Response of Garlic Mustard (*Alliaria petiolata* Bieb. [Cavara and Grande]) to Summer Herbicide Treatment

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Aerial application of herbicides is a common practice for control of many invasive species. Treatment is usually conducted during the dormant season to minimize damage to desirable native species. However, growing season application of herbicide (glyphosate) has been used to effectively control purple loosestrife (*Lythrum salicaria*) with little impact to native species, when applied to dense stands where native species are absent or are well below the loosestrife canopy (Heidorn and Anderson 1991).

Like many invasive herbs, garlic mustard (*Alliaria petiolata*) frequently occurs in a dense stand of first-year (rosette) plants with few native species in the immediate vicinity. In these stands, use of herbicides during the growing season may provide effective control and result in little threat to the native flora.

In 1991 an experiment was conducted to monitor the short-term effectiveness of three herbicides commercially used to control mustards (Cruciferae) in midwestern agricultural fields. Basagran (bentazon) and Blazer (acifluorfen) are postemergent contact herbicides that target dicots. Basagran is listed as selective for some species of sedge (Cyperaceae) but not grass (Graminae), while Blazer affects some species of grass. Both herbicides were applied at rates of 0.5, 0.75, and 1.0 lb active ingredient/acre. SEE2,4-D (a low-volatile ester formulation) was also tested, at rates of 0.125, 0.25, 0.5, and 1.0 lb active ingredient/acre. The ester formulation of 2,4-D was selected to minimize vapor drift during warm weather.

The study site was a narrow floodplain forest along Keith Creek, in Aldeen Park, Rockford, Illinois. Twenty-five 1-m x 2-m plots, separated by a 1-m buffer, were established in a dense stand of garlic mustard rosettes. Few native herbaceous species were present. Plots were randomly assigned to control (five plots) or treatment (two plots for each level of herbicide).

Data were collected in four permanent 0.25-m^2 (0.5-m x 0.5-m) quadrats per plot on June 25, 1991, and again after treatment on July 30, 1991. Percent cover of *A. petiolata* was visually estimated in 5% cover classes.

Herbicides were mixed with distilled water and 0.3 oz of water-soluble blue dye/33 oz; 0.3 oz/33 oz of crop oil concentrate was added to both Basagran and Blazer. Treatments were made on July 8, 1991, with a two-nozzle (flat spray tip) boom attached to a CO_2-powered sprayer unit, calibrated to deliver 10 gal water/acre at 19 psi, 67 paces/min. Air temperature was approximately 75°F.

One-way ANOVA was used to text among treatments for significant changes in garlic mustard cover following herbicide application. A single cover value was obtained for each quadrat by dividing post-treatment cover by pretreatment cover. This method removed the problem of auto-correlation due to collecting data in permanent quadrats, and also relativized among plots so that pretreatment cover differences were not a factor. Analysis was conducted with Systat (v. 5.02, Wilkinson 1990).

Pretreatment *A. petiolata* cover was similar among all treatment groups, ranging from 66.9 to 83.1% ($F=0.414$, df 10,89, $p = 0.94$). Cover declined in all plots by 8–95% three weeks after treatment (Table 1).

Table 1. Percent cover of garlic mustard pre- and post-treatment, and percent reduction in cover following herbicide treatment. Similar letters indicate statistically similar means.

Herbicide[a]	Rate	Pre-Treatment	Post-Treatment	% Reduction in Cover
Basagran	.50	66.88	5.88	.94 a
	.75	71.25	4.00	.95 a
	1.00	83.13	3.63	.96 a
Blazer	.50	75.00	50.62	.34 b
	.75	71.88	48.75	.30 b
	1.00	66.88	39.38	.46 b
SEE 2,4-D	.125	67.55	48.13	.28bc
	.25	74.38	67.50	.08 c
	.50	74.38	24.38	.66 c
	1.00	79.38	46.88	.40 b
Control		74.25	60.50	.15 c

[a] Herbicide application rates given in pounds of active ingredient per acre.

The greatest reduction in cover was achieved using Basagran, which significantly reduced *A. petiolata* cover by 94–96%. No differences were detected between the three application rates. Blazer less effectively, although still significantly, reduced *A. petiolata* cover by 30–46%. The highest reduction in cover occurred with the highest application rate, although the differences between concentrations were not significant. SEE 2,4-D had an erratic effect, reducing *A. petiolata* cover by 8–66%. Application rates of 0.5 and 1.0 lb/acre produced significant declines comparable to or exceeding that obtained with Blazer, while 0.125 and 0.25 lb/acre resulted in nonsignificant declines, comparable to the declines recorded in the control plots. Untreated plots experienced a nonsignificant decline in *A. petiolata* cover of 15% over the same three-week period, likely reflecting the impact of mid-summer high temperatures and low rainfall.

Application of Basagran at 0.5 lb/acre provided effective mid-summer control of first-year *A. petiolata* rosettes growing in dense stands. The reduction in cover was similar to that achieved with a dormant season application of a 3% glyphosate solution, which reduced *A. petiolata* cover by 91–100% the following spring (Nuzzo 1991). Blazer and SEE 2,4-D had limited or no effectiveness. Impact on native herbs was not monitored in this study, and use of Basagran in sites containing native herbs may result in damage to the vegetative community.

Literature Cited

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