Glyphosate-resistant Kochia

- 17 GR kochia populations confirmed in SK
- 2 in MB
- Multiple resistant
  - Gr 2 – SU’s

Beckie et al., 2015
58% of glyphosate resistant kochia
found on chem-fallow
Glyphosate-resistant weeds in ND and MN

- **2007**

- **GR common ragweed**
- **GR giant ragweed**
- **GR waterhemp**

Black symbols: confirmed resistant cases; Blue: highly suspected

Provided by: Drs. Jeff Stachler and Mike Christoffers
Glyphosate-resistant weeds in ND and MN

2013

- GR horseweed / marestail
- GR kochia
- GR common ragweed
- GR giant ragweed
- GR waterhemp
- GR wild oat

Black symbols: confirmed resistant cases; Blue: highly suspected

Provided by: Drs. Jeff Stachler, Jeff Gunsolus, Mike Christoffers, and Kirk Howatt
DOW SELLS TREFLAN, EDGE HERBICIDES TO GOWAN

RealAgriculture News Team  December 1, 2015
Ag Business, Agronomy, Crop Production, Eastern Canada, News, Weed control, Western Canada

Gowan Company has announced a deal to acquire the entire DNA (dinitroaniline) herbicide portfolio from Dow AgroSciences, including popular herbicides Treflan and Edge.

The products to be acquired by Gowan have active registrations in 22 countries including the USA,
New burnoff-partner registered prior to field pea

• Goldwing – NuFarm
  • Contains pyraflufen-ethyl – Group 14 herbicide / ppo inhibitor
  • MCPA ester (equivalent to about 2 to 4 oz active/acre)
• Tank-mix with glyphosate
Goldwing - some important weeds controlled according to label:

- Cleavers
- Dandelion (suppression)
- Kochia (including Group 2 & glyphosate resistant biotypes)
- Mustards
- Narrow-leaved hawk’s-beard
- Night-flowering catchfly
- Volunteer canola (all herbicide-tolerant biotypes)
Goldwing

• Label expansion for certain pulse and industrial oilseed crops planned after 2016 season
Lentil
Lentils – Herbicide Research Underway

• Fall applied Valterra (flumioxazin)
• Focus (pyroxasulfone)
• Post-emergence fluthiacet-methyl (Cadet) as a tank-mix with Solo or Sencor
Fall applied Valterra

- Valterra is a soil applied Group 14 herbicide
  - Shorter residual than Authority
- Have investigated both fall and spring application prior to lentil
  - Risk of injury with spring application in lentil at rates tested.
Fall applied Valterra Research

• Fall applied Valterra when tank-mixed with glyphosate has provided good control of narrow-leaved hawksbeard, dandelion, and other winter-annual weeds.

• Has also controlled early spring emerging kochia in studies.
Fall applied Valterra – Weed Control
Saskatoon and Scott, 2014-15

Numbers above bars indicate # of site-years
Emergence Timing for Kochia

Cumulative Growing Degree Days (Base Temperature 0 C.)

Kochia Emergence (%)

Early May pre-seed burnoff timing
Focus herbicide

• Registered in corn, soybean and now wheat (spring & winter, not durum)

• Combination of carfentrazone (AIM – Group 14), and pyroxasulfone (Group 15).

• Strength - Highly effective in controlling Downy and Japanese brome in winter wheat!
Pyroxasulfone

• Pyroxasulfone is soil active, works on emerging weeds.
• Requires moisture to control weeds.
• Dry spring reduces efficacy: can result in total failure.
Focus herbicide

• Peas and lentils have exhibited good tolerance, pea tolerance > lentil tolerance.
• Chickpea tolerance is very good as well.
• For the past two years, studies at Scott, Sk found that fall application has resulted in better control of wild oats than spring application.
  • If spring moisture is good, spring application is equal or slightly better than fall, but fall application lower risk of failure.
Fall vs Spring Pyroxasulfone (Focus) Scott 2014

% Control

Wild oat
Cleavers

Scott Data
Fall vs Spring Pyroxasulfone (Focus) Scott 2014

Wild oat

% Control

Fall 50  Fall 100  Fall 150  Fall 200  Fall 300  Fall 400 gai/ha  Spring 50  Spring 100  Spring 150  Spring 200  Spring 300  Spring 400

Scott Data
Pyroxasulfone in field pea
Wild Oat Control Ratings Scott, 2010-12

<table>
<thead>
<tr>
<th></th>
<th>May (mm)</th>
<th>June (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>121</td>
<td>146</td>
</tr>
<tr>
<td>2011</td>
<td>32</td>
<td>81</td>
</tr>
<tr>
<td>2012</td>
<td>53</td>
<td>185</td>
</tr>
<tr>
<td>LTA</td>
<td>36</td>
<td>60</td>
</tr>
</tbody>
</table>

Pyroxasulfone rate (g ai/ha)
Focus herbicide

• Has been very effective on cleavers in soils with 3 to 5% organic matter (provided adequate moisture to activate product).
• Level of other weeds controlled can be quite variable.
Focus herbicide

• What should your expectations be?
  • Wild oats – about 70% control; however, can range from 40 to >90% control;
  • Wild mustard – around 50% control (I have limited data on this);
  • Kochia – any level of control is a bonus.
Pyroxasulfone – Wild Oat Control Summary Scott, SK. 2008 - 2012

% Visual Control

Rate g ai/ha

Max
Min
Mean

# Data Points

3 11 7 11 9

Max
Min
Mean

# Data Points
Pyroxasulfone – Cleaver Control Summary Scott, SK.
2008 - 2012

% Visual Control
Rate g ai/ha
Max
Min
Mean

# Data Points

Pyroxasulfone – Cleaver Control Summary Scott, SK. 2008 - 2012

% Visual Control
Rate g ai/ha
Max
Min
Mean

# Data Points
Pyroxasulfone – Green Foxtail Summary Scott, SK.
2008 - 2012

% Visual Control
Rate g ai/ha
Max
Min
Mean

# Data Points

- Max
- Min
- Mean

# Data Points
Pyroxasulfone – Kochia Summary Scott, SK. 2008 - 2012

![Graph showing % Visual Control vs Rate g ai/ha with data points at 100, 125, 150, and 200 g ai/ha.]

- Max
- Min
- Mean

# Data Points

- 5
- 7
- 8
- 5
Lentil Desiccation Trials

• Conducted by T. Zhang, M.Sc.
• Evaluate contact herbicides applied alone or in combination with glyphosate and effect on lentil crop desiccation, seed yield, and glyphosate residues.
• Conducted at Scott Research Farm and Saskatoon from 2012 and 2013.
Lentil Desiccation Study

- Products Studied
  - Pyraflufen-ethyl – 1X and 2X
  - Valterra (flumioxazin) – 1X and 2X
  - Heat (saflufenacil) – Low and High rate
  - Reglone (diquat) – Low and High Rate
  - Good Harvest (glufosinate) – Low alfalfa rate (0.81 liter/acre) and 2X (1.62 liter/acre). Registered rate for lentil desiccation is 1.09 liter/acre)
  - All products were evaluated by themselves and in tank-mixes with Roundup (the old 1 liter/acre rate)
Effect of herbicides on desiccation of lentil (Mean of 6 SK locations)
Glyphosate residues in Lentil Seed

• Glyphosate residues were below the Canadian MRL of 4 ppm at 4 site-years where tested (sometimes as low as 0.1 ppm).

• Tank-mixing glyphosate with Good Harvest or Reglone resulted in lower glyphosate residues in the seed than glyphosate alone.
Field Pea
Herbicide Layering

• Using both pre- and post-emergent herbicides of different modes of action to reduce risk of weed resistance and improve overall weed control.

• Have focused on controlling Group 2 resistant cleavers on soils with organic matter > 5%
Group 2 Resistant Cleavers Control
Rosthern 2014

- Edge
- Heat
- Authority Low
- Authority High
- Command Low
- Command Med
- Command High
- Viper
- Basagran
- Edge fb Heat
- Edge fb Authority
- Edge fb Viper
- Heat fb Viper
- Authority High fb Viper
- Command Low fb Viper
- Command Med fb Viper
- Command High fb Viper

Control

Rosthern 2014
Group 2 Resistant cleavers control Rosthern 2015

- Authority 210
- Authority 280
- Command Low
- Command Med
- Command High
- Basagran 0.4X
- Basagran 1.0X
- Viper
- Authority 210 fb Bas 0.4X
- Authority 280 fb Bas 0.4X
- Command Low fb Bas 0.4X
- Command Med fb Bas 0.4X
- Command High fb Bas 0.4X

% Visual Control

% Visual Control
Group 2 Resistant cleavers control Rosthern 2015
Cleavers biomass in glufosinate tolerant canola (2013 & 2014) Scott, Saskatoon, Rosthern

Note: Means with the same letter in the same row are not significantly different (P>0.05). The multi-treatment comparisons using Tukey method. SEM = standard error of mean.
Cleaver contamination in glufosinate tolerant canola (2013 & 2014)
Symptoms from clomazone (Command) – Group 13
Symptoms from clomazone (Command) – Group 13
Yellow Flash in Field Pea from Odyssey

- Looked at effect of timing
- Applied 2X rate of Odyssey at 1-2 node, 5-6 node, and >8 node at Saskatoon, 2014 and 2015.
Pea tolerance to Odyssey timing – 2X rate -2014
Mean of 2 cultivars (CDC Golden and CDC Sage)
Pea tolerance to Odyssey timing – 2X rate -2014
Mean of 2 cultivars (CDC Golden and CDC Sage)
Odyssey applied to CDC Golden at 2X rate 1-2 node 2015

Odyssey applied to CDC Golden at 2X rate at >8 node - 2015
Fababean
Fababean – Data generated for potential Minor Uses

- Heat – pre-seed
- Authority – pre-seed
- Viper – post-emergence
- Heat and Heat / glyphosate - desiccation
Acknowledgements

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