Herbicide Carryover Affects on Cover Crops

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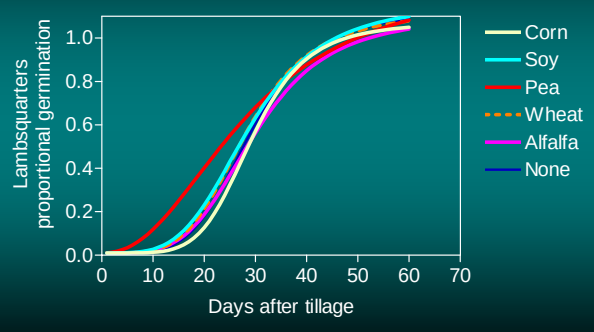
Woodland Draba

Whitlow Grass or Fairy Candelabra

Marestail or Horseweed

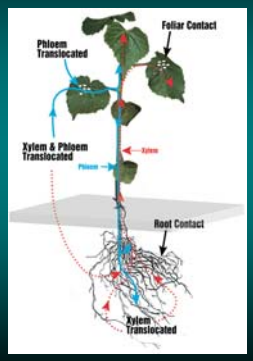
Downy Brome

Effect of Canopies on Weed Germination



Herbicide Carryover Risk: (High Risk)

1. Crop sensitivity
2. Soil
   - pH (> 7.5)
   - Texture (coarse)
   - Organic matter (low)
   - Tillage (no-till)
3. Weather
   - Precipitation (< 15 in)
   - Temperature (cool)
4. Application
   - Date (late spring)
   - Rate (high)



High Risk Areas of Fields

- Hill tops
  - Dry, low organic matter, high pH
- Low areas
  - Too wet for microbial breakdown
  - High pH

Microbial Breakdown: Optimal Conditions

- Most herbicides broke down by microbes
- Anaerobic and aerobic
  - Mostly aerobic (more carryover in flooded soil)
- Moist soil (50 – 100% field capacity)
- Soil pH (5.5 – 7 optimal)
- High soil organic matter
- Warm soil (80 – 90ºF)

D. Devlin et al. 1992. C-707. K-State Univ.

Atrazine Carryover

- High pH (> 7.5)
  - Fewer H^+ available
  - Atrazine maintains neutral charge
  - Less adsorbtion to soil
  - More available to plant

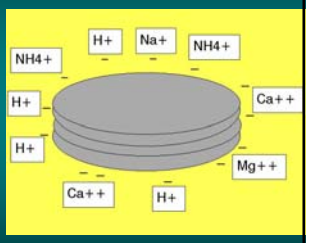
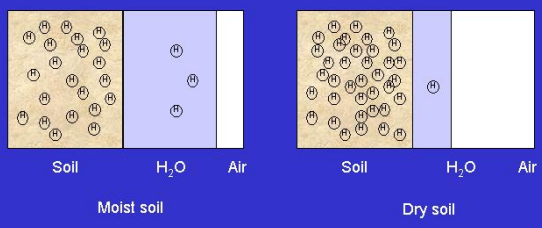
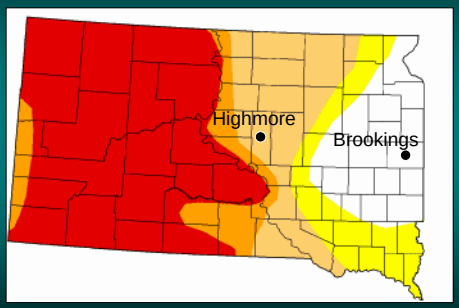


Figure 2. Soil moisture effect on herbicide availability.



R. Hartzler. Iowa State University

2006 September drought map



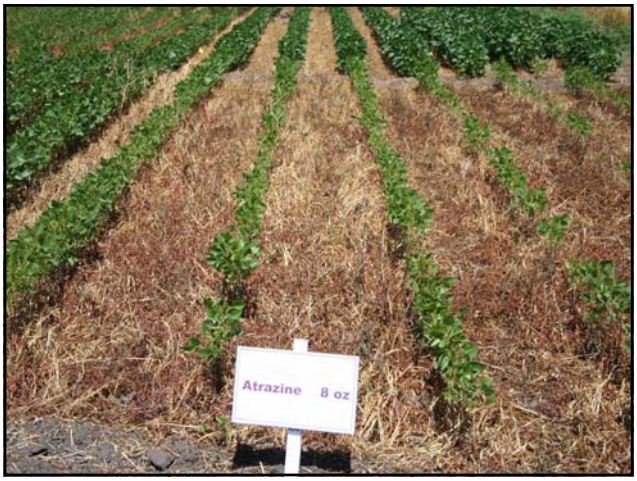
Herbicide	Brookings	Highmore
Bicep Lite II Magnum		
Atrazine applied (lb/A)	1.30	1.30
Atrazine detected (lb/A)	0.14	0.18
Atrazine loss (%)	**89**	**86**
Harness Xtra		
Atrazine applied (lb/A)	0.89	0.85
Atrazine detected (lb/A)	0.14	0.18
Atrazine loss (%)	**84**	**79**

Atrazine loss over summer, 2006.

Atrazine Loss Over Winter, 2006-2007

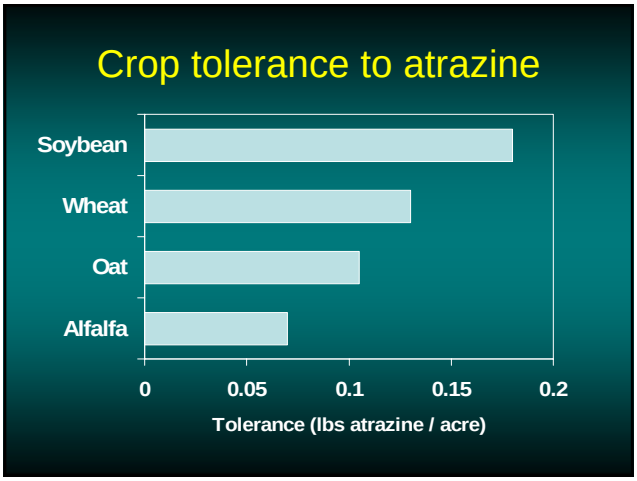
Applied (lb/A)	Soil Analysis Nov. (lb/A)	Soil Analysis June (lb/A)	Loss (%)
3.00	3.30	0.42	87
1.50	1.10	0.26	76
0.50	0.38	0.12	68
0.25	0.28	0.066	76
0.00	0.004	0.019	---

Brookings Agronomy Farm, Applied Nov. 6, 2006.



Atrazine 1 pt

Atrazine 3 pt


Crop tolerance to atrazine
Soybean
Wheat
Oat
Alfalfa
0
0.05
0.1
0.15
0.2
Tolerance (lbs atrazine / acre)

Injury from Photosynthesis Inhibitors

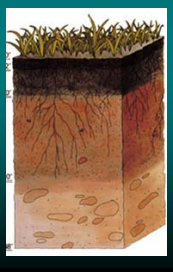
Spartan Tolerance (Most to Least)

1. Soybean (anytime)
2. Flax
3. Chickpea
4. Sunflower (anytime)
5. Field pea
6. Dry edible beans
7. Safflower
8. Canola (24 mo)
9. Lentil

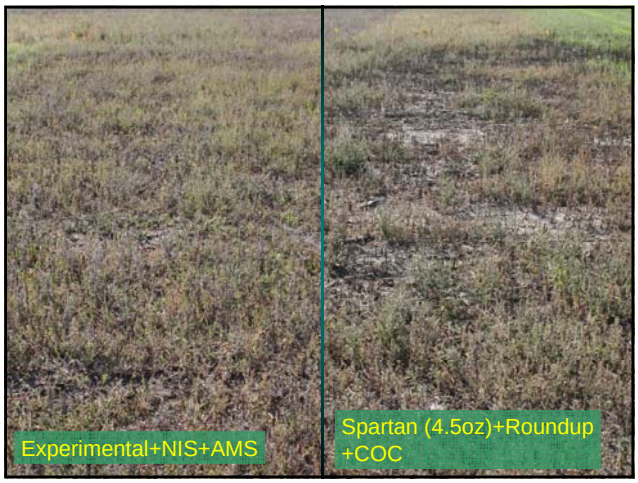
12 mo rotation for crops not on label

Factors Affecting Spartan Availability

- Microbial degradation
  - Moisture, warm temperatures needed
- Soil pH > 6.5
- Low organic matter
- Coarse particle size



Sept. 8, 2006


Experimental+NIS+AMS
Spartan (4.5oz)+Roundup
+COC

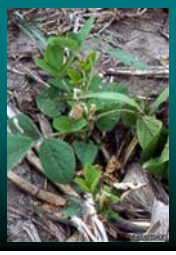
Spartan (4.5oz)+Roundup+COC

"Cheatgrass" Herbicides: Olympus, Maverick

- Northwest US
  - Field pea 12 mo
  - Lentils 18 mo
  - Canola 22 mo
- Must be 24 in precip.
- New herbicide: PowerFlex from Dow

ALS Herbicides for Broadleaves

- Ally (metsulfuron)
  - 22 mo for many crops
  - Breakdown by hydrolysis
- Harmony (thifensulfuron)
  - 45 days
- Express (tribenuron)
  - 45 – 60 days
- Resolve (rimsulfuron)
  - 10 – 18 months



ALS-Inhibiting Herbicides

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"Bleacher" Herbicides

- Corn:
  - PRE: Balance, Radius, Epic
  - POST: Callisto, Laudis, Impact
- Soybean: Command
- Wheat: Huskie
  - 9 months for many crops
- 10 – 18 mo rotation for many crops

"Bleacher" Injury

Microtubule Inhibitors: Prowl, Treflan

- Prowl rotation 12 months
- Treflan rotation 5 months

Growth Regulators

- WideMatch, Curtail
  - 120 days: Brassicas
  - 10.5 mo: Peas
  - 18 mo: Chickpea, lentils
- Status, Distinct
  - 120 days

Rotation Restriction for Pea (Legume)

> 12 Months	12 Months	< 12 Months
Atrazine	Acetochlor	Beyond
Balance Pro	Authority First	Pursuit/Raptor
Radius	Epic	Python
Callisto	Everest	Stout
Lumax		Status
Resolve		Flexstar
		Impact
		Sencor
		Prowl

Rotation Restriction for Canola (Mustard)

> 12 Months	12 Months	< 12 Months
Atrazine	Acetochlor	Resolve
Authority First	Callisto	Status
Radius	Epic	Everest
Pursuit/Raptor	Prowl	
Lumax	Sencor	
FirstRate		
Balance Pro		
Flexstar		
Spartan		

Rotation Restriction for Oat (Grass)

> 12 Months	12 Months	< 12 Months
Atrazine	Acetochlor	Balance Pro
Everest	Authority First	Raptor
Radius	Epic	Callisto
Pursuit	Prowl	Status
Treflan	Spartan	FirstRate
		Flexstar
		Sencor
		Resolve
		Stout

Herbicide Residue Analysis

Oscar E. Olson Biochemistry Labs
South Dakota State University
SAS 133, Box 2170
Brookings, SD 57007-1217
Telephone Number: 605-688-6171
FAX Number: 605-688-6295

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