PPO inhibitors as new herbicides in lentil production

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Lentils in Saskatchewan

- 95% of Canadian lentil production
- World leading exporter since 1995
- Lentil very poor competitor
- Weeds cause up to 17% yield losses

Source: CanStat
PPO inhibitors

- Group 14 herbicides
- Protoporphyrinogen IX oxidase (PPOX)
- “Light requirement”
- Low number of resistant weeds
- Focus on sulfentrazone (Authority®) and Fluthiacet-methyl (Cadet®)

Source: http://grist.org/
Sulfentrazone

- Soil applied, pre-emergent herbicide
- Activity depends on soil pH and organic mater
- Registered crops

  Chickpeas; Garbanzo Beans; Field Pea; Soybeans; Sunflowers; Flax

- Recroping restriction for lentil - 24 months (revised 2014)
- Controls: Kochia, Lamb’s quarters, Wild buckwheat and Redroot Pigweed
Sulfentrazone

Effect of sulfentrazone rate on control of broadleaf weeds in chickpea. Error bars represent the range of control values. n = number of site-years of data collection from 2002-2005.

Courtesy of Eric Johnson
Effects of sulfentrazone on lentil

Two year study (2011, 2012) in two locations (Saskatoon and Scott)

Injury rating after 280g ai/ha of Sulfentrazone at Saskatoon (2011)

Yield data for Saskatoon and Scott (2011-2012)
Electrolyte leakage assay (ELA)

ELA of seven lentil varieties with 100 µM concentration of Sulfentrazone

% of electrolyte leakage

- Redberry
- Sedley
- Improve
- KR1
- Maxim
- Rosetown
- Impala
Fluthiacet-methyl

- Not registered in Canada
- Foliar applied, post-emergence herbicide
- In USA registered crops:
  
  **Corn and soybean**

Controls: Kochia, Waterhemp, Lamb’s quarters, Wild buckwheat, Velvetleaf, Pigweed, etc.
Effects of Fluthiacet-methyl on lentil

Two year study (2011, 2012) in two locations (Saskatoon and Scott)

Injury rating after 8 g/ha of Fluthiacet-methyl at Saskatoon (2011)

Yield data for Saskatoon and Scott (2011-2012)
Dose response study

Fluthiacet-methyl rates: 0, 0.5, 1, 2, 4, 8, 16, 32, 64 and 128 gai/ha

Improve: \( GR_{50} = 32 \) gai/ha

Rosetown: \( GR_{50} = 1.7\) gai/ha
Current work

- Screening diverse lentil germplasm and validating selections
Conclusion

- Genetic diversity to the effects of PPO inhibitors exist in lentil germplasm

- The next step is understanding genetics which controls lentils response to PPO inhibitors

- The goal is to provide essential tools and knowledge to the breeders which will lead to development of PPO tolerant lentil varieties

- PPO inhibitors will be part of lentil weed management strategies in near future
Acknowledgements

Prof Kirstin Bett
Prof Christian Willenborg
Prof Albert Vandenberg
Eric Johnson
Ken Sapsford

Field lab crew
Questions?