ADOPT DEMONSTRATION REPORT
(Agriculture Demonstration of Practices and Technology)

RESEARCH

AGRICULTURE

20110289

COMPARISON OF DIFFERENT HERBICIDE OPTIONS TO CONTROL ABSINTH (ARTEMISIA ABSINTHIUM) IN PERENNIAL PASTURE

Funded by:
The Saskatchewan Ministry of Agriculture under the Canada-Saskatchewan Growing Forward bi-lateral agreement

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Prepared by: Western Beef Development Centre
ADOPT Final Report – Project Number 20110289

Project Identification

1. Project Title
   Comparison of Different Herbicide Options to Control Absinth (*Artemisia absinthium*) in Perennial Pasture

2. Project Number: 20110289

3. Producer Group Sponsoring the Project: Western Beef Development Centre

4. Project Location(s):
   - Western Beef Development Centre's Pathlow Pasture near Melfort,
   - Western Beef Development pasture at Termuende Research Farm near Lanigan,
   - Producer (Jerry and Janice Sopatyk) site near Meacham, RM 342,
   - Producer (Gary and Pam Welter) site near Kerrobert, RM 350.

5. Project start and end dates (month & year): May 2012 to July 2013

6. Project contact person & contact details:
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Objectives and Rationale

7. Project objectives:
   Absinth (*Artemisia absinthium* L.) is a long-lived perennial herbaceous plant with a woody base. Individual plants grow 40 to 100 cm tall. Leaves are silvery-pubescent. The plant is easily recognized through its characteristic sage odour. Absinth was originally introduced from Eurasia and was recognized as a serious weed as early as 1954. Absinth is found throughout Canada but is most abundant on the Prairies. The Saskatchewan Weed Control act lists absinth as a noxious weed which must be prevented from expansion if the infestation is greater than five hectares or eradicated if the infestation is less than five hectares in size. Once established, absinth is very difficult to eradicate. Cattle will not graze it by choice and heavy infestations reduce forage production and quality. If dairy cattle consume absinth on pasture or in hay, milk 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 absinth yet. Landowners are therefore often limited to herbicide as an effective control method in perennial pasture stands. Various herbicide products have been introduced to the market and offer producers a choice in available treatments. Economical considerations related to herbicide cost, herbicide rate, and number of required applications are all important considerations. Effective herbicide treatments will also kill or injure the legume component of a forage stand which needs to be taken into consideration. A producer also needs to determine whether the herbicide treatment is more economical than breaking and re-seeding of a pasture stand.

The objective of this project was to demonstrate six different herbicide options to demonstrate their degree of effectiveness immediately after spraying and up to a year following spraying. The cost of the herbicide application will need to be weighed against the effectiveness of control provided. Producers will also need to weigh the benefit of weed control against the loss of beneficial forage legumes in treated pasture or hay fields.

8. Project Rationale:

With the implementation of the new Weed Control act in December 2010, producers are required to control larger populations and eradicate smaller populations of noxious weeds such as absinth. Noxious weeds also decrease production of desirable forage species and devaluate the land. The increasing abundance of noxious weeds in many areas of the province has increased awareness about noxious weeds and increased the desire to have effective weed control tools at hand. Most chemicals suggested for control of absinth are costly and/or require multiple applications to obtain longer term weed control. This project provided a demonstration of herbicide options for absinth and an opportunity to educate producers on product advantages and disadvantages as well as associated cost.

Methodology and Results

9. Methodology:

The project sites chosen were tame pastures or hay fields containing a proportion of a legume like alfalfa, sainfoin or cicer milkvetch. Herbicide treatments included: 2,4-D LV Ester (700 g/L), as a chemical of lower cost but less long-term effectiveness; Banvel II as a next option which may provide only limited long-term effectiveness; Restore II, Reclaim, and Grazon as higher priced pasture specific products with differing residual effects; Rejuvera XL as a new product comparison; and an unsprayed control. For this trial, Dow Agro Sciences provided the rangeland products Restore II, Reclaim, and Grazon, and DuPont provided the developmental product Rejuvera XL.

Table 1. Composition and rates of herbicides used in the demonstration project.

<table>
<thead>
<tr>
<th>Product</th>
<th>Formulation</th>
<th>Rate</th>
<th>Group</th>
<th>Recommended Water volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D LV Ester</td>
<td>700g/L</td>
<td>1.7 L/ha</td>
<td>4</td>
<td>100 L/ha</td>
</tr>
<tr>
<td>Banvel II</td>
<td>dicamba</td>
<td>4.6 L/ha</td>
<td>4</td>
<td>90-220 L/ha</td>
</tr>
<tr>
<td>Restore II</td>
<td>aminopyralid + 2,4-D ester</td>
<td>2.4 L/ha</td>
<td>4</td>
<td>200 L/ha</td>
</tr>
<tr>
<td>Reclaim</td>
<td>aminopyralid, metsulfuron-methyl +</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,4-D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reclaim A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 g/ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reclaim B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.7 L/ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grazon</td>
<td>picloram + 2,4-D</td>
<td>6.92L/ha</td>
<td>4</td>
<td>200 L/ha</td>
</tr>
<tr>
<td>Rejuvera XL</td>
<td>metsulfuron-methyl + aminocyclopyrachlor</td>
<td>90g ai/ha</td>
<td>2, 4</td>
<td>200 L/ha</td>
</tr>
</tbody>
</table>
A single herbicide application during the period of active plant growth was used to allow for comparison of residual effects and longer-term effectiveness of each product. Spraying occurred between the last week of June and first week of July 2012. An earlier application date would be desirable to avoid development of large and bushy plants which are more difficult to spray. The spraying window used in this demonstration may however be more representative of on farm application practices. Time limitations commonly associated with other farming operations and the need for conducive weather conditions commonly delay spraying. Plot size varied from 0.006 hectares to 0.5 hectares depending on site availability and weed distribution.

![Diagram of herbicide application rates and minimum plot size used.](image)

**Figure 1.** General plot distribution pattern with application rates, and minimum plot size used.

Herbicide effectiveness was based on plant composition inventories completed at one, three, and 12 month intervals following spraying. Observations were compared against pre-treatment inventories and the untreated control. Each inventory was conducted using a 50x50cm quadrat with ten quadrats randomly placed within each treatment plot. Composition was visually estimated based on percent cover of each species.
10. Results

A plant composition inventory was completed at each site prior to herbicide application (Figure 2).

Kerrobert Site

The tame forage stand at this site was desired to be 85% alfalfa, 10% meadow brome, and 5% crested wheatgrass as measured by volume. The stand was two to three years old at the time of treatment. The forage stand was grazed in 2011 and used for silage during the 2012 trial year. Absinth was present in the stand at rates of 5 to 40% canopy cover. Absinth was particularly concentrated along fencerow, edge of native prairie, and around on site rockpiles. No other significant weed problems were apparent. The demonstration plots were placed in areas with 30 to 40% absinth in the total stand composition. Plots at this site were 16 meters by 46 meters for a total area of 0.074 hectares. Spraying took place on July 5 around 11.45am with air temperatures at 24 degrees Celsius and wind speeds of about 5 to 10 km/hr. A tractor mounted 8m plot sprayer from the Western Applied Resource Farm in Scott was used. Water volumes for all treatments were targeted at 200 L/ha. Alfalfa was at 30 to 40% bloom and the absinth plants were at the bud stage with no flower development.

Visual observations one month following spraying at Kerrobert (Figure 3) showed that 2,4-D was not effective in controlling absinth. The incomplete kill also allowed a portion of the alfalfa plants to survive. The Banvel II spray coverage may have been inadequate as plants showed spray damage with an incomplete kill. Survival of absinth and alfalfa plants was variable across the plot. Absinth and alfalfa plants in Restore II, Reclalm, and Grazon plots showed a complete kill. Dead plants were still recorded in the plant inventory as they made up part of the canopy cover. Alfalfa in the Rejuvera XL plots had been killed while most absinth plants were curled but still showing green tissue. All plots were later cut for silage.

Three months following spraying (Figure 4) there was little control of absinth in 2,4-D treated areas. Most alfalfa plants were killed and meadow brome was filling in bare ground. The mature canopy at the time of spraying may have reduced the effectiveness of spray cover in this plot. Similar issues were noted in the Banvel II treatment where most alfalfa plants were killed with poor control of absinth. Restore II, Reclalm, and Grazon achieved good to excellent kill of absinth and alfalfa plants. A few sprayer misses allowed the occasional escapee of alfalfa, absinth, and dandelion. Meadow brome was mostly filling in bare spots although some wild oats and orchard grass are also noted on bare ground openings. The Rejuvera XL treatment showed an almost perfect control with a few spray misses along the plot edges.
One year after treatment (Figure 5) small and spindly abinst plants were noted across the 2,4-D treated plot but alfalfa had also started to regrow. The Banvel II plot had already been cut for hay and inventory effectiveness was limited. Some abinst plants were re-growing along with danelion. Restore II, Reclaim, and Grazon were still showing near perfect control with only a few abinst and alfalfa plants found in the Grazon plot. The grass component in these plots was dominated by meadow brome and smaller amounts of crested wheatgrass. The occasional rose and foxtail barley plants were noted as other potentially undesirable species. Perfect control was observed in the Rejuvera XL plot with plant composition reduced to meadow prome and a lesser portion of crested wheatgrass. Bare ground created after the eradication of abinst and alfalfa remains noticeable one year following treatment.
Figure 5. Summarized plant composition 12 months following herbicide application at Kerrobert, SK. Balance represents bare ground where cover does not reach 100%.

Meacham Site
This tame forage stand was established in 1999-2000 with a mixture of cicer milkvetch, alfalfa, and meadow brome grass and is used for grazing. Absinth canopy cover ranged from zero to 50% before treatment. Other weeds present included dandelion, perennial sow thistle, field chickweed, Canada goldenrood, shepherd’s purse, pennycress, blueburr and flixweed (Figure 6). In an attempt to suppress the increasing absinth infestation, the producer used bale grazing in the winter of 2011/12. Heavy residue from the bale grazing was still present at the time of the pre-treatment vegetation inventory. The residue rapidly disintegrated over the period of the trial. Plots were placed away from bale grazing sites and in areas of higher absinth densities. Plots were 10 meters wide and 50 meters long for a total area of 0.05 hectares. Spraying took place on June 28 between 3pm and 5pm with air temperatures of 24 degrees Celsius and wind speeds of about 30 to 35 km/hr. Alfalfa was in mid to late bloom and absinth plants were vegetative, large, and mature. A quad mounted sprayer with a 10 foot boom from PAMI was used for the Meacham, Lanigan, and Pathlow sites.

Figure 6. Summarized plant composition prior to herbicide application at Meacham, SK. Balance represents bare ground where cover does not reach 100%.
One month following spraying (Figure 7), a good kill of all broadleaf plants was noted in the 2,4-D treatment. The plot was almost exclusively composed of meadow brome. It should be noted that due to plot arrangement at this site, the original absinth distribution was low in this treatment. Kill of broadleaves including absinth was incomplete in the Banvel II treatment. Reclaim showed a good kill of all broadleaves with stand composition being reduced to meadow brome and Kentucky bluegrass. The broadleaves in the Restore II treatment were partially killed but showed herbicide impact. A good kill of all broadleaves was noted with only a few escaping plants or sprayer misses. Alfalfa and cicer milkvetch plants in the Rejuvera treatment were mostly dead or dying with absinth plants showing some herbicide damage although some plants appear to be surviving.

![Figure 7. Summarized plant composition one month following herbicide application at Meacham, SK. Balance represents bare ground where cover does not reach 100%.

During the three month inventory (Figure 8) some weed increase other than absinth could be noted in most plots at the site near Meacham. The original stand had a large volume of alfalfa and cicer milkvetch plants which created significant openings and bare ground in plots with effective broadleaf plant kill. The 2,4-D treated plot has some alfalfa and cicer milkvetch plants present along with dock and Canada thistle. Banvel II provided good control with most legumes and absinth killed. The Restore II and Reclaim treatments had some surviving absinth and alfalfa plants mostly due to sprayer misses. Wild oats and quackgrass were also noted in these plots. The Grazon treatment showed good control with annual weeds like field pennycress taking advantage of the bare ground openings. The weed control in the Rejuvera XL treatment did not correspond with the results of the other three sites. Control of absinth was poor with many plants not effectively killed. At the same time the legumes were burnt off and other weeds like dock were effectively controlled. Lower than ideal water volumes may partially explain the difference in effectiveness observed at the Meacham site compared to the other three sites.
One year following treatment (Figure 9) there was still a noted increase in bare ground in treated areas with various annual weeds taking advantage of these openings. The 2,4-D treated area was still almost free of absinth although the initial absinth plant population was low in this area. Absinth plants along with legumes and dandelions had started to re-establish in the Banvel II treatment plot. Restore II, Reclaim, and Grazon treated areas were all free of absinth and legumes. Various annual weeds were noted in the bare ground patches. The Rejuvera XL treated plot remained weedy with both absinth and annual weeds present. Cicer milkvetch plants were also noticed in this plot while the alfalfa plants did not show re-growth one year following treatment.

**Figure 8.** Summarized plant composition three months following herbicide application at Meacham, SK. Balance represents bare ground where cover does not reach 100%.

**Figure 9.** Summarized plant composition 12 months following herbicide application at Meacham, SK. Balance represents bare ground where cover does not reach 100%.
**Lanigan Site**

The tame forage stand was a meadow brome and alfalfa mixture with minor portions of smooth brome, intermediate wheatgrass, quackgrass, and Kentucky bluegrass. Absinth canopy cover ranged from zero to 65% at the pre-treatment inventory (Figure 10). Other weeds present included dandelion, thistle, stinkweed, and wild mustard. Plot size at this location was 6 meters by 15 meters for a total area of 0.009 hectares. Spraying took place on June 26 between 11am and 1pm with an air temperature of 30 degrees Celsius and with speeds less than 10km/hr. The sward was tall at the time of treatment and the spray boom could not be lifted high enough to clear all vegetation. Absinth plants were vegetative and vigorous at the time of spraying.

![Figure 10](image1.png)

**Figure 10.** Summarized plant composition prior to herbicide application near Lanigan, SK.

![Figure 11](image2.png)

**Figure 11.** Summarized plant composition one month following herbicide application near Lanigan, SK. Balance represents bare ground where cover does not reach 100%.

One and three months following the herbicide application in plots near Lanigan, DuPont’s Rejuvera XL along with the Dow Agroscience’s range products exhibited good control of absinth and other broadleaf plants. Banvel II provided more than expected control and plots treated with 2,4-D showed a significant reduction in absinth plant cover compared to control plots (Figure 11 and 12).
One year after herbicide treatment, absinth re-appeared in many of the treatment plots (Figure 13). As expected, the 2,4-D treated area had a reoccurrence of absinth plants along with alfalfa and dandelions. Although the inventory for the Banvel II plot does not indicate it, small absinth plants were noted in this plot. Unfortunately, absinth plants had also re-appeared in plots treated with Restore II, Reclaim, and Grazon. This was unexpected as these products should provide multiple year residual broadleaf control. The high air temperatures during herbicide application may partially explain the reduced product effectiveness at this site. The Rejuvera XL treated area remained weed and legume free one year following treatment. Dandelion made up the bulk of the “other weeds” observed at this site with Canada thistle contributing a few plants. The loss of forage legumes did not create significant openings in the stand as the proportion of legumes at the outset of the trial was lower compared to other locations.
Pathlow Site
The tame forage stand at this location was an old smooth brome and alfalfa stand. Creeping red fescue and Kentucky bluegrass were secondary grasses. Legumes included alfalfa, alsike clover, and the native American vetch. Other broadleaf plants included dandelion, strawberry, yarrow, sow thistle, and Canada thistle (Figure 14). Absinth canopy cover ranged from zero to 30% in the treatment plots. Plots were 10 meters by 50 meters for a total area of 0.05 hectares. Spraying took place on July 3 between 10am and 2pm with air temperatures of 26 degrees Celsius and wind speeds of about 10 to 20 km/hr. Abinsth plants were vegetative with large and mature plants often growing taller than spray boom height.

**Figure 14.** Summarized plant composition prior to herbicide application at Pathlow, SK. Balance represents litter where cover does not reach 100%.

**Figure 15.** Summarized plant composition one month following herbicide application at Pathlow, SK. Balance represents litter and minimal bare ground where cover does not reach 100%.
One month following treatment (Figure 15), absinth plants in the 2,4-D treated plot appeared twisted but not dead and overall control was estimated at 50%. Control of strawberry and dandelion was also rated poor. Banvel II appeared to achieve a 95% reduction of absinth plants across the plots although plants appeared to be affected but not yet killed. Restore II and Reclaim were estimated to have achieved 95% control of absinth with good control of dandelion, and about 80% control of strawberry plants. Grazon appeared to provide excellent control of broadleaf plants with 98% of absinth, dandelion, and strawberry controlled. Rejuvera XL was rated at 75% control of absinth plants. One month following spraying, the plants appeared affected with green tissue still visible.

![Graph](image1)

**Figure 16.** Summarized plant composition three months following herbicide application at Pathlow, SK. Balance represents litter and minimal bare ground where cover does not reach 100%.

![Graph](image2)

**Figure 17.** Summarized plant composition 12 months following herbicide application at Pathlow, SK. Balance represents bare ground where cover does not reach 100%.

Twelve months following herbicide application (Figure 17), the plots at Pathlow followed the
trend of the three month inventory (Figure 16). Absinth plants along with dandelion, strawberry, and common yarrow were noted across the 2,4-D treated plot. The Banvel II treated area had regrowth of dandelions apparent throughout the plot although legumes and absinth were not noted. Restore II, Reclaim, and Grazon showed very good control with only a few dandelion plants noted in the Restore II and Grazon plots. A strawberry patch was observed in the Reclaim plot although it was likely due to a sprayer miss. The Rejuvera XL plot was almost exclusively composed of tame grasses with effective control of broadleaf plants including absinth.

The following series of figures provides a comparison of the average change in absinth canopy cover for each herbicide as observed in the vegetation inventories completed at each project site (Figure 18-23). The comparison of the four project sites demonstrates the individuality of each forage stand in terms of initial absinth infestation and variability in effectiveness of control.

**Figure 18.** Comparison of the change in absinth canopy cover in 2,4-D treated plots during the project period at the four demonstration sites.

**Figure 19.** Comparison of the change in absinth canopy cover in Banvel II treated plots during the project period at the four demonstration sites.
Figure 20. Comparison of the change in absinth canopy cover in Restore II treated plots during the project period at the four demonstration sites.

Figure 21. Comparison of the change in absinth canopy cover in Reclaim treated plots during the project period at the four demonstration sites.
Figure 22. Comparison of the change in absinth canopy cover in Grazon treated plots during the project period at the four demonstration sites.

Figure 23. Comparison of the change in absinth canopy cover in Rejuvera XL treated plots during the project period at the four demonstration sites.
**Extension Activities**

- Signs placed at each of the sites.
- Field day at Kerrobert site held on August 8, 2012 as part of the South Eagle Creek Watershed Group Summer field day.
- Field day at Meacham site held on August 21, 2012 as part of the Pasture Management Tour organized in collaboration with WUQWTR with 10 attendees.
- A presentation on “Applied Invasive Weed Management – What Worked” at event organized through a local AEGP group and held in Abernethy on December 4, 2012 with 34 attendees.
- Preliminary results presented as a portion of the Weed Webinar held on December 19, 2012 with 53 attendees.
- Field day at Lanigan site held on June 25, 2013 as part of the Western Beef Development Centre Summer filed day with 94 attendees.
- Article published in the March 2013 edition of AGRIVIEW.
- A presentation on “ADOPT project highlights and outcomes” presentation provided at North Battleford, Moose Jaw, and Yorkton during the Cutting Edge event series held on March 12-14, 2013 with 15 to 30 attendees at each location.
- Radio spot on “Absinth Control Options” submitted to CJWW on October 18, 2013.
- A webinar on absinth wormwood management held on October 23, 2013 as part of the Weed Webinar Series with 97 attendees registered.

![Project Signage at Meacham](image_url)
11. Conclusions and Recommendations

Absinth wormwood is a challenging weed to control in tame hay and pastures. This ADOPT funded project demonstrated the effectiveness of control up to 12 months following application of six different herbicide products. The four demonstration sites were different in their initial plant composition and degrees of absinth infestations. Meadow brome was the dominant grass at Kerrobert, Meacham, and Lanigan while the old tame forage stand at Pathlow was smooth brome dominated. The legume proportion also differed across sites with the Kerrobert site having a large proportion of alfalfa and the Meacham site having a large proportion of cicer milkvetch and alfalfa. The initial stand composition is an important factor in determining the economical feasibility and outcome of broadcast herbicide application.

Broadcast application of herbicides in an attempt to eradicate absinth will also result in the complete or almost complete eradication of any forage legumes present. Where the initial stand is composed of over 50% forage legumes, the loss of the legume has significant drawbacks. Stand production will be temporarily reduced. Although this project did not measure stand production, the loss of plant material usually produced by the legume component will be noticeable relative to the proportion of legume eradicated. Legumes fix valuable nitrogen and provide cross-fertilization to forage grasses. The larger the proportion of legumes eradicated through the herbicide application, the larger the loss of nitrogen input to the stand and subsequent forage production. At both Kerrobert and Meacham, herbicide treatments created noticeable stand openings with significant bare ground patches. At Meacham, the bare ground was a prime location for the establishment of annual weeds. Over time, these openings will likely fill in with existing grasses. However, a producer may need to consider adding forage grasses where the herbicide application reduces the cover of forage grasses to less than 50%. 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. 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. Products like Rejuvera XL, Restore II, Reclaim, and Grazon also have various degrees of residual effects during which time forage legumes cannot be re-established in the forage stand.

Stand composition and application equipment can also be a factor in herbicide effectiveness. At Pathlow, Lanigan, and Meacham it was difficult to achieve consistent spray cover as the sward height was at times greater than the boom height of the sprayer. Absinth plants at Meacham and Pathlow were also mature and had not been cut in previous years, which allowed for an accumulation of old stems and the production of stout plants. In the newer forage stand at Kerrobert, absinth plants were overall younger and less voluminous, and the stand was at times cut for hay or silage which helped to remove existing old plant growth.

Application of 2,4-D provided some top growth control but was in general not able to provide long term control of absinth in perennial forage stands. At Lanigan and Pathlow, the absinth population in 2,4-D treated plots was lower compared to the untreated control but plants were starting to increase from three to 12 months following treatment. The site at Kerrobert showed only a short-lived reduction in absinth canopy cover. Results from the 2,4-D treatment at the Meacham site should be interpreted with caution as the site was inherently low in absinth canopy cover and may not accurately reflect the effectiveness of 2,4-D in controlling absinth. Although it is the cheapest herbicide used in the trial (Table 2), multiple applications are likely necessary which may ultimately be more expensive than other product choices.

Banvel II is listed as a product which will provide top growth control of absinth. Control was not effective at any of the four demonstration sites. The degree of control was variable across demonstration sites. The reduction in absinth cover was most noticeable at Pathlow and Lanigan, although small absinth plants were noted in both plots during the 12 month assessment. Although not necessarily apparent in the random vegetation sampling, absinth plants were observed in the plot at Meacham during the three and 12 month assessments. Control of absinth using Banvel II was more effective compared to 2,4-D but multiple applications are still likely. The cost of Banvel II in conjunction with the need for multiple applications does not make it an economical
choice for control of absinth.

Restore II and Reclaim are similar in their chemistry and both achieved good to excellent control of absinth at the four demonstration sites. Restore II appeared more consistently effective in controlling absinth over the period of the demonstration. Grazon was also effective in absinth control at most sites. 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. Absinth plants on plots treated with Restore II, Reclaim, and Grazon were mostly noted at the Lanigan site. This may partially be explained by the 30 degree Celsius air temperatures at the time of application. The product labels indicate that application should not occur when temperatures exceed 28 degrees Celsius. The rangeland products Restore II, Reclaim, and Grazon may appear more costly but if they are able to provide multiple years of control may be more economical compared to lower cost options requiring multiple applications.

Results for Rejuvera XL were inconsistent. Effective control up to 12 months following application was observed at all sites except Meacham. At Meacham, the effectiveness of control more closely resembled that of Banvel II. The difference may have been due to sprayer set up or water volume. Where control was good it was very effective in controlling any broadleaf plants. No comparison on price can be made as the product had not been released for sale at the time of this report.

Table 2. Cost comparison of herbicides used in the ADOPT demonstration project.

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<thead>
<tr>
<th>Product</th>
<th>Rate per hectare</th>
<th>Rate per acre</th>
<th>Cost per L*</th>
<th>Cost per hectare</th>
<th>Cost per acre</th>
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<tbody>
<tr>
<td>2,4-D ester 700</td>
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<td>Reclaim A</td>
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<td>$42.50**</td>
<td>$104.98</td>
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<tr>
<td>Rejuvera XL</td>
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<td>36.44g</td>
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<td>N/A</td>
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</table>

* Cost per litre based on suggested retail prices as of June 2013.
** Cost based on combined product.

Producers considering herbicide application for control of absinth wormwood in their tame forage hay or pasture stands can use Figure 24 as a guide for their decision making. Both 2,4-D and Banvel II are listed to be used for control of absinth but do not provide effective control and will likely require multiple seasons of applications. Therefore the products receive an X for incomplete control and a question mark as the use of this product is an economical decision left to the user’s judgement. Rejuvera XL, Restore II, Reclaim, and Grazon receive a check mark as they all provided good or excellent control of absinth. However, control was never consistently complete and will depend on conditions at time of application, equipment calibration, as well as stand history and composition. Please consult the Guide to Crop Protection for detailed application information and restrictions prior to any herbicide application. 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.
Summary of Observations

Figure 24. Summary on herbicide recommendations based on demonstration results and Recommendations of the Guide to Crop Protection.

Supporting Information

12. Acknowledgements

- The Ministry’s support for this project was acknowledged on signage displayed at each site and in all communication and extension materials.
- Industry and co-operator support has also been mentioned in all project signage and in all communication and extension materials.
- Industry support was provided from DuPont and Dow Agro Sciences in providing herbicides for all project sites as well as agronomic assistance and site visits.
- Support was provided by Western Beef Development Centre Staff in site supervision, equipment rental, and overall project implementation.
- In-Kind support was provided by Saskatchewan Ministry of Agriculture Regional Forage Specialists to assist in project implementation.

13. Appendices

Appendix A – Site Photos
Appendix B – Project Extension
Appendix C – Additional Plant Composition Charts
Abstract

14. Abstract/Summary

Absinth wormwood (*Artemisia absinthium*) is a challenging weed to control in tame hay and pastures. Herbicide application is often required where large scale infestations of the weed occur. This ADOPT funded project demonstrated the use of six different herbicide options and their effectiveness up to 12 months following treatment. Spraying of 2,4-D ester 700, Banvel II, Restore II, Reclaim, Grazon, and Rejuvera XL took place between the last week of June and first week of July 2012. Treatments were implemented at producer locations near Kerrobert and Meacham, as well as at the Western Beef Development Centre pastures near Lanigan and Pathlow for a total of four demonstration sites. Results across sites reflected the variability in initial absinth canopy cover present and variability in herbicide effectiveness associated with application timing, equipment, and stand maturity. It is important to note that any broadleaf herbicide application will result in the eradication of beneficial forage legumes present. The loss of the beneficial effects of forage legumes on feed quality and soil fertility will need to be weighed against potential benefits of weed control. Absinth control was not effective in 2,4-D treated plots and the need for multiple seasons of application will cumulate the cost of this herbicide choice. Banvel II provided more effective control compared to 2,4-D but absinth plants were found at all demonstration sites 12 months following herbicide application. Restore II, Reclalm, and Grazon all provided good control with only minor absinth occurrences noted following treatment. Rejuvera XL provided good control at three of the four sites but the product has not yet been released for sale. Based on cost, residual weed control provided, and label recommendation, Restore II would likely be the product of choice when considering longer term absinth wormwood control. For any herbicide options considered, the Guide to Crop Protection should be consulted for product application information and restrictions. Results of this demonstration project were communicated through field days, event presentations, and webinar delivery.
Appendix A – Site Photos
Kerrobert Site

- Pre-Treatment
- Spraying
- 1 month - Control
- 1 month – 2,4-D
- 1 month – Banvel II
- 1 month – Restore II
- 1 month – Reclaim
- 1 month – Grazon
- 1 month – Rejuvera XL

- 3 months – 2,4-D
- 3 months – Banvel II
- 3 months – Restore II
- 3 months – Reclaim
- 3 months – Grazon
- 3 months – Rejuvera XL
12 months – Control

12 months – 2,4-D

12 months – Banvel II

12 months – Restore II

12 months – Reclaim

12 months – Grazon

12 months – Rejuvera XL
Meacham Site

1 month – Control
1 month – 2,4-D
1 month – Banvel II
1 month – Restore II
1 month – Reclaim
1 month – Grazon
12 months – Control
12 months – 2,4-D
12 months – Banvel II
12 months – Restore II
12 months – Reclaim
12 months – Rejuvera XL
12 months – Reclaim
12 months – Grazon
Lanigan Site

Pathlow Site

Control 12 months – 2,4-D 12 months – Banvel II
12 months – Restore II 12 months – Reclaim 12 months – Grazon
12 months – Rejuvera XL
Appendix B – Project Extension

Pasture Management Tour
Tuesday, August 21, 2012 – 9:30 a.m. – 4:30 p.m.
Tour will depart from the Watrous Regional Office
403 Main Street, Watrous, SK

TOUR STOPS INCLUDE:
Akin Farm, Watrous, SK
Comparison of biological and chemical control options for Gleditsia cherry in perennial forage

Sopikoc Farms, Wawouch, SK
Comparison of different herbicide options to control Amsinckia in perennial forage

Clear Rock Ranch – a non-irrigated range

Wolzheim AG (former PPSA) pasture, near, SK
Cutting grazing and pasturing to reduce bush and weed abundance in perennial pasture

Native plant identification

Cost $160/Person

Weed Webinar Series – Absinth Wormwood
Wednesday, October 23, 2013
12 p.m. (Saskatchewan time)

Presenters:
Nadja Moro, PAg – Ministry of Agriculture, Regional Forage Specialist
Lorne Klein, PAg – Ministry of Agriculture, Regional Forage Specialist

Join us for a Ministry hosted webinar on Wednesday, October 23 at noon. Nadja Moro will explain the biology and characteristics of the plant while Lorne Klein will discuss control options and their feasibility in perennial forage stands.

Please pre-register at https://zoom.us/j/3541700002: If you have any questions, contact Nadja Moro at 306-946-3219 or Lorne Klein at 306-946-2812. Please note you may join the webinar by computer or phone. If you are unable to attend, please pre-register for the event so we can send you the link and the webinar can be viewed at a more convenient time.

15th Annual Field Day
Tuesday, June 25, 2013
at the Termuende Research Ranch
Lanigan, SK

Riding Technology into the Future

Morning Topics:
“Tools for Raising Successful Replacements”
Dr. Colin Palmer, SC, VM, University of Saskatchewan
“Producer Challenges in Breeding Heifers and Young Cows”
Cathy Ellord and Iain Fraser, UK Ministry of Agriculture
“Dairyland Grass Breeding in Saskatchewan”
Dr. Bruce Coulman, University of Saskatchewan

Afternoon Tours/Presentations:
Stockpiled Perennial Forage Grazing, Grazing Sanitation for BFP Protein and Digestive Efficiency, RFID Tag Testing Results, Bio-Digester Results, Post-Metron on Winter Feeding 2012-13, Abomasal Control in Foals, Nutritional and the Beef Code of Practice
Appendix C – Additional Plant Composition Charts

**Figure 20.** Change in average canopy cover of absinth recorded in different treatment plots at site near Kerrobert, SK.

**Figure 20.** Change in average canopy cover of absinth recorded in different treatment plots at site near Meacham, SK.
Figure 20. Change in average canopy cover of absinth recorded in different treatment plots at site near Lanigan, SK.

Figure 20. Change in average canopy cover of absinth recorded in different treatment plots at Pathlow site, SK.