Group 2 resistant Cleavers  
Control in Peas  

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Background

• imidazolinone herbicides (Group 2) - most widely used broadleaf weed control herbicides in peas
• Cleavers (Galium spurium) and possibly (Galium aparine) have evolved resistance to Group 2 herbicides
• Cleavers have increased in ranking from the 43rd most abundant weed in the 1970’s to the 9th most abundant weed in 2000’s. ("Prairie Weed Survey 1970’s to the 2000’s” Leeson et.al 2005)
• Research trials have been conducted at a number of locations across Saskatchewan to evaluate herbicides with alternative modes of actions to control cleavers in field peas.
Top 10 weeds in the Prairies

- Wild oat*
- Green foxtail*
- Wild buckwheat*
- Canada thistle
- Lamb’s-quarters

- Chickweed*
- Stinkweed*
- Redroot pigweed*
- Cleavers*
- Kochia*

*Known resistant populations
Over Winter Cleavers

Size of Cleavers at application
Winter annual Cleaver Control

![Graph showing the comparison of Winter annual Cleaver Control treatments. The x-axis represents different treatments including Prepass, GLY+ Express, GLY 0.5 l/ac, GLY 1 l/ac, CleanStart, GLY+ Attain, GLY+ UAP-0401. The y-axis represents the percentage control, ranging from 0 to 100. The treatments are compared at 7 DAA and 23 DAA.]
Group 2 Resistant Cleavers
Group 2 Resistant Cleavers Control in Peas

• Sulfentrazone (Authority)
  • Registered in field pea, chickpea, flax, sunflower. Lentils are sensitive.
  • Effective on kochia, wild buckwheat, lambsquarters, redroot pigweed
• Investigating efficacy on cleavers
Sulfentrazone for cleavers control, 2010-11

Soil organic matter

<table>
<thead>
<tr>
<th>Herbicide Rate (g ai/ha)</th>
<th>&lt; 3.5%</th>
<th>3.5 - 5%</th>
</tr>
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<tbody>
<tr>
<td>105</td>
<td></td>
<td></td>
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<tr>
<td>140</td>
<td></td>
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<tr>
<td>280</td>
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</table>

% control
Sulfentrazone for cleavers control, Melfort
> 5% Organic Matter
Cleavers Control with Pre-emerg Treatments

- Clomazone 150
- Clomazone 120
- Clomazone 90
- Saflufenacil 50
- Saflufenacil 36
- Saflufenacil 18
- Sulfentrazone 280
- Sulfentrazone 140
- Sulfentrazone 105

Bar graph showing the percentage of control with different treatments.
Cleavers Control with Post-emerg Treatments

- Clomazone 90
- Clomazone 120
- Clomazone 150
- Imazamox+bentazon 20/427
- Bentazon 427

% Control
Post-emergent Clomazone
Pre-emergent Clomazone
Results & Conclusions:

• Sulfentrazone (Authority®), will control Group 2-resistant cleavers on soil with less than 6% organic matter. FMC is applying for registration.

• Control has been variable on soils with higher organic matter levels (black soil zone).

• Pre-emerge products saflufenicil (Heat®) and clomazone (Command®) and post-emerge product imazamox plus bentazon (Viper®) all had some activity on cleavers but none provided control of cleavers.

• Post-emergent clomazone injured cleavers, but caused too much injury to the peas.
Future work

• Investigate sequential applications or combinations of these products to provide control of cleavers in the black soil zone.
Controlling Cleavers in Cereals

• Two main products added to herbicide mixes for cleavers control:
  • Fluroxypyr
  • Dicamba

• Low rates of fluroxypyr and dicamba used in mixes to control Group 2 resistant kochia will not control cleavers
Kochia control in Cereals

Product in mix to control Kochia

- Pyrasulfotole: 13%
- Dicamba: 32%
- Fluroxypyr: 48%
- Dichlorprop: 7%
Predicting weeds at risk for glyphosate resistance

• Currently 23 glyphosate-resistant weed species worldwide, but only three in Canada – giant ragweed and Canada fleabane in Ontario and kochia in Western Canada

• In the Grassland region, the top three weeds predicted at greatest potential risk of glyphosate resistance are kochia, wild oat, then green foxtail

• In the Parkland region the top three species are, wild oat, green foxtail, and cleavers
GR kochia in southern Alberta: 10 locations
South West Saskatchewan: 3 locations
Objectives:

(1) tool for producers to assess their risk of glyphosate resistance on a field-by-field basis;

(2) raise awareness for proactive resistance management in western Canada

Producer answers 10 questions related to crop production system, tillage system, and glyphosate usage (each question with four possible answers)

Tool indicates relative risk of glyphosate resistance based on the 10 responses
Resistant management

• Strong statistical association between weed resistance and lack of crop rotation diversity
• Recent study indicates 3 or more crop types significantly reduce the risk of weed resistance vs. 2 or fewer crop types
Palmer Amaranth

Hand Weeding
10 Ways Australian Farmers can fight Herbicide Resistance

1. Act now to stop weed seed set
2. Capture weed seeds at harvest
3. Rotate crops and herbicide mode of action
4. Test for resistance
5. Aim for 100% control and monitor every spray event
6. Don’t automatically reach for glyphosate
7. Never cut on-label herbicide rate
8. Plant clean seed into clean fields
9. Use the double knock technique
10. Employ crop competitiveness to combat weeds

www.weedsmart.org.au
Harvest Weed Seed Control
Harrington Seed Destructor
Herbicide Resistant Strategies

- **IPM – Integrated Pest Management**
  - Include Crop rotation
  - Herbicide Mixes – with multiple modes of action
  - Tillage may have a place?

- **Specific Weeds of concern:**
  - Wild oat – Group 1 and 2 resistance
  - Cleavers – Group 2 resistance
  - Chickweed – Group 2 resistance
  - Kochia – Group 2 and 9 resistance

- Few or No New modes of action in the pipeline
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