the plot once each week. Cover was estimated by uploading photos to Canapeo (Patrignani & Ochsner, 2015), which measures green and non-green pixels. A biomass clip was done on August 11th. All weeds within a square placed randomly in each plot were clipped at the base, identified, counted, and then placed in an oven at 65°C until dry.

Data were analyzed in R 4.3.2 (R core team, 2024). General linear mixed models were used to test the effect of the treatments on weed response variables. Treatments were the fixed effects, and block was the random effect. If necessary, models were square root transformed to satisfy assumptions of normality, but untransformed means are reported. An ANOVA was used to test for significance of fixed effects, and any significant effects were further explored with Tukey's HSD test post-hoc analyses to determine means separation.

Results

Weed canopy cover was significantly different based on the interaction of time and treatment (p-value < 0.001) (Fig. 1). The mulch only and mulch + abrasion treatments had higher weed canopy cover than all the treatments that included quinclorac at either the high or low rate. The treatments with quinclorac and glufosinate had lower weed canopy cover than any treatment without quinclorac. However, bindweed biomass and total weed biomass were not affected by treatments (Table 2).

Discussion

High and low rates of split pre- and post-emergent quinclorac applications combined with glufosinate provided some weed control, resulting in reduced canopy cover early in the season. Despite lower weed canopy cover

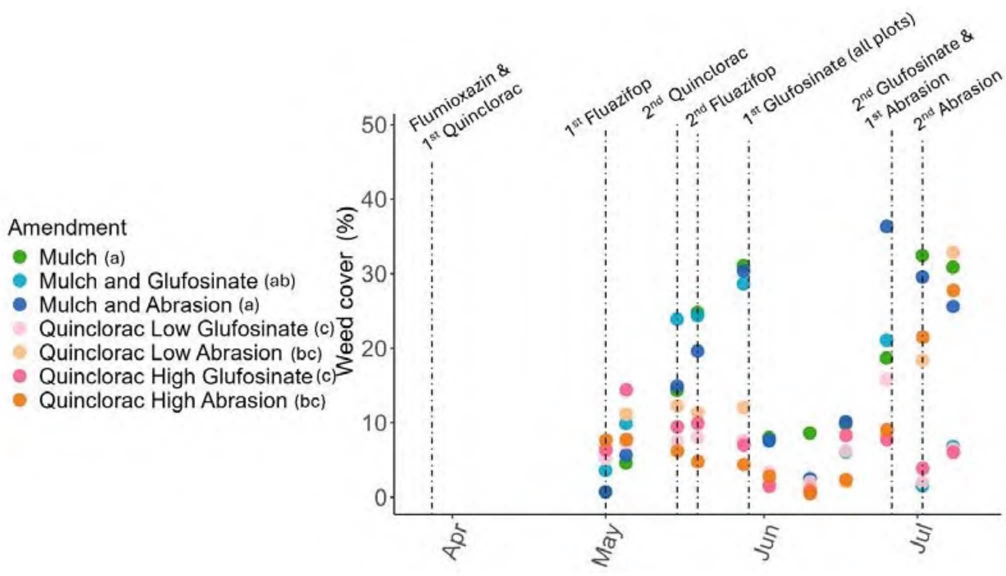

Figure 1. Weed canopy cover over time across 7 different herbicide and abrasion treatments.

Table 2. Mean bindweed aboveground biomass and total aboveground weed biomass per treatment. For each response variable, the p-values and f-statistics of an ANOVA run on a general linear mixed model are also given. Treatment was the fixed effect and block was the random effect. Treatments had no significant effect on either weed response variable.

Response variable	Bindweed biomass (g)	Total weed biomass (g)
P-value (F-statistic)	0.87 (0.40)	0.57 (0.75)
Mulch	2.9	10.8
Mulch and glufosinate	2.4	9.8
Mulch and Abrasion	2.8	14.0
Quinclorac low and glufosinate	2.2	13.2
Quinclorac high and glufosinate	2.2	6.6
Quinclorac low and abrasion	1.1	19.8
Quinclorac high and abrasion	5.9	6.5

through the beginning of July, these treatments did not continue to provide adequate weed control through harvest. There were no significant differences in bindweed aboveground biomass or total weed biomass in mid-August. The effect of quinclorac on weed growth lasted later in the season than in 2024, when there were no significant differences between quinclorac-treated plots and plots only treated with glufosinate after May 10th. It is encouraging that there may be a cumulative effect of multiple years of quinclorac treatments, however it is discouraging that these effects are still only measurable until early July. In highbush blueberries, only two applications of quinclorac and glufosinate are allowed per year, and so additional weed control tactics will be necessary to provide season-long weed control when bindweed has become well-established.

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References

Besancon, T., Oudemans, P., et al. (2024). Commercial Blueberry Pest Control Recommendations for New Jersey, 2024 (Rutgers NJAES).

Bley, M., and Gannett, M. (2025). Experimental Control of Bindweed in Established Blueberry Plantings. Fruit Notes, 90, 11–15.

Forcella, F., Humburg, D., W. et al. (2018). Air-propelled abrasive grit can damage the perennial weed quackgrass. Canadian Journal of Plant Science, 98(4), 963–966. https://doi.org/10.1139/cjps-2017-0291

Forcella, F., James, T., & Rahman, A. (2011). Post-emergence weed control through abrasion with an approved organic fertilizer. Renewable Agriculture and Food Systems, 26(1), 31–37. https://doi.org/10.1017/S1742170510000438

Forcella, F., Poppe, S., et al. (2023). Abrasive grit-weeding in apple. Technology in Agronomy, 3(1). https://doi.org/10.48130/TIA-2023-0001

Forcella, F., Poppe, S., Tepe, E., & Hoover, E. (2020). Broadleaf weed control with abrasive grit during raspberry establishment. Weed Technology, 34(6), 830–833. https://doi.org/10.1017/wet.2020.68

Kolmanič, A., Leskovšek, R., & Lešnik, M. (2020). Long-Term Control of Hedge Bindweed (*Calystegia sepium* L.) with Single, Tank Mixture, and Sequential Applications of Glyphosate, 2,4-D, and Dicamba. Agronomy, 10(8), Article 8. https://doi.org/10.3390/agronomy10081184

Patrignani, A., & Ochsner, T. E. (2015). Canopeo: A powerful new tool for measuring fractional green canopy cover. Agronomy Journal, 107(6), 2312–2320.

Perez-Ruiz, M., Brenes, R., et al. (2018). Agricultural residues are efficient abrasive tools for weed control. Agronomy for Sustainable Development, 38(2), 18. https://doi.org/10.1007/s13593-018-0494-6

R Core Team (2024). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org.

Sideman, B. (2024). Highbush blueberry weeds. In New England Small Fruit Management Guide. https://ag.umass.edu/fruit/ne-small-fruit-management-guide/highbush-blueberries.

Willeke, L., Krähmer, H., et al. (2015). Sprouting Ability and Seasonal Changes of Sugar Concentrations in Rhizomes of *Calystegia sepium* and Roots of *Convolvulus arvensis*. Journal of Plant Diseases and Protection, 122(3), 133–140. https://doi.org/10.1007/BF03356542

Wortman, S. E. (2015). Air-propelled abrasive grits reduce weed abundance and increase yields in organic vegetable production. Crop Protection, 77, 157–162. https://doi.org/10.1016/j.cropro.2015.08.001