Sulfentrazone, a potential broadleaf herbicide for flax

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Sulfentrazone

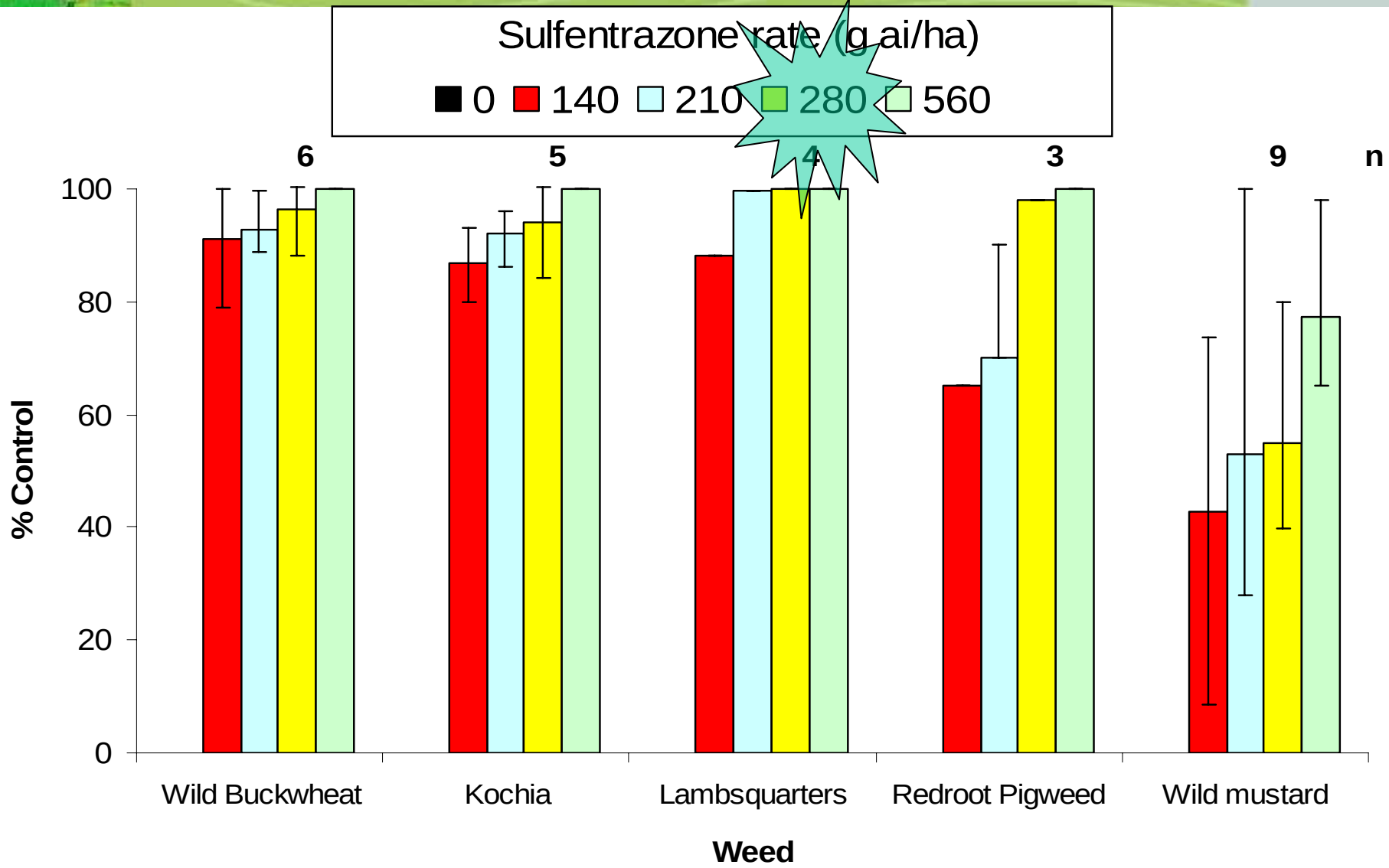
- Trade name in US – Spartan
- Registered on tobacco and sunflower in United States
- Section 18 registration in North Dakota for control of wild buckwheat in chickpea and dry pea.
- Section 18 registration in North Dakota for control of kochia in flax.
- GROUP 14 –
  - Protoporphyrinogen Oxidase (PPO) Inhibitor
    - Enzyme is important in the production of chlorophyll

PPO inhibitors

- **Peroxidation of lipids in cell membrane**
  - **Get cell leakage**
- **Therefore, first symptoms are water soaked lesions followed by necrosis of these lesions**

Sulfentrazone

- **Soil applied – can be tank-mixed with glyphosate at pre-seed or pre-emergence;**
  - **Consistency ??**
    - **fall vs spring application?**
      - **Studies indicate spring application more consistent than fall**
- **Screened for tolerance in chickpea, lentil, dry bean, lupin, and fababean. Also sunflower, flax, and alfalfa seed.**



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

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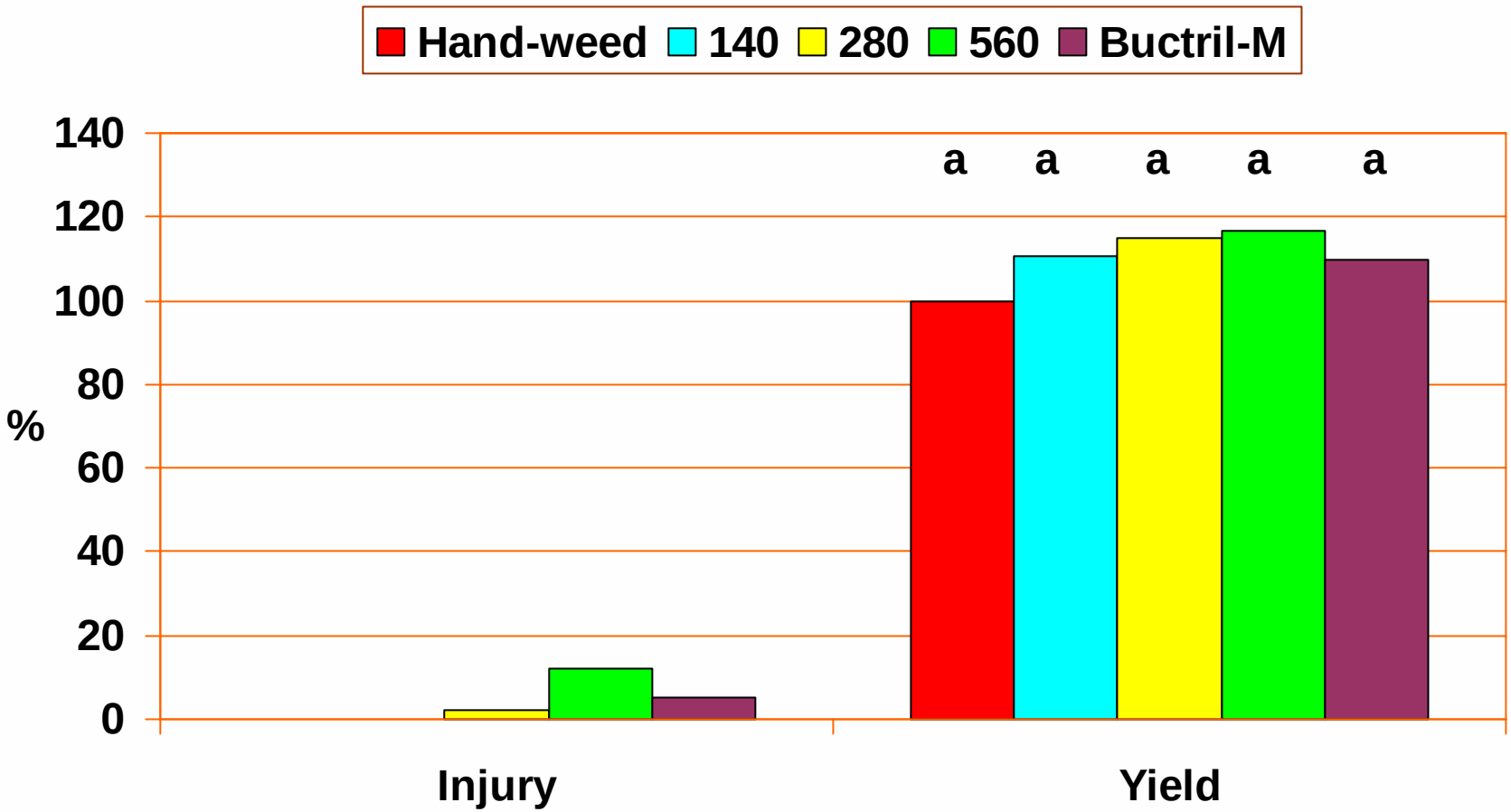
Flax Tolerance to Sulfentrazone

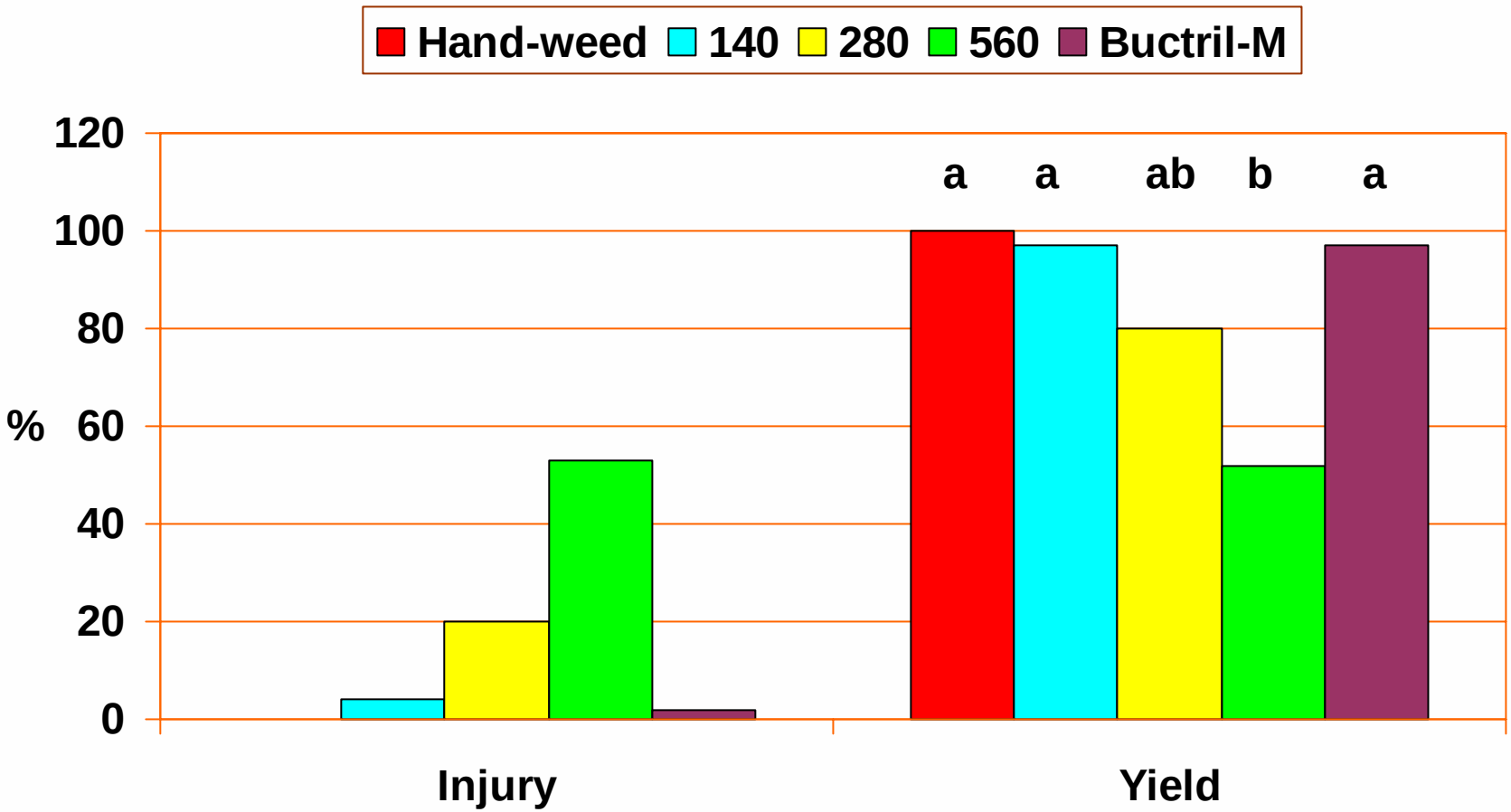
- Is dependent on soil cationic exchange capacity (texture, organic matter) and pH;
  - Cation exchange capacity more important than pH
  - More injury in soils with low CEC; low organic matter, coarse textured soils.
- Moisture is also important. High rainfall after application will increase potential for injury.

Tolerance of Flax to Sulfentrazone. Scott, 2004.



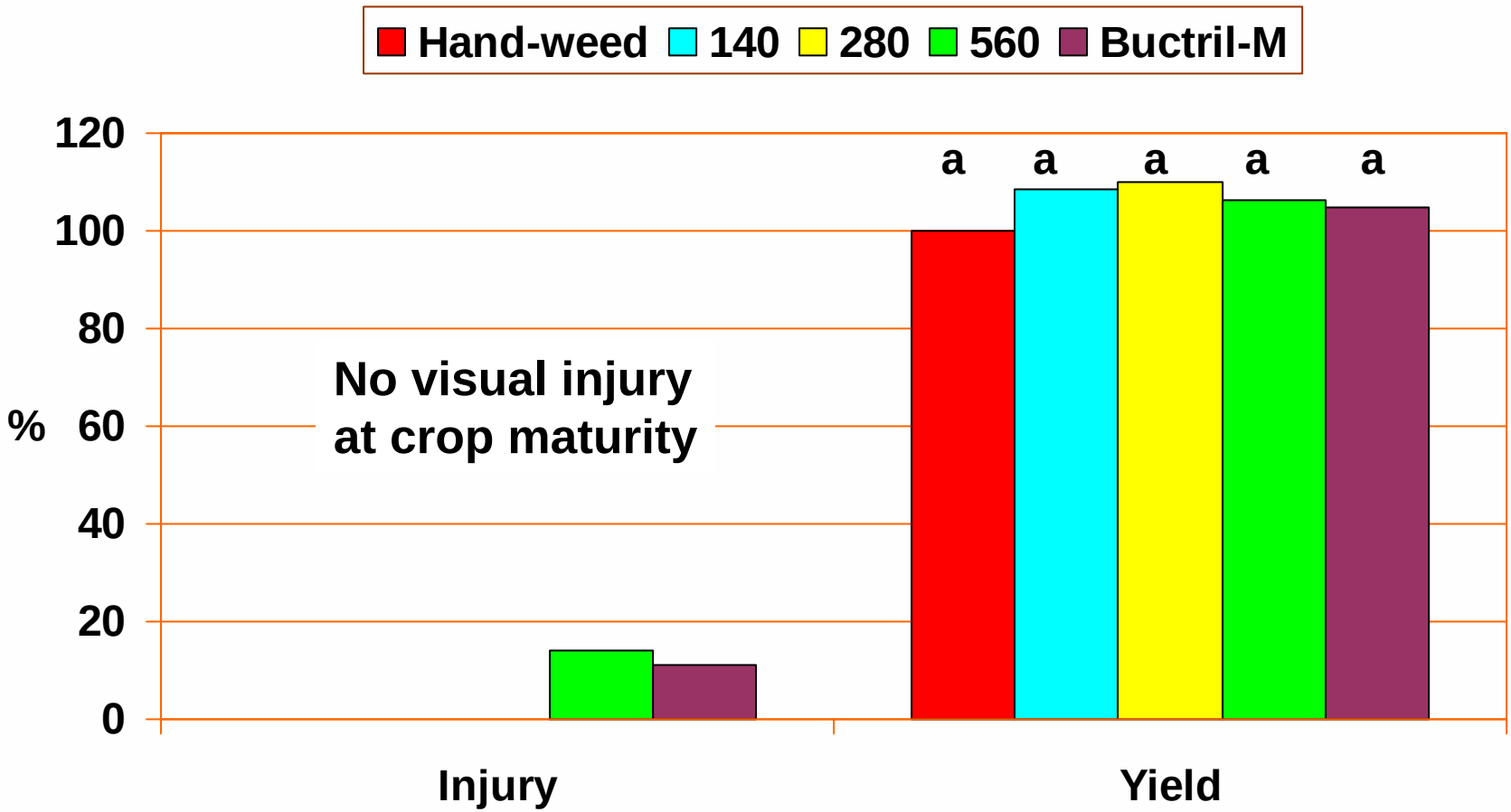
Injury rating – 2nd rating about 21 DAT
Yield expressed as a Percent of Hand-weed check

Tolerance of Flax to Sulfentrazone. Scott, 2005.



Injury rating – 3rd rating near Crop Maturity
Yield expressed as a Percent of Hand-weed check

Tolerance of Flax to Sulfentrazone. Indian Head, 2005.



Injury rating –2nd rating at July 15, 2005
Yield expressed as a Percent of Hand-weed check

2006 flax results

- Tolerance and weed control studies conducted at Lethbridge, AB; Scott, SK, Melfort, SK, Saskatoon, SK (2 soil types), Indian Head, SK, and Brandon, MB
- Studies were funded by SaskFlax. Will be repeated in 2007.
- Rates evaluated ranged from 35 to 560 g ai/ha

2006 results - Tolerance

- Lethbridge
  - No injury observed
- Scott
  - Unacceptable injury at rates > 280 g ai/ha. In one study, marginal tolerance at 140 g ai/ha
- Saskatoon (Silty clay loam soil)
  - Acceptable tolerance at all rates
- Saskatoon (clay soil)
  - Some injury at highest rate, but no reduction in plant stand or yield

2006 results - Tolerance

- Melfort
  - Injury observed at highest rate; but no yield reduction
- Indian Head
  - No injury recorded at any rate
- Brandon
  - Unacceptable crop injury at highest rate early in the season; but crop recovered and no yield reduction.

2006 Results – Weed Control

- Target weed was redroot pigweed.
- Lethbridge
  - Redroot pigweed and Kochia was controlled at rates of 35 to 70 g ai/ha; Wild buckwheat controlled at 140 g ai/ha.
- Scott
  - Redroot pigweed and wild buckwheat controlled at 70 g ai/ha; kochia and redroot pigweed controlled at 140 g ai/ha
- Saskatoon
  - Weed control was good at both sites but was better on the clay soil. Clay soil – rates of 70 g ai/ha controlled RR pigweed, wild buckwheat, and Russian thistle.
  - Silty-clay loam soil. Rates of 140 g ai/ha controlled RR pigweed, and 280 g ai/ha to control wild buckwheat.

2006 Results – Weed Control

- Melfort
  - On this high organic matter soil (10 to 12% organic matter) redroot pigweed was not adequately controlled at any rate. Highest rate (560 g ai/ha) provided only 50 to 60% control of RR pigweed (primary weed present).
- Indian Head
  - Redroot pigweed and wild buckwheat controlled at rates of 70 to 140 g ai/ha.
- Brandon
  - Not enough weeds present to evaluate weed control.

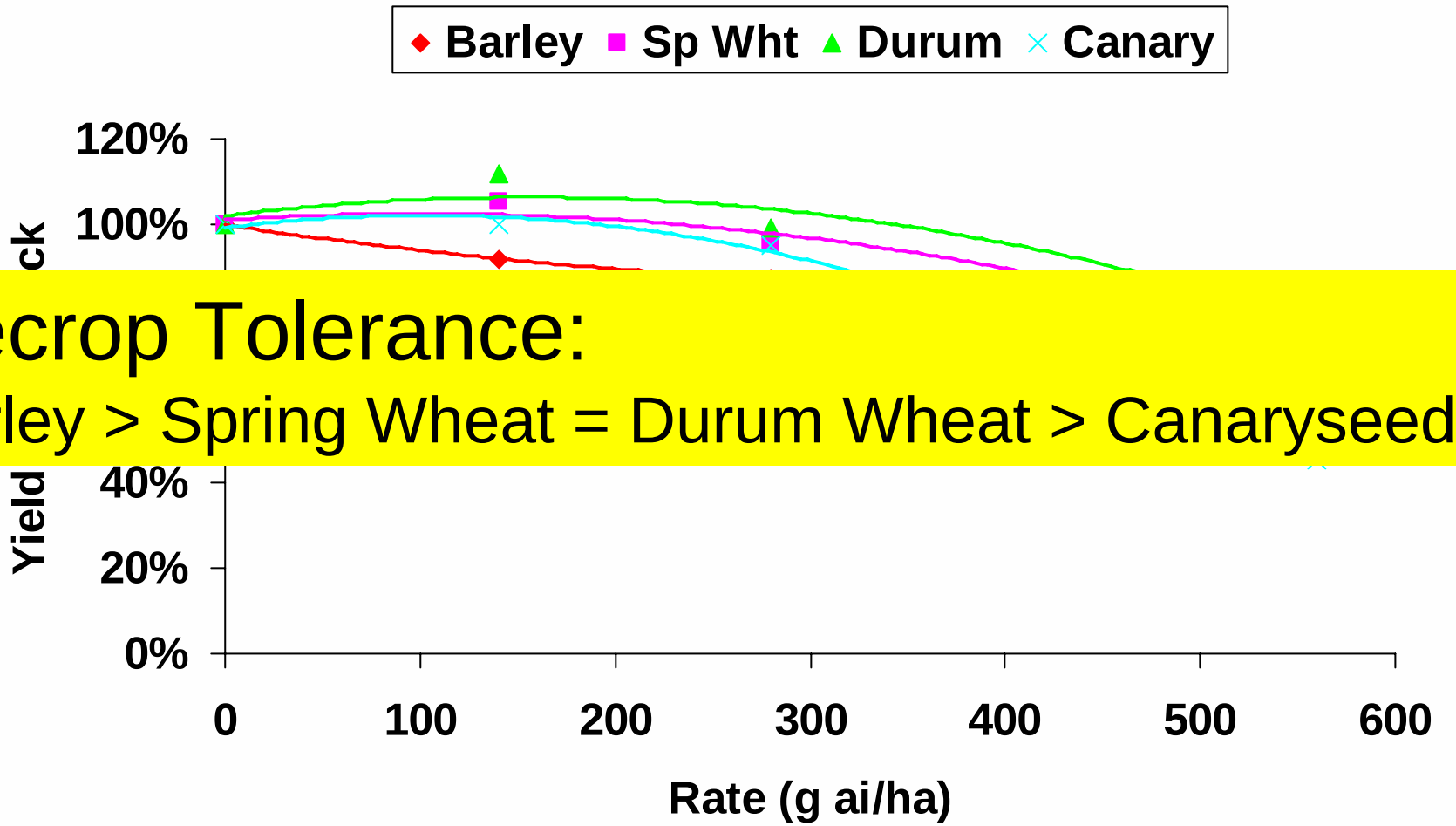
General conclusions from 2006

- On most soils, rates of 140 g ai/ha or less were adequate to control redroot pigweed, wild buckwheat, and kochia. This is a rate that is safe to flax even at a 2 times that rate (overlaps).
- On high organic matter soil at Melfort, concern over lack of control (herbicide bound to soil?). More evaluations required, particularly in Manitoba Red River Valley

Sulfentrazone Carryover

- Re-cropping studies underway
- Higher carryover potential on high soil pH
- Higher carryover in soils with low cation exchange capacity – more important than soil pH (Kerr et al. 2004)

Effect of sulfentrazone residues on cereal recrops. Scott 2006.



Recrop Tolerance:

Barley > Spring Wheat = Durum Wheat > Canaryseed

Sulfentrazone – Recropping Issues

- Requires a lot more work
- Injury to lentil noticed 3 years after application at Scott (1X rate).

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Status of Sulfentrazone

- Nufarm has signed marketing agreement with FMC to market sulfentrazone in Canada
  - Possible 2007 registration??

BOTTOM LINE – Sulfentrazone

- Still a lot of work to do
  - Need more studies to determine lowest effective rates for various soil types.
  - More re-cropping work required.
  - Once sulfentrazone registered, need intensive extension program on its use, expectations, and re-cropping.

ACKNOWLEDGEMENTS

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PESTICIDE RISK REDUCTION PROGRAM

SASKATCHEWAN PROVINCIAL MINOR USE PROGRAM

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Carfentrazone-ethyl

Technical Update

Carfentrazone-ethyl

- Group 14 herbicide
  - PPO inhibitor
  - No soil residual / No cropping restrictions
- Expected results
  - Symptoms appear very rapidly (within a few hours)
  - Leaves take on a water soaked appearance, followed by wilting and necrosis
  - Complete death occurs within a few days

Carfentrazone-ethyl – Weed Control

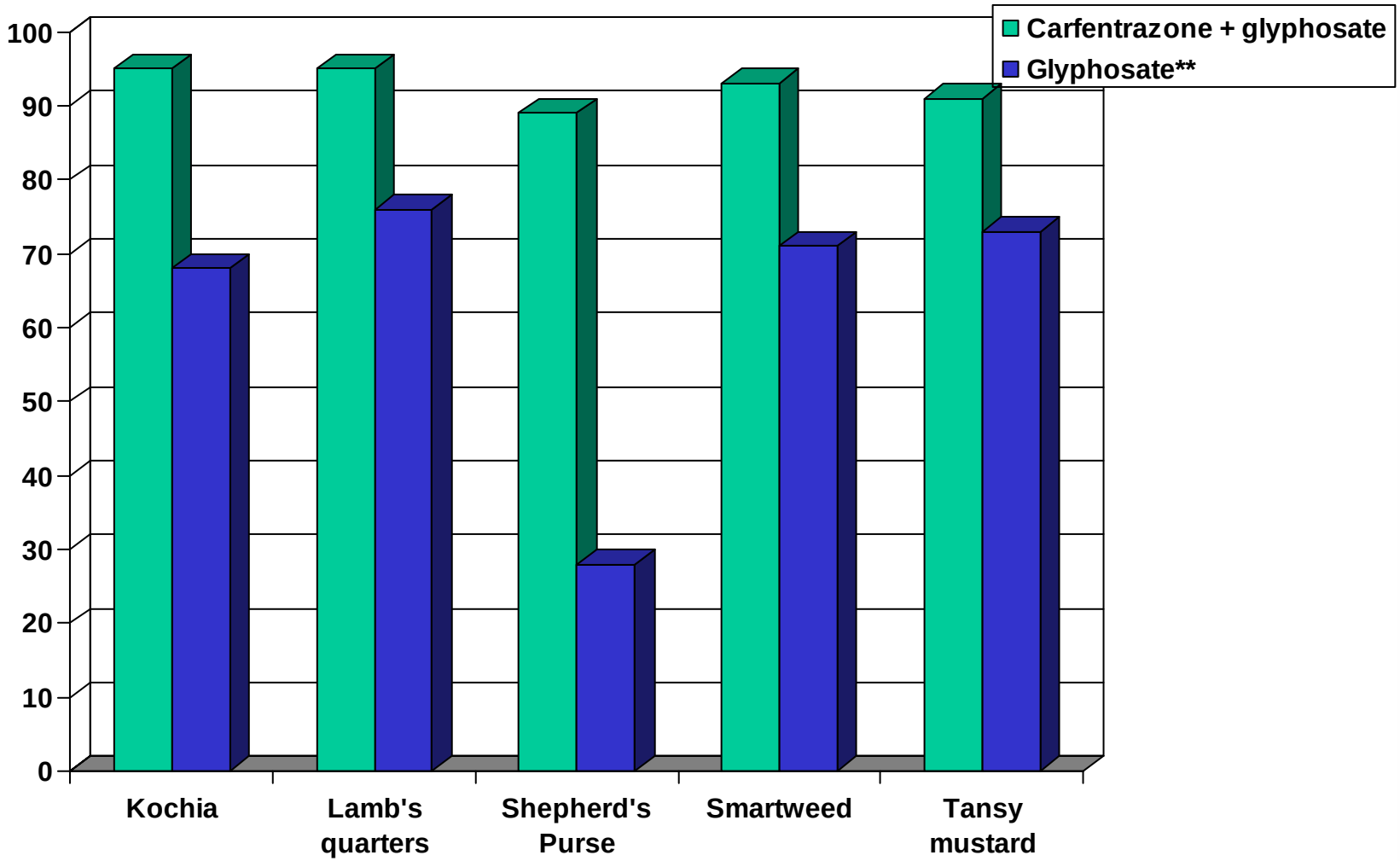
Carfentrazone at 14.8 mL/ac + glyphosate at 0.5 L/ac (356 g/L formulation)

(spring preseed burndown application)

- All weeds listed on the glyphosate label

- PLUS increased speed of activity and improved control of:
  - Volunteer canola (including RR, LL, CL)
  - Kochia (including group 2 resistant)
  - Dandelion*
  - Winter annuals

*spring germinating plants only

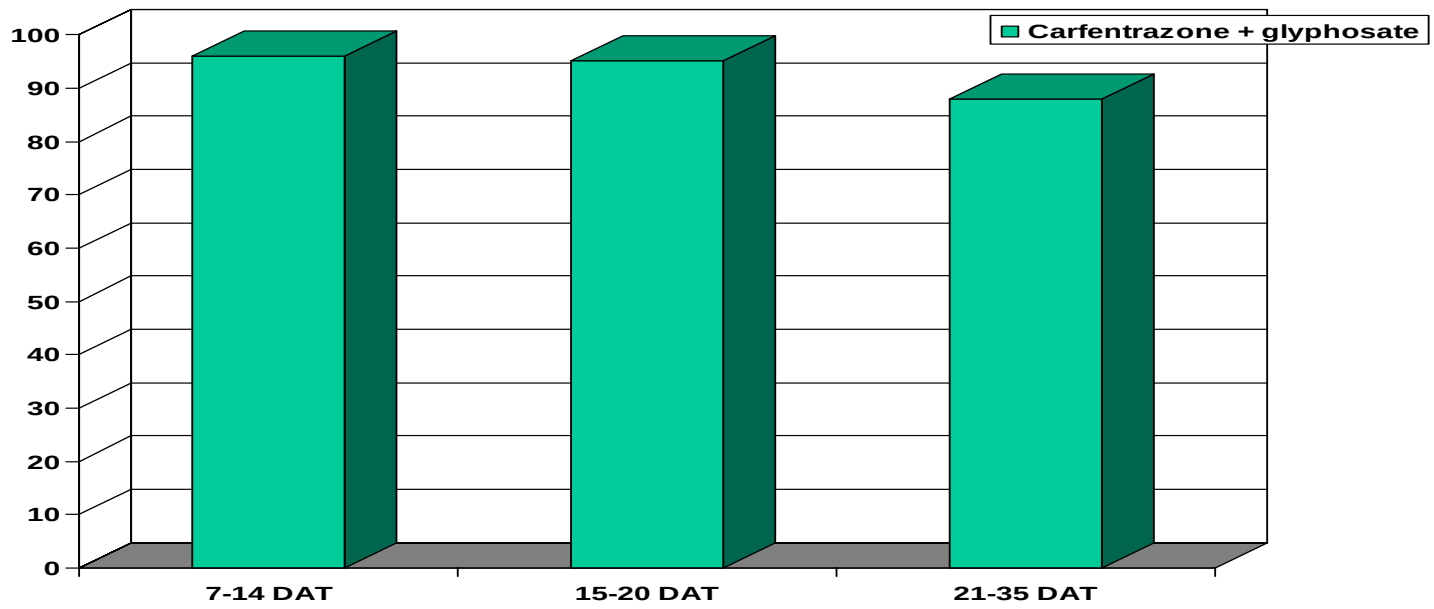


*data referenced comes from trials conducted by FMC Corporation

**glyphosate rate equivalent to 1.0 L/ac of 360 g/L formulation

Ratings taken 3-7 days after treatment

Glyphosate Tolerant Canola control



*data referenced comes from trials conducted by AgQuest Inc.

**plants up to 3 leaf

Carfentrazone-ethyl – No worries

- No soil residual / No cropping restrictions
- Contact herbicide – coverage important
- Crops:

  (prior to seeding/emergence)

  – All pulse crops – such as, peas, lentils, chickpeas, beans
  – Canola
  – Flax
  – Potatoes
  – Sunflowers
  – Wheat, barley, oats

BOTTOM LINE
Sulfentrazone & Carfentrazone ethyl

- Will not solve all weed control problems
- Will give producers additional tools to help manage certain hard to control broadleaf weeds