

Bromacil, Diuron, and Flumioxazin Combinations for Total Vegetation Control

Introduction

Industrial vegetation managers constantly battle herbaceous vegetation in areas designated to be 'vegetation free' such as substations and underneath guardrails. Individual site characteristics can change over the course of time in terms of vegetation types, the potential for herbicide resistant biotypes, and off target damage due to lateral or subsurface herbicide movement. Managers need to have a wide array of herbicides at their disposal to confidently treat these areas to deal with changes in site characteristics and to prevent the introduction of herbicide resistant weeds due to the repeated application of the same chemistries.

Past research at the University of Kentucky for total vegetation control evaluated flumioxazin, diuron, sulfometuron, and bromacil in individual trials. Each of these products have specific characteristics that make them desirable options in certain situations. For example, flumioxazin is labeled for kochia control, sulfometuron provides pre and post emergent control of grass species such as johnsongrass, and bromacil provides a control option for glyphosate or ALS resistant marestail. A study was conducted in 2006 to compare these products for overall total vegetation control.

Methods and Materials

The trial was located at a retired storage facility at the intersection of I-75 and Ironworks Pike in Fayette County, KY. Fifteen herbicide treatments were installed in randomized complete block design with three replications (Table 1). Treatments were applied at 25 GPA using a CO₂ handheld sprayer and all treatments included Activator 90 surfactant at 0.25 % v/v and RoundUp Pro at 2 qt / ac for burndown of existing weed pressure. The untreated check (treatment 15) was treated with RoundUp Pro as well for comparison purposes. Vegetation included annual lespedeza, tall fescue, wild carrot, and chicory.

Data collected included: 1) percent bareground at application, 2) percent bareground and percent area by weedy species 60 days after treatment (DAT), 90 DAT, and 120 DAT. Analysis of variance (ANOVA) was performed on percent bareground at application with mean separation using Fisher's LSD to test for differences at application. A significant difference in percent bareground was present across treatments at initiation, and therefore, the remaining data points (i.e. 60, 90, 120 DAT) were analyzed using analysis of covariance (ANCOVA) with preapplication data as the covariate. This allowed for a more accurate treatment mean comparison.

Results

60 DAT

Treatments that included Oust at 3 oz or Krovar I alone at 10 or at 6 lbs / ac combined with Payload at 8 oz/ac were the only treatments to exceed 90% bareground at 60 DAT (Table 1). The Payload alone treatments resulted in bareground percentages ranging from 65 to 77 %. The addition of Oust at 3 oz and Telar at 1.5 oz to the Payload at 8 oz treatments resulted in > 95 % bareground. Authority at 8 oz per acre resulted in 70 % bareground.

90 DAT

Treatments of Payload alone dropped in control levels to < 50 %. The Payload-Oust-Telar tank mix still provided excellent levels of bareground. Krovar alone or combined with Payload or Oust-Telar continued to provide excellent control > 90 %. Karmex alone treatments provided satisfactory control levels ranging between 80 and 90 %.

120 DAT

Krovar alone at 10 lb/ac, all Karmex tank mixes, Krovar I tank mixes, and the Payload-Oust-Telar tank mix resulted in bareground levels > 90% at 120 DAT.

Overall Bareground

Payload alone, Authority, and the RoundUp Pro check treatments were all statistically significantly lower than all other treatments at 120 DAT. There were no significant differences between the remaining treatments at 120 DAT (Table 1). Krovar I alone at 10 lb / ac and Karmex combined with Oust and either Escort or Telar resulted in > 95% bareground from 90 DAT through the rest of the trial. Krovar at 10 lb / ac resulted in similar results at every evaluation period as Krovar @ 6 lb / ac + Oust and Telar at 3 and 1.5 oz /a c, respectively. The Payload-Oust-Telar combination maintained bareground levels > 90% at the end of the trial while Payload alone at 8 oz resulted in ~ 4 % bareground at the end of the trial.

Vegetation 120 DAT

Average percent cover by species was evaluated to determine if any patterns of noncontrol were present (Table 2). This data was not analyzed statistically due to spatial variation in the study area; data in Table 2 was simply averaged by treatment and included here for observational purposes only.

A trend seems apparent with the Payload alone treatments as annual lespedeza, yellow foxtail, and purpletop are present in these treatments 120 DAT. The Authority alone and the RoundUp Pro treatment also show this trend. Purpletop is a warm season perennial grass that does not compete well with other weeds. This may explain its presence in plots with high bareground percentages late into the summer as this site characteristic is ideal for late season germination.

Table 1: Percent Bareground

| Treatment | Active Ingredient | Rate per acre | Initial* | 60 DAT | 90 DAT | 120 DAT |
|-------------|-------------------|---------------|----------|-----------|----------|---------|
| Payload | Flumioxazin | 8 oz | 45.33 | 77.46 ab | 9.77 c | 3.62 c |
| Payload | Flumioxazin | 10 oz | 29.50 | 73.89 ab | 45.25 bc | 42.93 b |
| Payload | Flumioxazin | 12 oz | 28.33 | 65.01 bc | 20.11 c | 9.73 bc |
| Krovar I | Bromacil + diuron | 10 lb | 18.33 | 93.75 a | 99.09 a | 97.02 a |
| Krovar I | Bromacil + diuron | 6 lb | 22.00 | 91.84 ab | 93.77 a | 89.89 a |
| Payload | Flumioxazin | 8 oz | | | | |
| Payload | Flumioxazin | 8 oz | 15.83 | 87.18 ab | 85.88 a | 85.34 a |
| Hyvar XL | Bromacil | 6.4 qt | | | | |
| Karmex80 | Diuron | 12 lb | 24.50 | 89.75 ab | 83.15 ab | 89.24 a |
| Karmex80 | Diuron | 10 lb | 35.00 | 87.79 ab | 83.52 ab | 86.49 a |
| Payload | Flumioxazin | 8 oz | | | | |
| Payload | Flumioxazin | 8 oz | | | | |
| Oust XP | Sulfometuron | 3 oz | 40 | 98.1 a | 87.78 a | 88.52 a |
| Escort XP | Metsulfuron | 1 oz | | | | |
| Karmex80 | Diuron | 10 lb | | | | |
| Oust XP | Sulfometuron | 3 oz | 24.50 | 97.25 a | 98.82 a | 97.9 a |
| Escort XP | Metsulfuron | 1 oz | | | | |
| Payload | Flumioxazin | 8 oz | | | | |
| Oust XP | Sulfometuron | 3 oz | 26.67 | 91.43 ab | 92.8 a | 92 a |
| Telar | Chlorsulfuron | 1.5 oz | | | | |
| Karmex80 | Diuron | 10 lb | | | | |
| Oust XP | Sulfometuron | 3 oz | 14.83 | 95.68 a | 96.86 a | 97.93 a |
| Telar | Chlorsulfuron | 1.5 oz | | | | |
| Krovar I | Bromacil + diuron | 6 lb | | | | |
| Oust XP | Sulfometuron | 3 oz | 18.33 | 96.25 a | 94.93 a | 97.02 a |
| Telar | Chlorsulfuron | 1.5 oz | | | | |
| Authority | Sulfentrazone | 8 oz | 31.67 | 70.25 abc | 20.23 c | 3.53 c |
| RoundUp Pro | Glyphosate | 2 qt | 14.83 | 43.68 c | 8.21 c | 5.17 c |

Note: Means followed by the same letter are not statistically different using Tukey-Kramer's Test at $p = 0.05$.

* Initial bareground means are preapplication means presented for comparison purposes only and are not statistically analyzed

Table 2: Average Percent Cover of Live Vegetation 120 DAT

| Treatment | Active Ingredient | Rate per acre | Annual Lespedeza | Chicory | Yellow Foxtail | Purpletop |
|-------------|-------------------|---------------|------------------|---------|----------------|-----------|
| Payload | Flumioxazin | 8 oz | 73 | 0 | 15 | 3 |
| Payload | Flumioxazin | 10 oz | 7 | 0 | 17 | 27 |
| Payload | Flumioxazin | 12 oz | 55 | 0 | 12 | 11 |
| Krovar I | Bromacil + diuron | 10 lb | 0 | 1 | 1 | 0 |
| Krovar I | Bromacil + diuron | 6 lb | 0 | 4 | 4 | 2 |
| Payload | Flumioxazin | 8 oz | | | | |
| Hyvar XL | Bromacil | 6.4 qt | 0 | 11 | 0 | 1 |
| Karmex80 | Diuron | 12 lb | 4 | 1 | 0 | 3 |
| Karmex80 | Diuron | 10 lb | 0 | 8 | 0 | 0 |
| Payload | Flumioxazin | 8 oz | | | | |
| Oust XP | Sulfometuron | 3 oz | 0 | 0 | 0 | 8 |
| Escort XP | Metsulfuron | 1 oz | | | | |
| Karmex80 | Diuron | 10 lb | | | | |
| Oust XP | Sulfometuron | 3 oz | 3 | 1 | 0 | 2 |
| Escort XP | Metsulfuron | 1 oz | | | | |
| Payload | Flumioxazin | 8 oz | | | | |
| Oust XP | Sulfometuron | 3 oz | 0 | 0 | 0 | 7 |
| Telar | Chlorsulfuron | 1.5 oz | | | | |
| Karmex80 | Diuron | 10 lb | | | | |
| Oust XP | Sulfometuron | 3 oz | 0 | 3 | 0 | 2 |
| Telar | Chlorsulfuron | 1.5 oz | | | | |
| Krovar I | Bromacil + diuron | 6 lb | | | | |
| Oust XP | Sulfometuron | 3 oz | 0 | 1 | 1 | 3 |
| Telar | Chlorsulfuron | 1.5 oz | | | | |
| Authority | Sulfentrazone | 8 oz | 56 | 4 | 11 | 17 |
| RoundUp Pro | Glyphosate | 2 qt | 30 | 0 | 53 | 3 |

Note: Means presented in Table 2 are for comparison purposes only and are not statistically analyzed.

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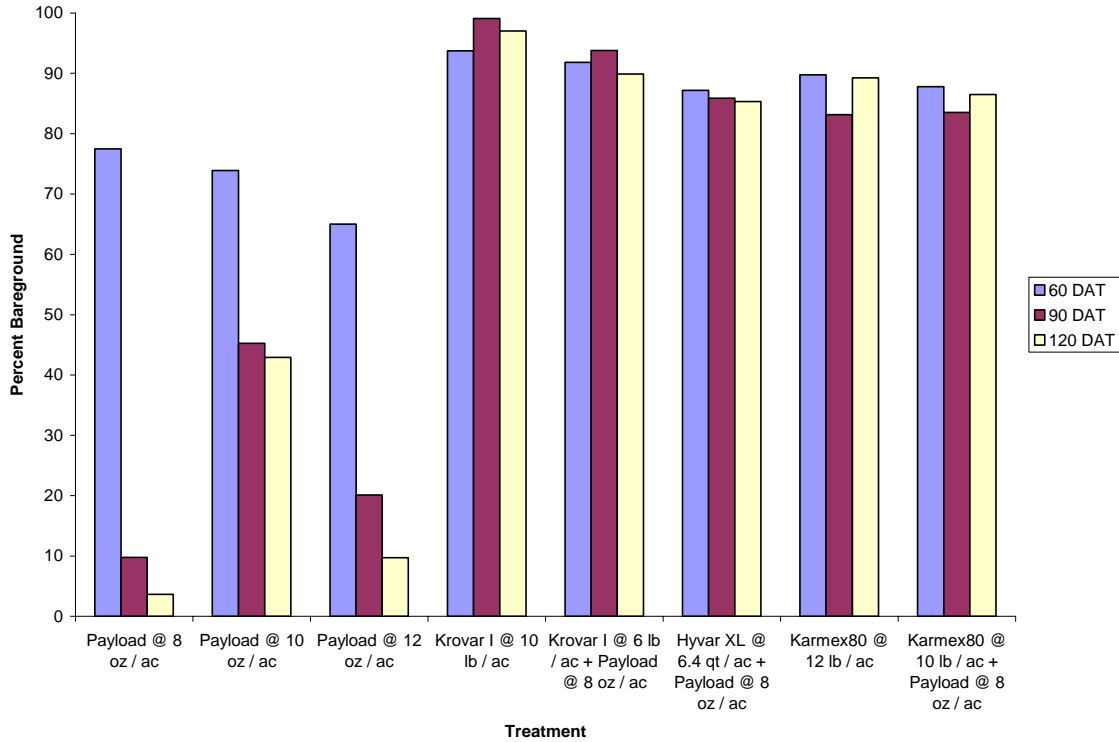


Figure 1: Least Square Means of Payload, Krovar I, Hyvar XL, and Karmex80 Tank Mixes

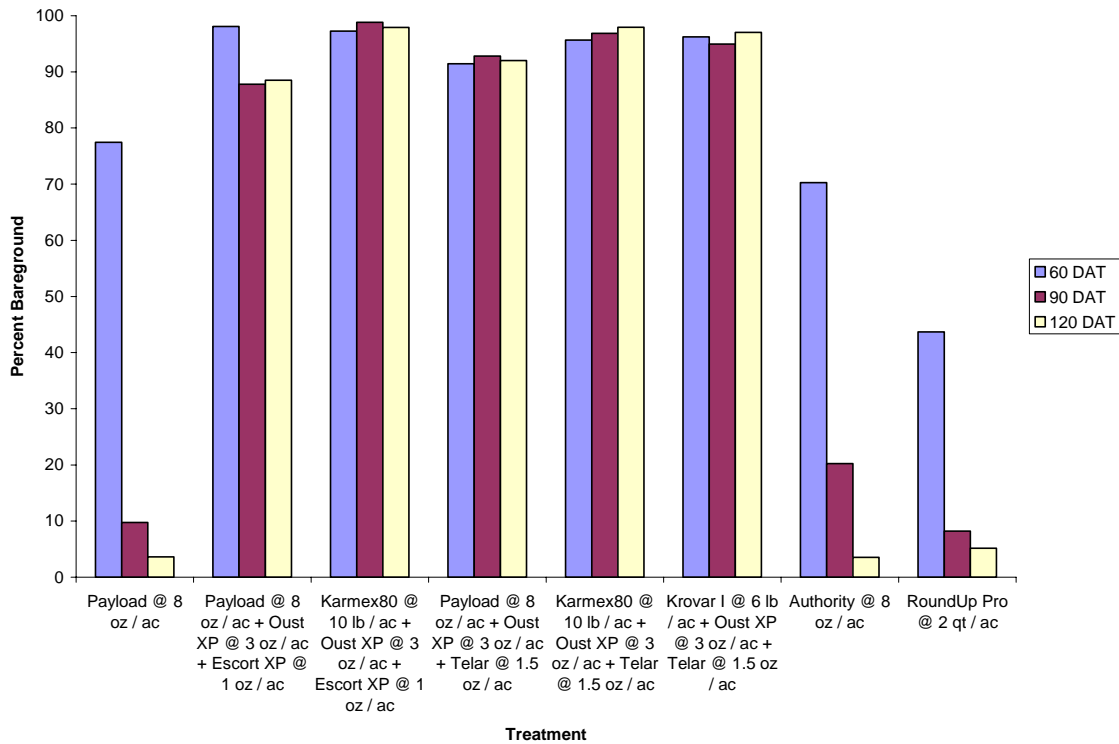


Figure 2: Least Square Means of Payload, Oust, Escort, Telar, Krovar I, and Karmex80 Tank Mixes