WesternBeef DEVELOPMENT CENTRE

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ANALYSIS COMPARISON OF DIFFERENT HERBICIDE OPTIONS TO CONTROL ABSINTH IN PERENNIAL PASTURE

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Introduction

Absinth (*Artemisia absinthium* L.) is a long-lived perennial herbaceous plant with a woody base. Individual plants grow 40 to 100 cm tall and leaves are silvery-pubescent. The Saskatchewan weed control act lists absinth as a noxious weed (Saskatchewan Ministry of Agriculture, 2010) which must be prevented from expansion if the infestation is greater than five hectare (12.5 acre) or eradicated if the infestation is less than five hectares in size. Once established, absinth is very difficult to eradicate, as cattle will not graze the plant by choice and heavy infestations will reduce forage production and quality. If dairy cattle consume absinth on pasture or in hay, the milk flavour will be tainted. Cultivation is not a practical method of control in perennial pasture. Mowing prior to seed production does provide some control, but does not eradicate the established plants. Despite ongoing research, no biological controls have been released for use on absinth. The objective of this study was to determine effectivness of six herbicides to control absinth immediately after spraying and up to a year following treatment.

Trial Management and Measurement

Four separate Saskatchewan sites (Melfort, Lanigan, Meacham, and Kerrobert) were chosen in tame pastures or hay fields containing a proportion of a legume such as alfalfa, sainfoin, or cicer milkvetch. Herbicide treatments included: (1) an unsprayed control, (2) 2,4-D LV Ester (700 g/L), as a chemical of lower cost, but less long-term effectiveness; (3) Banvel II as an option, which may provide only limited long-term effectiveness; (4) Restore II, (5) Reclaim, and (6) Grazon as higher-priced products with differing residual effects; and (7) Rejuvra XL as a new product comparison (**Table 1**). The plot sizes for each herbicide treatment at each site varied from 0.006 to 0.5 ha (0.015 to 1.3 acre) depending on site availability and weed distribution. A single herbicide application during the period of active plant growth (late June to early July 2012) was used to allow for comparison of residual effects and longer term effectiveness of each product. Time limitations commonly associated with other farming operations along with appropriate weather conditions can delay spraying.

Canopy cover was measured in a rectangular frame (0.5 × 0.5 m, 0.25 m^2) with ten quadrats randomly placed within each treatment plot by visual estimation (Daubenmire, 1959) before herbicide treatment (pre-treatment); and at one-, three-, and 12-month intervals following spraying.

The estimated amount of canopy cover was put into the following five categories: grasses, legumes, other weeds (i.e. dandelion, perennial sow thistle, field chickweed, Canada goldenrod, shepherd's purse, pennycress, flixweed), absinth, and bare ground.

Observations were compared against pre-treatment measurements and the untreated (unsprayed) control.

Table 1. Formulation, rates, and cost of herbicides used in the trial

Product	Formulation	Rate/acre	Cost/acre[1]	Recommended water volume (L/acre)
2,4-D LV ester	2,4-D ester: 700 g/L	0.65 L	$9.04	40
Banvel II	dicamba	1.86 L	$65.00	36-90
Restore II	aminopyralid + 2,4-D ester	1 L	$33.60	80
Reclaim	aminopyralid, metsulfuron-methyl + 2,4-D ester	Reclaim A 80 g Reclaim B 0.7 L	$42.50[2]	80
Grazon	picloram + 2,4-D ester	2.8 L	$48.16	80
Rejuvra XL	metsulfuron-methyl + aminocyclopyrachlor	36.44 g	N/A[3]	80

[1]Cost per acre based on suggested retail prices as of June 2013.

[2]Cost based on combined product.

[3]Product not released at time of study; product will be released in 2015.

Results, Discussions, and Recommendations

The four trial sites were different in their initial botanical composition and degree of absinth infestations (**Table 2**).

Table 2. Canopy cover percentage of perennial pasture in four locations before trial

Item	Location			
	Kerrobert	**Lanigan**	**Meacham**	**Pathlow**
Grasses	18.5	67.0	38.0	41.5
Legumes	71.0	5.0	40.0	11.4
Other weeds[1]	0.0	20.0	9.5	18.6
Absinth	10.5	8.0	12.5	4.0
Bare ground	0.0	0.0	0.0	24.5

[1]Other weeds included dandelion, perennial sow thistle, field chickweed, Canada goldenrod, shepherd's purse, pennycress and flixweed.

Meadow bromegrass was the dominant grass at Kerrobert, Meacham, and Lanigan, while the old tame forage stand at Pathlow was smooth bromegrass-dominated. The legume proportion also differed across sites, with the Kerrobert site having a larger proportion of alfalfa (71%) and the Meacham site having a large proportion of cicer milkvetch and alfalfa (40%). The initial stand composition is an important factor in determining the economic feasibility and outcome of broadcast herbicide application. The effect of herbicide treatment on canopy cover percentage of perennial pasture (average of four sites) is presented in **Table 3**.

2,4-D: Application of 2,4-D provided some top-growth control, but was not able to provide long term control of absinth in stands. Although 2,4-D was the lowest priced herbicide used in the trial (**Table 1**), multiple applications may be necessary, which can be more expensive compared to other products. The broadcast application of herbicide, in an attempt to eradicate absinth, also resulted in the eradication of forage legumes. Where initial stand composition was greater than 18% legumes, legume loss can have significant impacts on pasture biomass and quality. Legumes fix valuable nitrogen (N) and provide cross-fertilization to forage grasses in pasture. The larger the proportion of legumes eradicated through herbicide application, the larger the loss of N input to the stand and subsequent forage production. Herbicide treatment areas also created noticeable bare ground patches (1.5 X greater). A producer may need to consider sod seeding forage grasses where the herbicide application reduced forage grass cover to less than 50 percent. This could occur where absinth and other broadleaf weeds are abundant, where legumes make up a large portion of the stand, and/or where the existing forage grass sward is limited or consisting of bunch grasses with limited ability to spread into bare ground openings.

Banvel II: Banvel II is listed as a product which will provide top-growth control of absinth. The degree of control was variable across all sites averaging 55% reduction in absinth cover after 12 months. Absinth plants were observed in plots at the three- and 12-month assessments after herbicide application. Control of absinth using Banvel II was more effective compared to 2,4-D, however multiple applications are still likely required (**Table 3**). The cost of Banvel II along with multiple applications doesn't make good economic sense for controlling absinth.

Table 3. Average pre-treatment and after herbicide treatment (1 month, 3 months, 12 months) canopy cover percentage of perennial pasture

Item	Control[1]	2, 4-D	Banvel II	Restore II	Reclaim	Grazon	Rejuvra XL
Grasses							
Pre-treatment	48.8	55.3	38.8	47.5	32.4	34.6	50.7
1 month	35.6	64.4	63.1	69.6	74.0	79.0	62.9
3 month	37.1	77.3	80.9	90.9	85.1	93.4	87.0
12 month	36.6	65.3	70.1	83.6	84.8	81.8	85.5
Legumes							
Pre-treatment	18.8	18.8	18.8	16.9	18.6	17.9	18.4
1 month	49.8	17.7	10.2	7.5	12.7	7.5	12.2
3 month	46.8	3.7	3.2	0.7	0.7	0.0	1.0
12 month	33.7	7.6	3.3	0.1	0.0	0.1	0.3
Other weeds[2]							
Pre-treatment	16.0	8.1	19.9	15.1	23.8	25.3	14.4
1 month	5.5	1.2	2.0	0.8	0.3	1.8	0.7
3 month	2.7	2.3	1.5	1.0	1.2	1.2	1.0
12 month	6.1	2.6	5.1	2.3	0.8	6.3	0.0
Absinth							
Pre-treatment	8.2	8.3	10.7	7.8	13.3	11.2	4.3
1 month	10.5	9.3	16.0	7.8	6.7	5.3	12.3
3 month	13.1	11.3	10.5	0.0	0.3	0.0	3.0
12 month	15.1	10.6	4.8	0.1	0.1	0.6	1.1
Bareground							
Pre-treatment	8.2	9.4	11.8	12.6	11.9	11.1	12.2
1 month	8.9	11.9	14.3	17.4	11.0	12.4	15.4
3 month	8.7	8.0	6.8	7.4	13.9	4.8	11.0
12 month	7.6	14.6	15.9	13.3	14.1	15.1	13.0

[1]Herbicide was not applied.

[2]Other weeds included dandelion, perennial sow thistle, field chickweed, Canada goldenrod, shepherd's purse, pennycress blueburr, and flixweed.

Restore II and **Reclaim:** These two products are similar in their chemistry (both contain aminopyralid) and both achieved excellent control (99%) of absinth at all sites. In particular, Reclaim appeared more consistently effective in controlling absinth over the period of the trial.

Grazon: Grazon was effective in absinth control (reduced from 11.2 to 0.6%) at most sites. However, Grazon contains picloram, which is notoriously mobile in the soil and cannot be used on

coarse textured soils or sites where herbicide movement may reach underlying water sources or aquifers. Grazon is marketed with a four- to five-year residual effectiveness, while Restore II and Reclaim are listed as providing three to four years of residual control. Therefore, it was unexpected to see absinth plants re-appear at some of the sites. Presence of absinth plants on plots treated with Restore II, Reclaim, and Grazon were at the Lanigan site. This may partially be explained by the high temperature (30°C) at the time of application. Product label indicates that application should not occur when temperatures exceed 28°C. The rangeland products Restore II, Reclaim, and Grazon may be more costly, but if they are able to provide multiple years of control, these herbicides may be more economical compared to lower cost options requiring multiple applications. In situations where bare ground openings are created with no contingency plan on how to fill them with desirable species, other noxious weeds may be allowed to establish instead.

Rejuvra XL: Rejuvra XL results were inconsistent compared to Restore II, Reclaim, and Grazon in controlling absinth. Effective control up to 12 months following application was observed at all sites except Meacham. At Meacham, effective control closely resembled that of Banvell II, possibly due to sprayer set-up or water volume. Stand composition and equipment can also be factors in herbicide effectiveness. At Pathlow, Lanigan and Meacham, it was difficult to achieve consistent spray cover as sward height was at times greater than the sprayer boom height. Absinth plants at Meacham and Pathlow were also mature and had not been managed in previous years, allowing for an accumulation of senesced material and stout plants. In the newer forage stand at Kerrobert, absinth plants were more immature and had lower biomass, with the stand harvested for hay or silage helping to remove existing old plant growth. Rejuvra XL was very effective in controlling (75%) any broadleaf plants (other weeds were completely eradicated). This product is currently not registered for use in Canada.

Implications

Based on absinth reduction potential, the study herbicides can be ranked as follows: 2,4-D < Banvel II < Rejuvra XL < Grazon < Restore II < Reclaim. However, economical considerations related to herbicide cost, herbicide rate, and number of required applications are all important considerations. Based on cost per acre, the herbicides (excluding Rejuvra XL as the product had not been released for sale) can be ranked as follows: 2,4-D ($9.04/acre)< Restore II ($33.60/acre) < Reclaim ($42.50/acre) < Grazon ($48.16/acre) < Banvel II ($65.00/acre). Note that currently only 2,4-D, Banvel II, and Restore II are registered for suppressing or controlling absinth. Effective herbicide treatments will also kill or injure the legume component, which needs to be taken into consideration. Determination of whether the herbicide treatment is more economical than breaking and re-seeding the pasture stand needs consideration. Furthermore, absinth reduction success using herbicides will depend on conditions at time of application, equipment calibration, and stand history and composition. Therefore consult the *Guide to Crop Protection* (Saskatchewan Ministry of Agriculture, 2014) for detailed application information and restrictions prior to any herbicide application.

Finally, herbicide application can only treat the symptom of a problem. It is important to reconcile the root cause of the infestation in order to prevent or limit the occurrence of future infestations.

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