



# Managing Around Waterhemp Resistance

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# Waterhemp



- Waterhemp is native to Illinois (1948) and Wisconsin
- Waterhemp increased in prevalence throughout the 1990's
- Currently one of the most problematic weed species to agronomic producers in the Midwest
- Two species of waterhemp that are taxonomically recognized common waterhemp (*Amaranthus rudis*) and tall waterhemp (*Amaranthus tuberculatus*)

A vertical strip on the left side of the slide shows a close-up of green waterhemp plants with serrated leaves.

# Challenges with Waterhemp Management

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- Waterhemp identification
- Biology of waterhemp
- Herbicide resistance

# Waterhemp Identification



Smooth Pigweed



Waterhemp

Waterhemp identification was often confused with smooth and redroot pigweed

# Waterhemp Identification



Leaves are somewhat glossy, more elongated than redroot or smooth pigweed



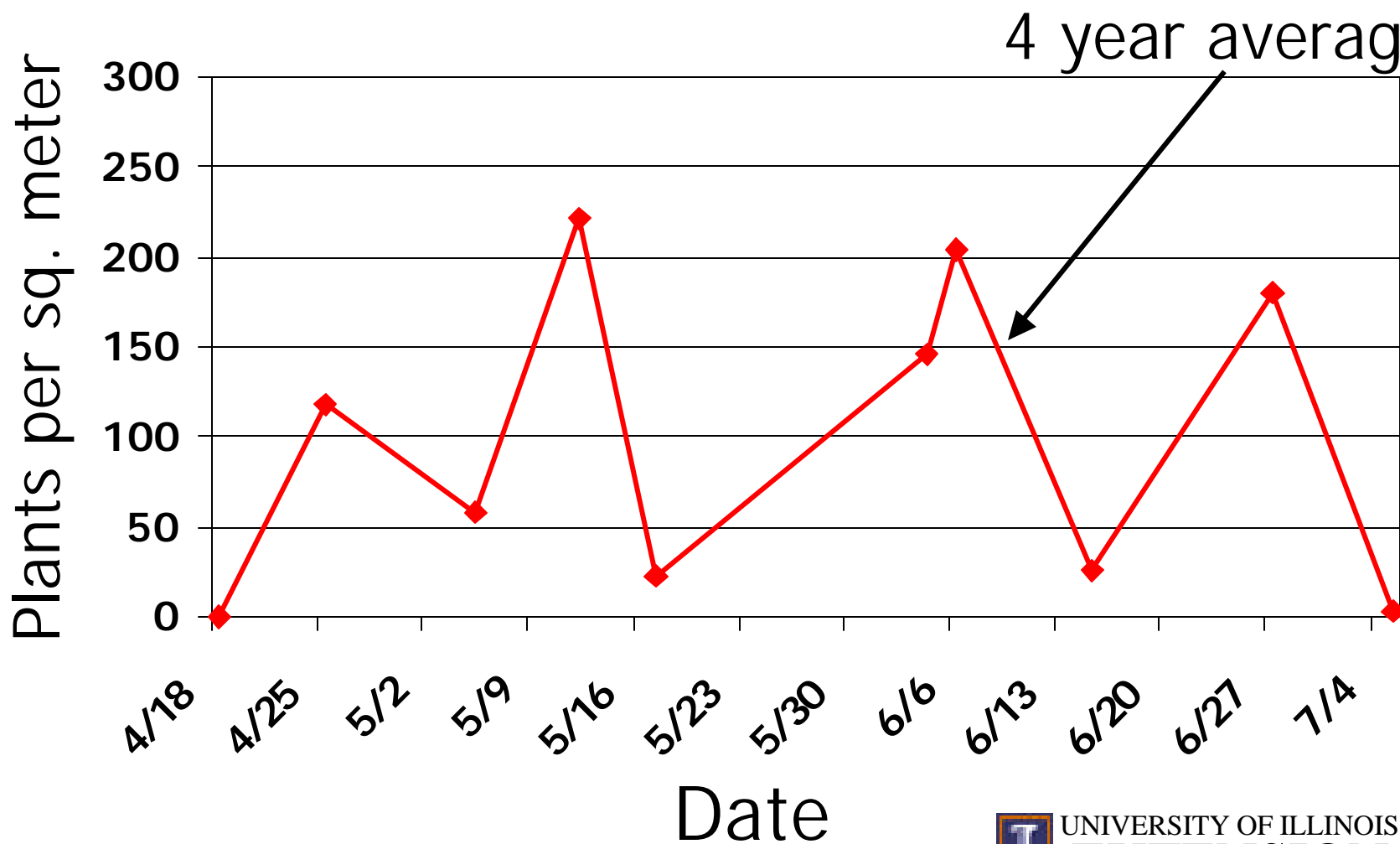
Stem and inflorescence color varies: light green to dark red, even variegated

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# Waterhemp Biology

- Germination and emergence extend longer into the growing season than what is common for other summer annual weeds
  - Presents management difficulties for producers
- Plants produce abundant amounts of seed
  - Amount is influenced by date of emergence
- Dioecious species, that must cross-pollinate to reproduce
  - Increases the genetic diversity of the population

# Waterhemp Emergence







# Shade Tolerance of Waterhemp

- Structures constructed with shade cloth
  - 0, 40%, 67%, and 95% shade
- Seedlings transplanted into shading structures
  - May 23 and June 23
- Destructive plant samples collected biweekly
  - plant height, leaf area, dry weight
- Four plants under each shade level allowed to reach maturity
  - biomass and seed production

# Influence of Shade and Emergence Time on Waterhemp Biomass and Seed Production - 2000

Shade	Emergence Time			
	May 23		June 23	
	Biomass <sup>a</sup>	Seeds	Biomass <sup>a</sup>	Seeds
0	555	1,493,736	172	602,031
40	449	806,599	171	318,117
67	220	367,659	114	92,635
95	2	2	2	4

<sup>a</sup>grams



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# Implications of Extended Waterhemp Emergence

- Soil-applied herbicides do not provide sufficient residual waterhemp control
- Waterhemp sizes may vary greatly at the time of postemergence herbicide application
  - Postemergence herbicides may fail on >6 inch waterhemp
- Waterhemp may emerge after postemergence herbicide applications
  - Many POST herbicides do not have residual waterhemp control

# Influence of Application Timing

Average WH control  
(weeks after planting)

Timing	0	2	4
EPP	95	87	71
PRE	89	72	59

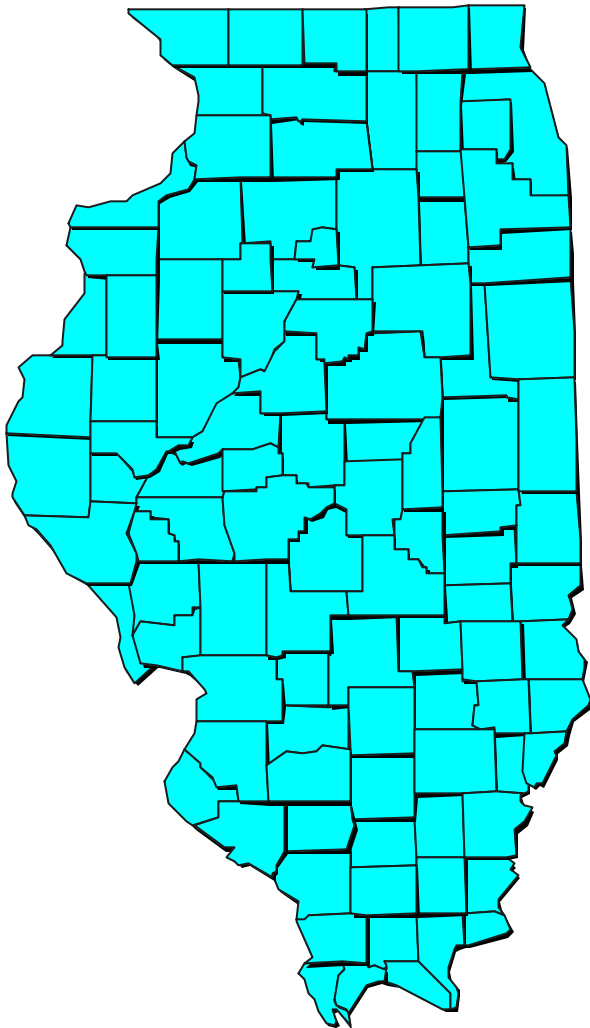
18% greater WH control 4 weeks after soybean planting from PRE application timing compared with EPP timing



# Late Emerging Waterhemp



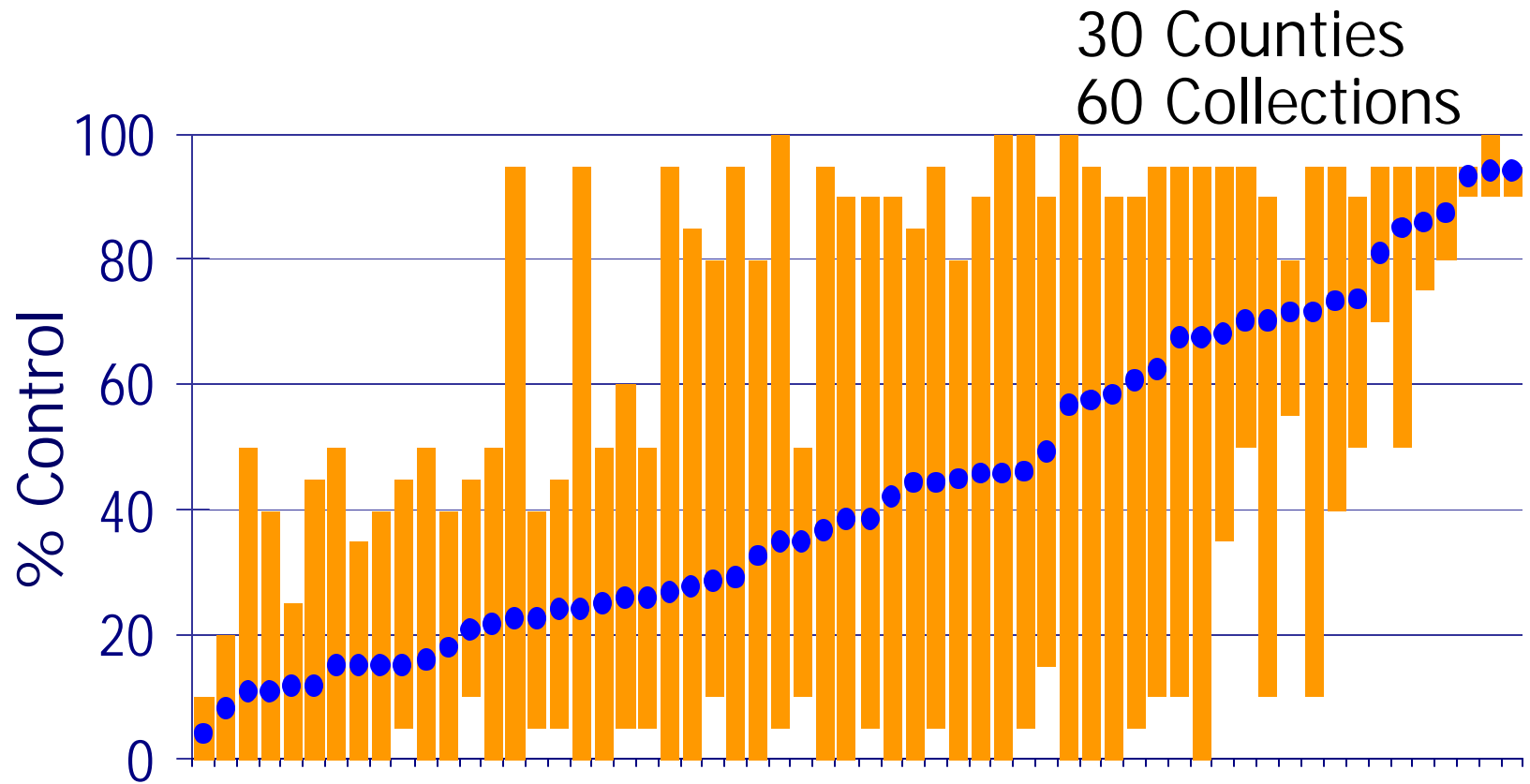
# Herbicide Resistant Waterhemp



- ALS-resistant waterhemp was first confirmed in Illinois in 1992
- ALS-resistant and triazine-resistant waterhemp populations reported in 1996
- Populations of triazine-resistant waterhemp are also present



# Herbicide Response Survey – 1999 and 2000

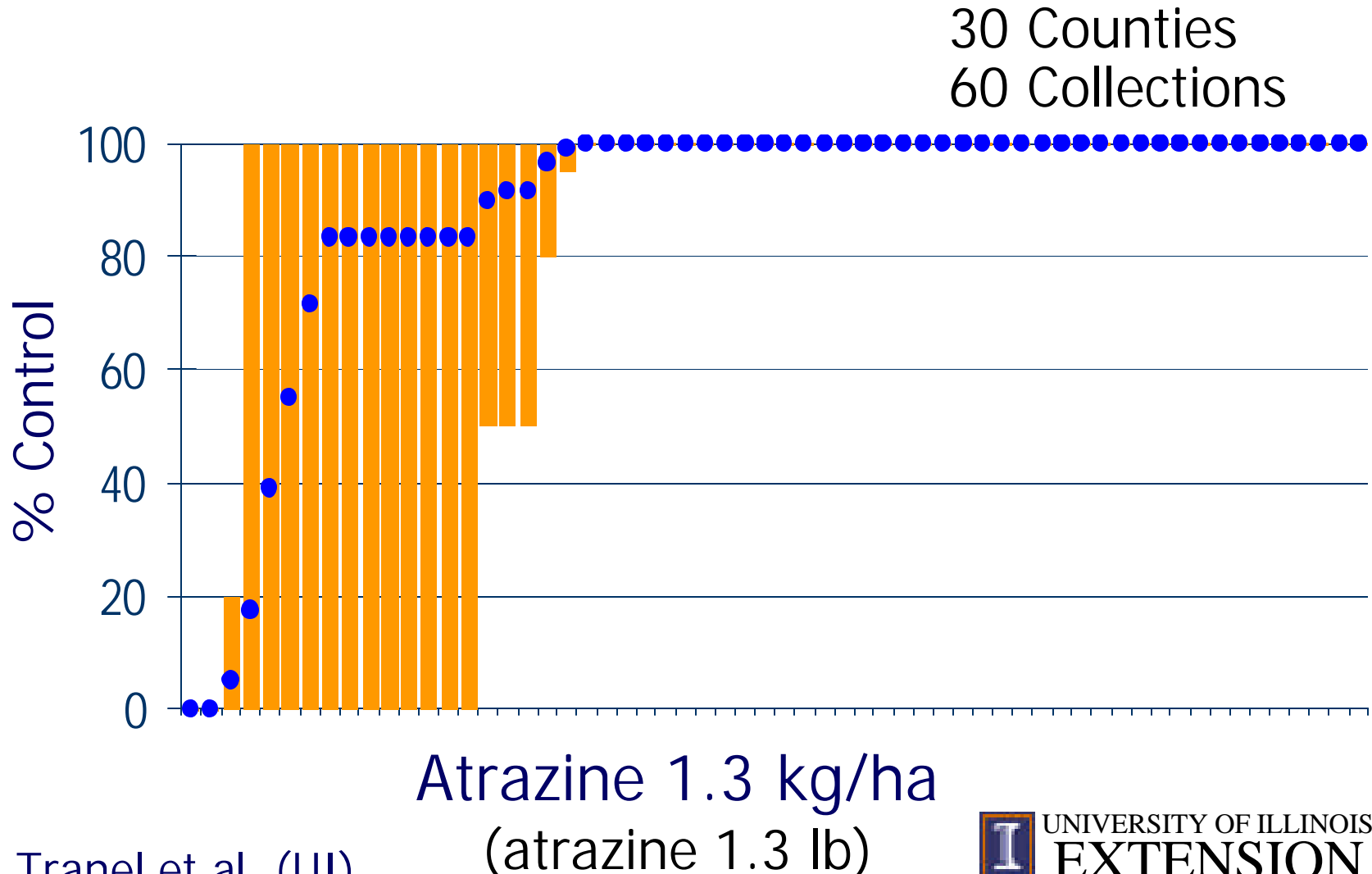


Imazethapyr 35 g/ha

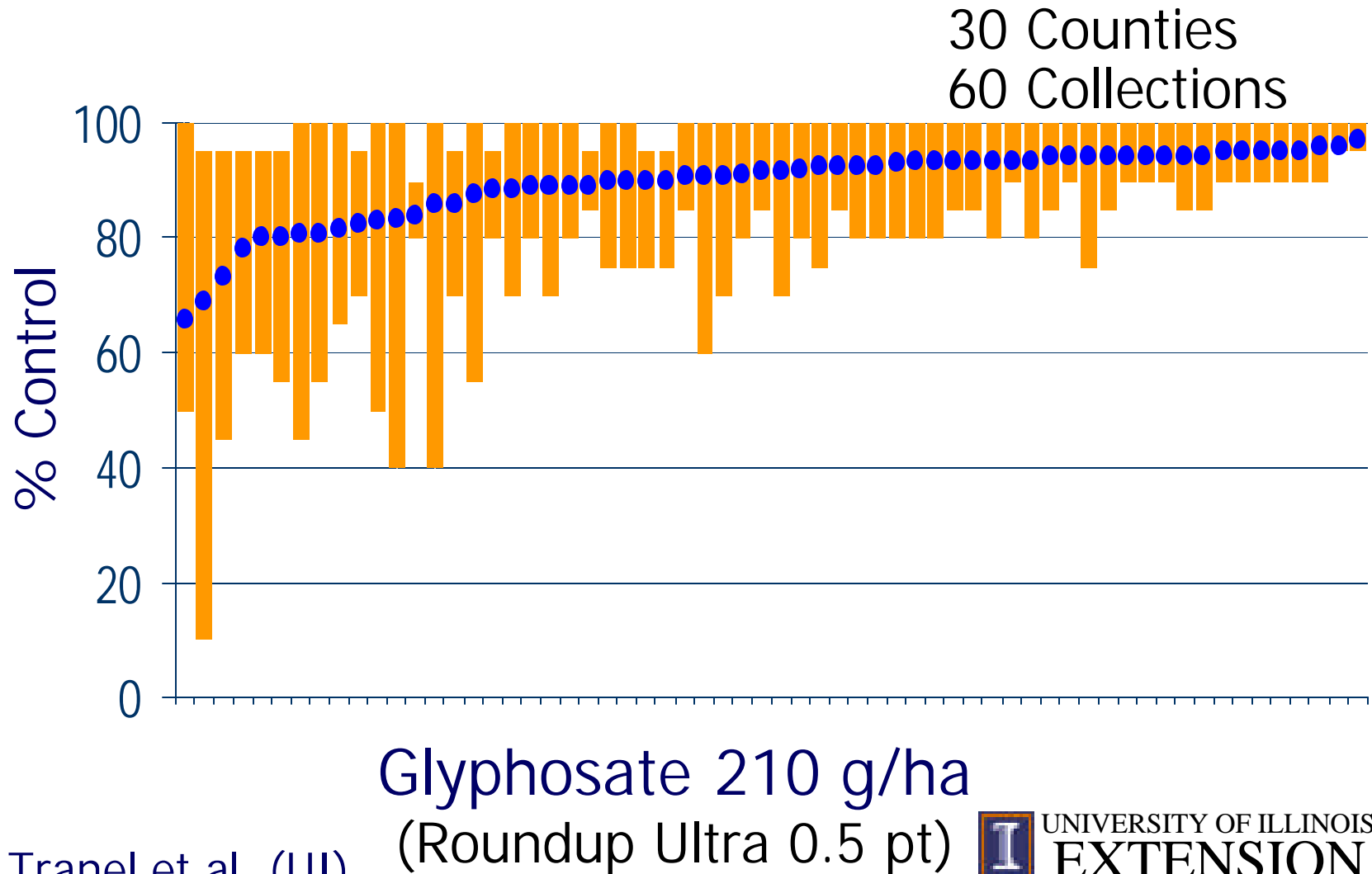
(Pursuit 2 fl oz)



# Herbicide Response Survey – 1999 and 2000



# Herbicide Response Survey – 1999 and 2000



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# Summary of Herbicide Resistance Survey in Illinois

- 90% of waterhemp populations were resistant to ALS-inhibiting herbicides
- ~25% of waterhemp populations were resistant to triazine herbicides
- Several waterhemp populations were identified with reduced sensitivity to glyphosate
  - This is a major concern with the extensive use of glyphosate in Roundup Ready soybeans
- Population of diphenyl ether-resistant waterhemp has been identified in Kansas

A close-up, high-angle photograph of a dense field of waterhemp plants. The plants are characterized by their vibrant green, serrated leaves and upright stems, creating a textured, layered appearance. The lighting is bright, highlighting the natural green tones of the vegetation.

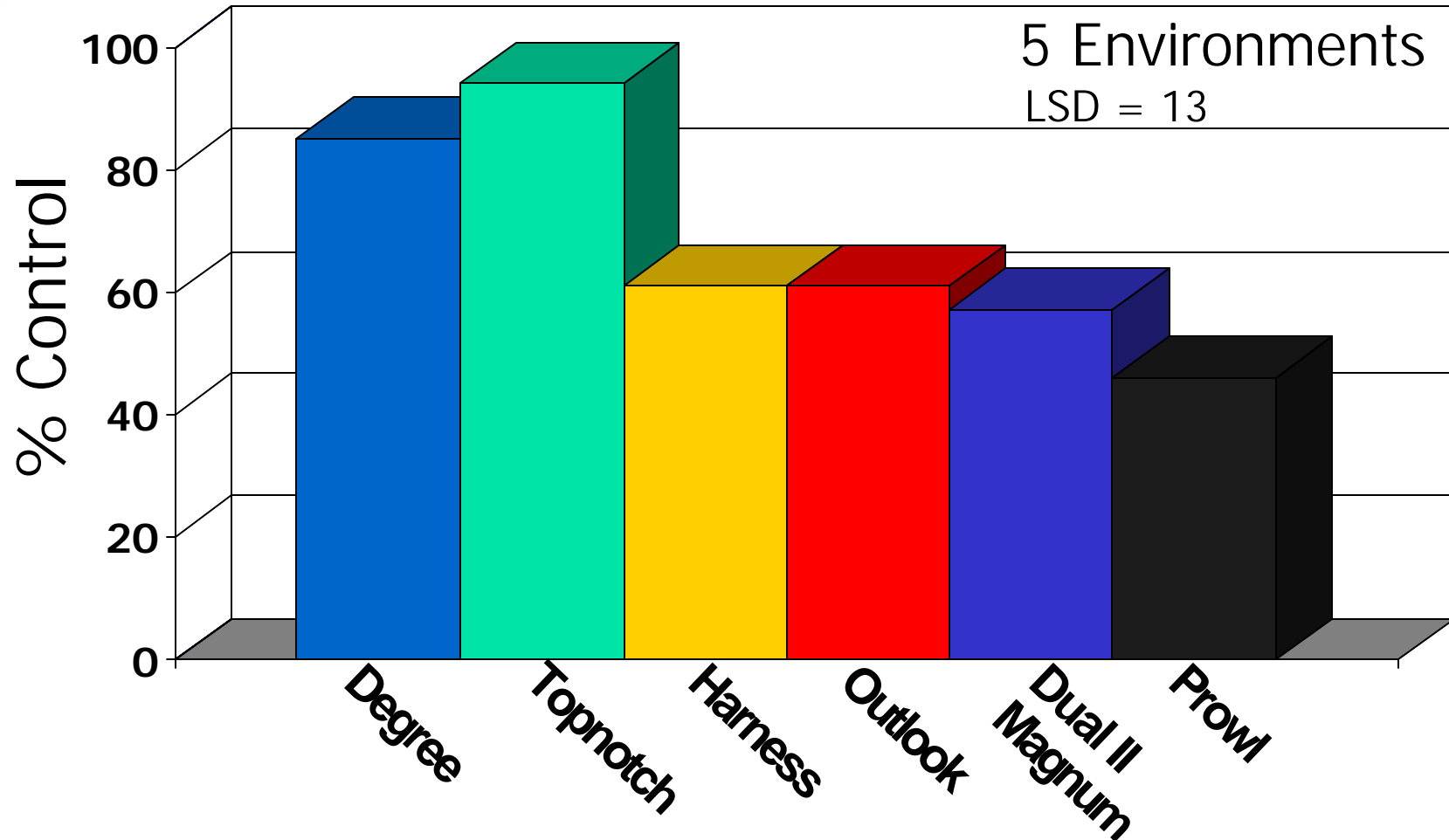
# **Waterhemp Management**



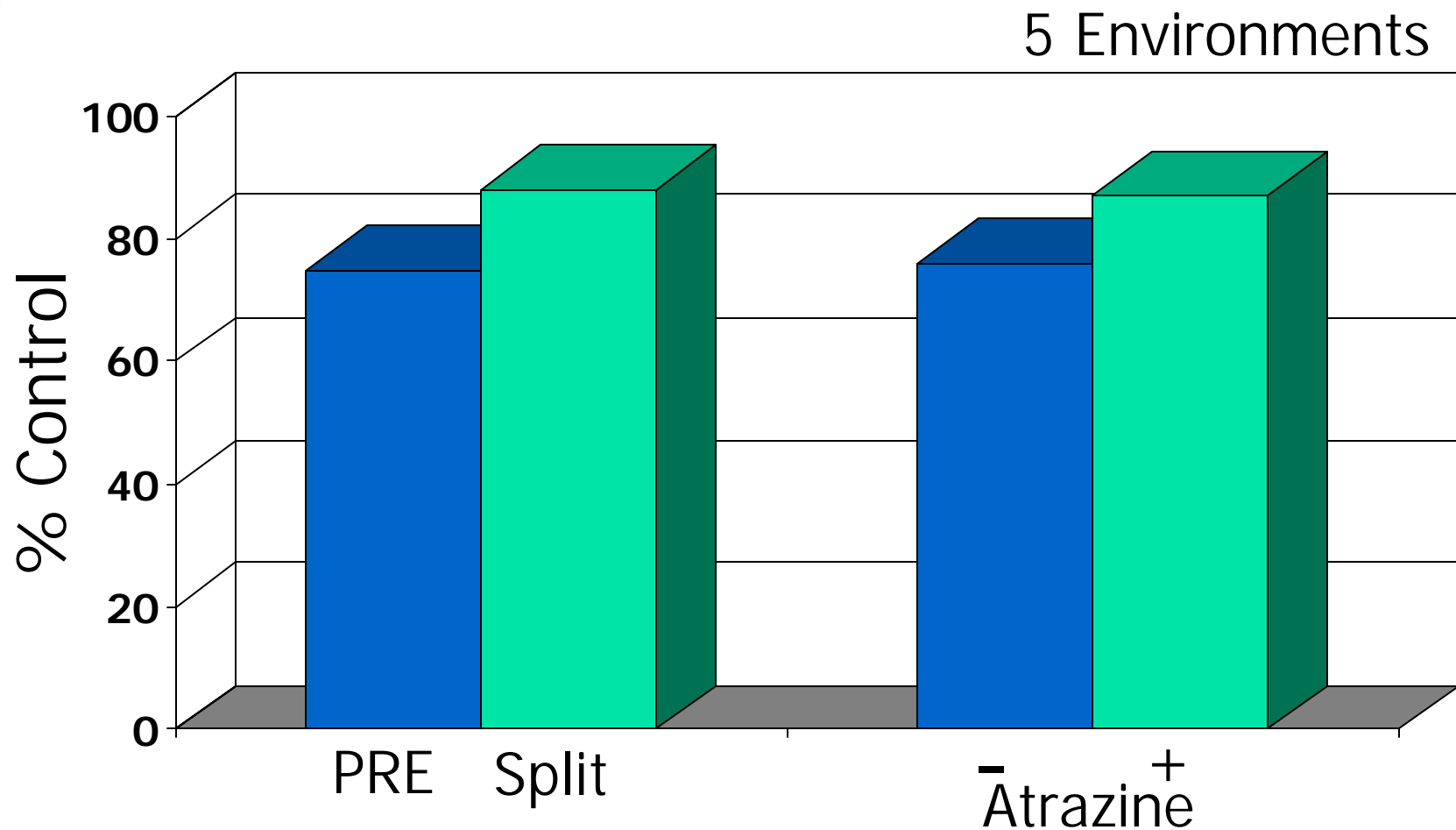
# Waterhemp Control in Corn

- Five environments in Illinois
  - '00: Altamont, Brownstown, and Urbana
  - '01: Altamont and Brownstown
- Two application timings:
  - PRE
  - Split: 2/3-PRE and 1/3 EPOS w/ Clarity 0.5 pt)
- Herbicides:
  - Degree, Topnotch, Harness, Outlook, Dual II Magnum, Prowl
  - Alone and with atrazine

# Preemergence Waterhemp Control in Corn (56 DAP)



# Effect of Split-Applications and the Addition of Atrazine (56 DAP)





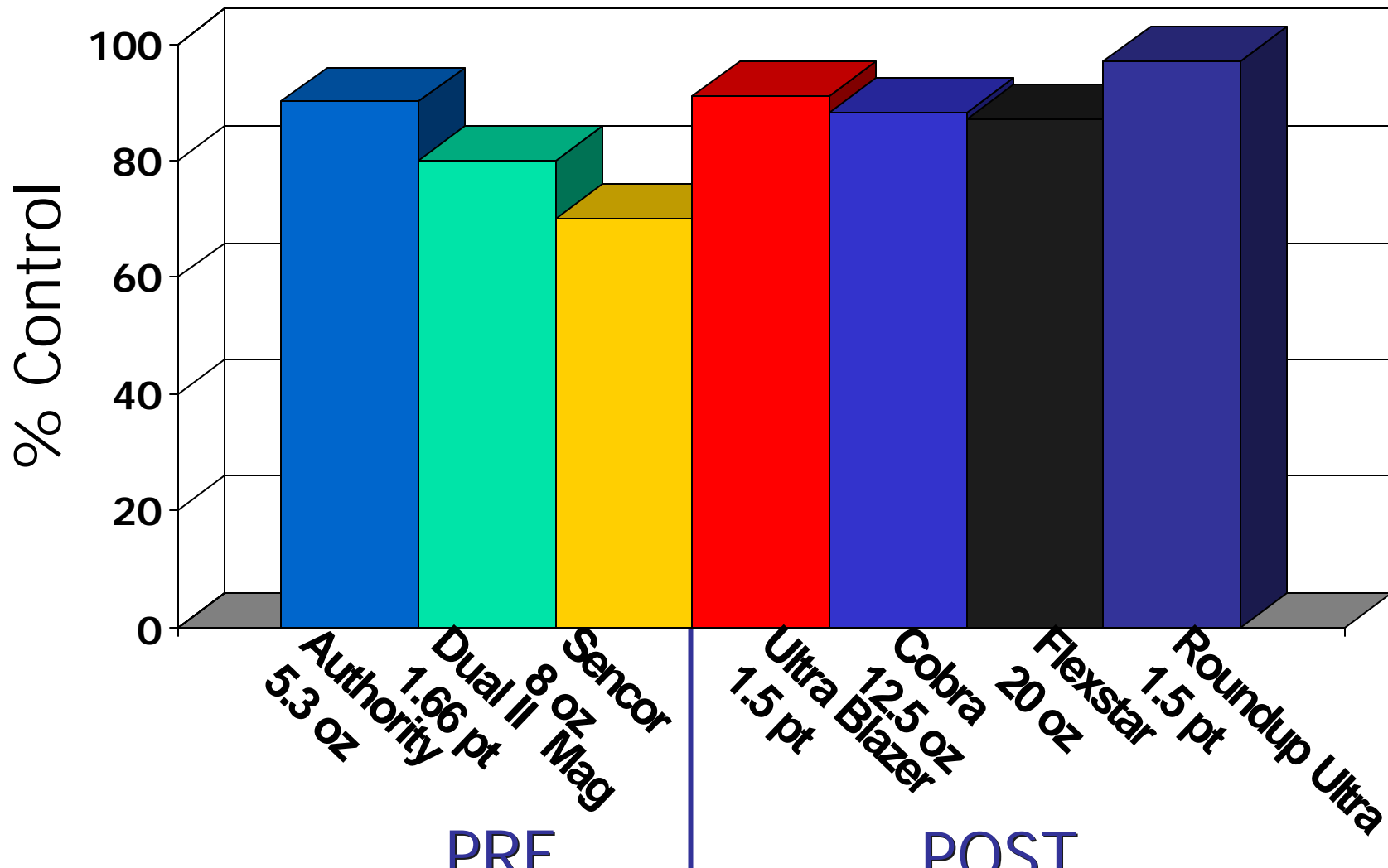


# Waterhemp Control in Soybean

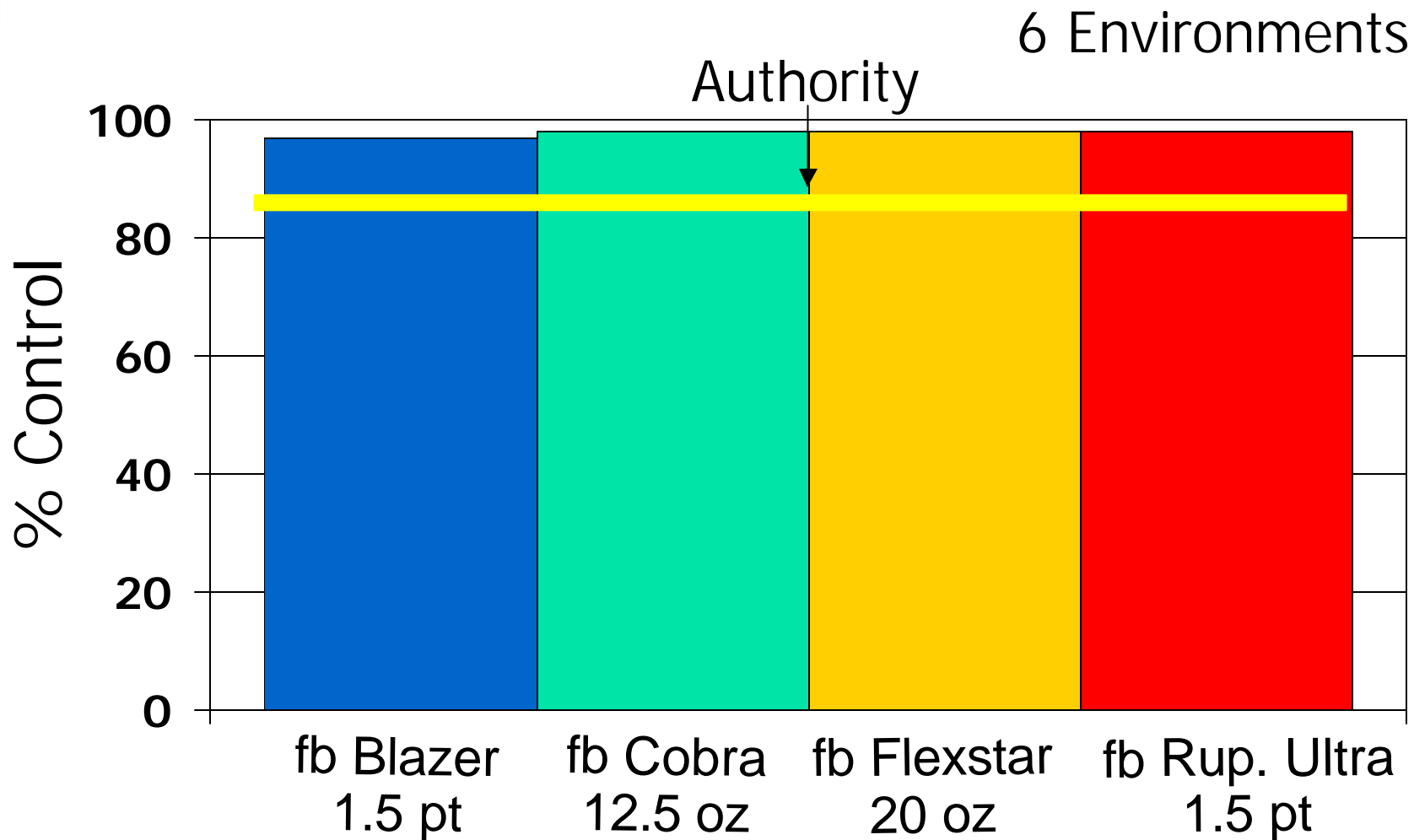
- Six environments in Illinois
  - '00: Altamont, Belleville, and Urbana
  - '01: Belleville, Brownstown, and Urbana
- Two application timings (PRE & 4" waterhemp)
- Herbicide treatments
  - PRE: Authority, Dual II Magnum, Sencor
  - POST: Ultra Blazer, Cobra, Flexstar, Roundup Ultra

# Waterhemp Control in Soybean (28 DAT)

6 Environments

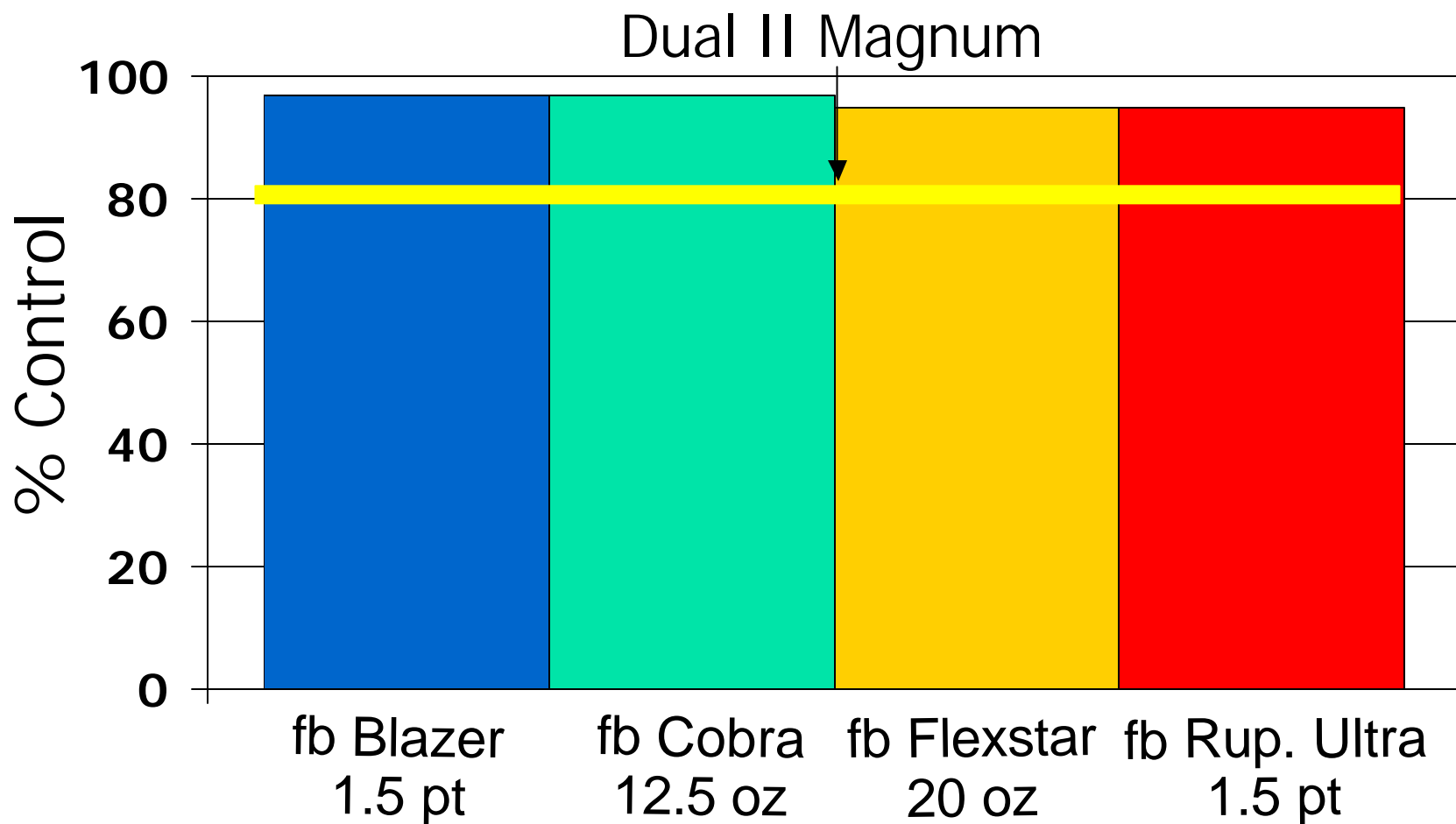


# Sequential Herbicide Programs with Authority (28 DAT)

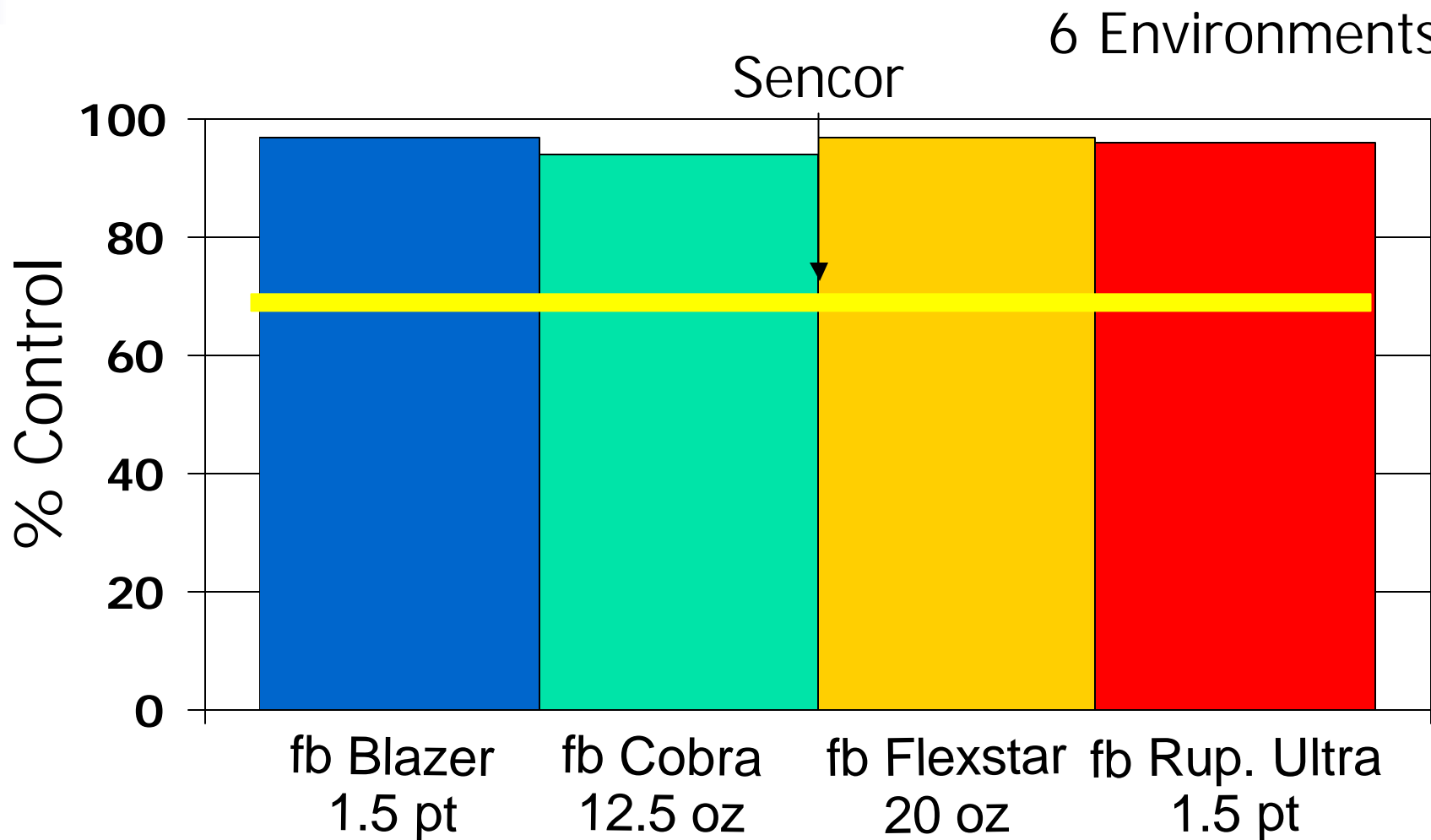


# Sequential Herbicide Programs with Dual II Magnum (28 DAT)

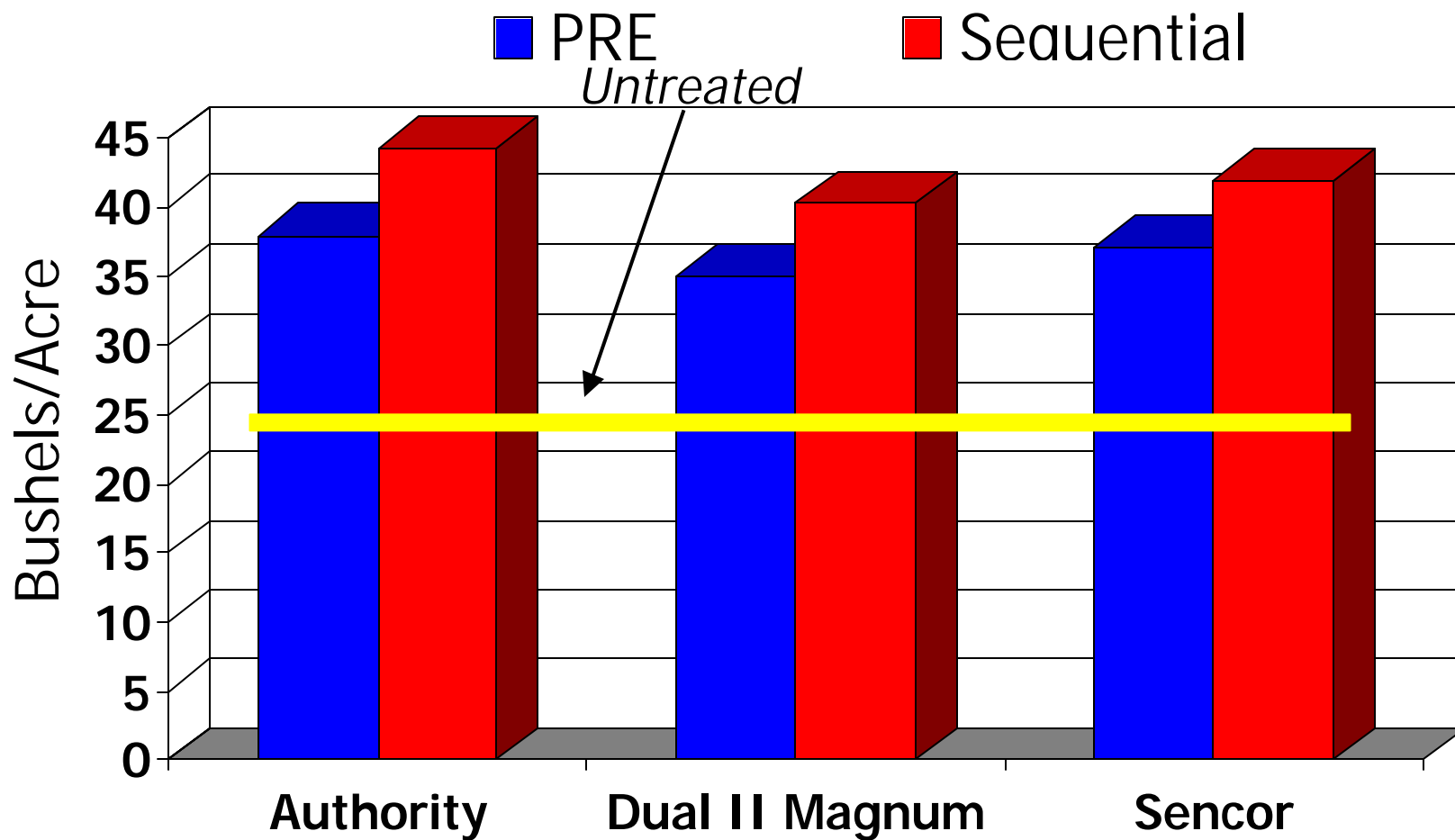
6 Environment



# Sequential Herbicide Programs with Sencor (28 DAT)



# Soybean Yield



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# Strategies for Waterhemp Management

- Due to waterhemp's biology and variability in populations (i.e. herbicide resistance) management is often difficult
- Best strategies for waterhemp management integrates a sequential management approach
  - Soil-applied herbicides followed by POST herbicide applications or cultivation
  - 2 POST applications
  - POST herbicide application followed by cultivation
- Using herbicides with different MOA or SOA in sequential programs delays herbicide resistance