Response of *Galium* species (cleavers) to herbicides

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Galium species (cleavers)

- Rubiaceae Family

- Annual weed which causes economic losses in agriculturally managed ecosystems around the world.
Galium species

- Annual or winter annual
- Twining stems
- Dispersion by animals
- Highly adaptable

Figure 1. Distinguishing features of Galium species (Defelice, 2002)
Galium species of Canada

- *Galium borealis* L.  (Northern Bedstraw)
- *Galium spurium* L.  (False cleavers)
- *Galium aparine* L.  (Catchweed Bedstraw)
Galium population growth

- 21\textsuperscript{st} in 1980’s weed survey of Western Canada
- 9\textsuperscript{th} in 2000’s weed survey of Western Canada
- Growth correlated with increasing canola acres

(Leeson et al, 2005)
Cleavers, *Galium spp.*

- **1970s**
- **1980s**
- **1990s**
- **2000s**

Frequency:
- Species not surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 50.0%
- More than 50.0%

Cleavers frequency and distribution in Western Canada. (Beckie et al 2005)
Cleavers in canola

- Highly competitive at low densities
- Seed is difficult to remove from canola seed
- Significantly affect canola grading
- Increased harvest difficulty
Existing herbicides

- **Glyphosate**
  a) Registered for control on plants up to 15cm

- **Glufosinate ammonium**
  a) Variable efficacy

- **Imazamox + Imazaphyr (ares)**
  a) Group 2 resistance
Potential new herbicides

- Quinclorac
  a) Group 4

- Clomazone
  a) Group 13
  b) Preplant, soil activated
Field Experiment

- Objective: Assessing the efficacy of several common herbicides and potential new herbicides on cleavers
Methodology

- Separate trials for each herbicide system (Liberty-link, Roundup-Ready, Clearfield)
- RCBD with 8 treatments
- Four replications
- Experiment run in 2013 and 2014
  a) Scott Research Farm
  b) Kernen Research Farm
  c) Rosthern
## Treatment list

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Control (untreated check)</td>
</tr>
<tr>
<td>2</td>
<td>Herbicide standard</td>
</tr>
<tr>
<td>3</td>
<td>Quinclorac</td>
</tr>
<tr>
<td>4</td>
<td>Clomoazone</td>
</tr>
<tr>
<td>5</td>
<td>Clomoazone  FB quinclorac</td>
</tr>
<tr>
<td>6</td>
<td>Herbicide standard FB quinclorac</td>
</tr>
<tr>
<td>7</td>
<td>Clomoazone FB herbicide standard</td>
</tr>
<tr>
<td>8</td>
<td>Clomoazone FB herbicide standard + quinclorac</td>
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*FB = followed by*
<table>
<thead>
<tr>
<th>Variable</th>
<th>Collection Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaver Control Rating</td>
<td>Rate pre-seed treatment prior to in-crop herbicide and others @ 7-10, 14-21, &gt; 28 days after herbicide application on CWSS scale.</td>
</tr>
<tr>
<td>Crop Injury Rating</td>
<td>Rate pre-seed treatment plots prior to in-crop herbicide and others @ 7-10, 14-21, &gt; 28 days after herbicide application on CWSS scale.</td>
</tr>
<tr>
<td>Biomass</td>
<td>Cut all plants (at canola pod fill) at soil surface in 2 x 0.5m².</td>
</tr>
<tr>
<td>Plant Height</td>
<td>During the podding stage, measure the height of 5 individual canola plants.</td>
</tr>
<tr>
<td>Crop Yield</td>
<td>Seed yield, % moisture at harvest, determine dockage, separate cleavers from canola in 100g samples.</td>
</tr>
<tr>
<td>Thousand Seed Weight</td>
<td>Count 250 seeds from each sample, multiply 4X.</td>
</tr>
</tbody>
</table>
Unsprayed check
Glyphosate
Glyphosate + Quinclorac
Cleavers biomass in glufosinate tolerant canola (2013 & 2014)

Note: Means with the same letter in the same row are not significantly different (P>0.05). The multi-treatment comparisons completed using Tukey method. SEM = standard error of mean.
Cleavers biomass in glyphosate tolerant canola (2013 & 2014)

Note: Means with the same letter in the same row are not significantly different (P>0.05). The multi-treatment comparisons completed using Tukey method. SEM = standard error of mean.
Cleavers biomass in imidazolinone tolerant canola (2013 & 2014)

Note: Means with the same letter in the same row are not significantly different (P>0.05). The multi-treatment comparisons completed using Tukey method. SEM = standard error of mean.
Cleaver contamination in imidazolinone tolerant canola (2013 & 2014)
Cleaver contamination in glufosinate tolerant canola (2013 & 2014)
Cleaver contamination in glyphosate tolerant canola (2013 & 2014)
Effects of herbicide treatment on yield in glyphosate tolerant canola 2013 & 2014 (Kernen only)

Note: Means with the same letter in the same row are not significantly different (P>0.05). The multi-treatment comparisons completed using Tukey method. SEM = standard error of mean.
Effects of herbicide treatment on yield in glufosinate tolerant canola 2013 & 2014)

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Effects of herbicide treatment on yield in imidazolinone tolerant canola

2013 & 2014

Note: Means with the same letter in the same row are not significantly different (P>0.05). The multi-treatment comparisons completed using Tukey method. SEM = standard error of mean.
Discussion

- Existing herbicides exhibit marginal control of cleavers

- Quinclorac is highly efficacious on cleavers

- Clomazone provides early season control and can improve the efficacy of in-crop herbicides
Dose Response Experiment
Methodology

- Separate dose response experiment for each herbicide (Glufosinate, Quinclorac, Ares)
- Three replications
- Experiment run in 2013 and 2014 at the U of S
## Data collection

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<tr>
<td>Crop Injury Rating</td>
<td>Rate all pots @ 7-10, 14 days after herbicide application on CWSS scale.</td>
</tr>
<tr>
<td>Biomass</td>
<td>In all dose response trials, aboveground biomass was harvested 21 days after herbicide application, oven dried, weighed and expressed as a % of the untreated control.</td>
</tr>
</tbody>
</table>
Ares
Quinclorac

![Graph showing the relationship between dose and biomass for different locations (SPG, Lacombe, Vegerville).]
Glufosinate
Acknowledgements

- Supervisor:
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  Eric Johnson

- Kernen Staff

- Fellow Grad Students
Questions ?
References


