Pyroxasulfone: A New Herbicide

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Outline

- Problem
- Pyroxasulfone
- Registrations
- Completed research
- Ongoing research in Canada
- Low risk of potential selection for resistance
- Summary
Problem

- Herbicide resistance in Canada is increasing
- 29% of agricultural farmland in Canada occupied by herbicide resistant weeds (Beckie et al 2013)
- Group 2 herbicide resistance is most common
- Problematic in crops where dominant use is Group 2 herbicides
  - Peas
Pyroxasulfone

- Group 15 herbicide
- PRE-seeding or PRE-emergence applied herbicide
- No incorporation needed
- Symptoms include
  - Dark green coloration
  - Stunting
  - Epinasty
  - Cessation of growth
- Requires soil moisture
- Affected by organic matter
Registrations

- Australia: Wheat and Triticale
- USA and Canada: Corn and soybean

- Registrations for both pyroxasulfone alone
  - Flumioxazin
  - Carfentrazone
Completed Research

- Tolerant crops:
  - Winter wheat
  - Sweet corn
  - Sunflower
  - Potatoes

- Efficacy has been shown on:
  - Lamb’s quarters
  - Green foxtail
  - Barnyardgrass
  - Redroot pigweed
  - Wild buckwheat
Japanese and Downy Brome Control in Winter Wheat

• Studies conducted at 3 locations: Coalhurst, AB, Lethbridge, AB, and Scott, SK in 2012-13

• Treatments:
  ▫ Untreated
  ▫ Simplicity 15 g ai/ha Fall and Spring POST
  ▫ Everest DG 30 g ai/ha Fall and Spring POST
  ▫ Everest SC 30 g ai/ha Fall and Spring POST
  ▫ Varro 5 g ai/ha Fall and Spring POST
  ▫ Valterra (Flumioxazin) 88 g ai/ha PRE-SEED
  ▫ Pyroxasulfone 112 g ai/ha PRE-SEED
  ▫ Pyroxasulfone 150 g ai/ha PRE-SEED
  ▫ Fierce (Pyroxasulfone at 112 g ai/ha + Flumioxazin 88 g ai/ha) PRE-SEED

Johnson and Beres 2014
Winter Wheat Visual Injury

% Visual Injury

- Untreated
- Simplicity Fall
- Simplicity Spr.
- Everest DG Fall
- Everest DG Spr.
- Everest SC Fall
- Everest SC Spr.
- Varro Fall
- Varro Spr.
- Valterra
- Pyroxasulfone 112
- Pyroxasulfone 150
- Fierce

Johnson and Beres 2014
Japanese Brome Control in Winter Wheat

% Control

- Untreated
- Simplicity Fall
- Simplicity Spr.
- Everest DG Fall
- Everest DG Spr.
- Everest SC Fall
- Everest SC Spr.
- Varro Fall
- Varro Spr.
- Valterra
- Pyroxasulfone 112
- Pyroxasulfone 150
- Fierce

Johnson and Beres 2014
Downy Brome Control in Winter Wheat

![Bar chart showing % control of downy brome with different treatments]

Johnson and Beres 2014
Cleavers and Wild Oat Control in Peas

- Tidemann et al (2014)
- 5 locations in Alberta and Saskatchewan
- Fall 2011 through 2012 growing season
- Organic matter ranges from 2.9%-10.6%
- Fall and spring applications
- 0, 50, 100, 150, 200, 300 and 400 g ai ha$^{-1}$
Fall vs Spring Results

- Fall and spring applications effective
  - No advantage when compared
- Organic matter affected effective pyroxasulfone rates
  - Higher organic matter, higher rates
- Rates differed between cleavers and wild oat
  - Wild oat: Efficacy starts at low rates, never better than ~80%, variable
  - Cleavers: Can be controlled 100%, rate dependent on location/OM
Organic matter (%)

Estimated ED50 rate (g ai ha\(^{-1}\))

Scott Fall
Scott Spring
Kernen Fall
Kernen Spring
Kinsella Fall
Kinsella Spring
Melfort Fall
Melfort Spring
Ellerslie Fall
Ellerslie Spring

Cleavers

Wild Oat

\[ y = 24.081x + 59.952 \]
\[ R^2 = 0.401 \]

\[ y = 33.675x - 61.935 \]
\[ R^2 = 0.691 \]
Pea Injury

- Scott and Kernan
  - Lowest OM
  - Nearly 200% normal rainfall
- Yield reduction
  - Higher rates than weed control
- No injury previously recorded
  - Rates up to 200 g ai ha$^{-1}$

Photo Credit: K.L. Sapsford
Other research

- Interaction of pyroxasulfone and Authority (Sulfentrazone)
  - Will be marketed as a combined herbicide by FMC
- Effect of organic matter on pyroxasulfone efficacy
- Control of kochia (variable) and green foxtail (excellent)
Low Risk of Selection for Resistance to Pyroxasulfone

- 4 species resistant to Group 15’s world wide (Heap 2013)
- Cross resistance to prosulfocarb and triallate in Australian Rigid Ryegrass (Busi and Powles 2013)
- Have triallate resistant wild oats
  - 8% of sampled fields (Beckie et al 2013)
- Triallate resistant wild oats cross resistant?
Summary

- Pyroxasulfone new Gr. 15
- Potential use in peas, wheat, winter wheat
- Requires moisture
- Control of HR weeds
  - Wild oat, cleavers, kochia (variable)
- Unique mode of action in terms of herbicide rotation
- Risk of HR evolving/existing?
- Expect registration in peas in 2015, wheat and winter wheat 2014
Funding

FMC

Agriculture and Agri-Food Canada  Agriculture et Agroalimentaire Canada

NSERC CRIS
References


• Johnson EN, Beres B (2014) Japanese and Downy Brome Control in Winter Wheat

Thank You