Weed Control in Sugarbeet

Getting Rid of Weeds using Multiple Control Tactics

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North Dakota State University and
University of Minnesota

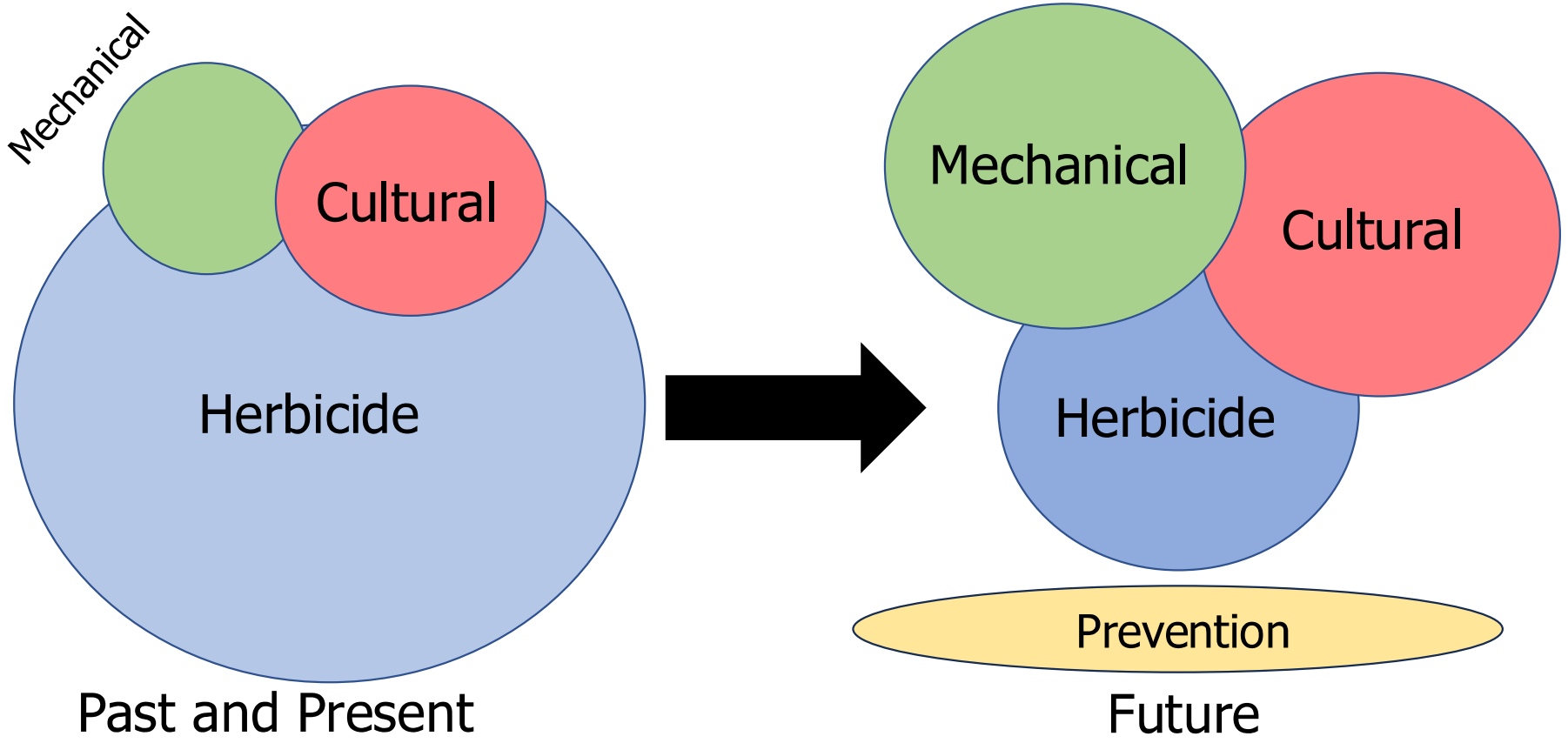
Thank you for your support

- Sugarbeet Research and Education Board: Matthew Brantner, Tyler Dahl, Jim Murn, and Jake Rust
- 'Sugarbeet' for funding my research program
- American Crystal Sugar: Moorhead research facility near the ACSC Technical Center
- Our research cooperators:
  - David Ahrens, Austin Broden, Tyler Dahl, Paul Miller, Rust Farms, and Vince Ulstad
  - NDSU Prosper Research Station
  - UMN Northwest Research and Outreach Center, Crookston
  - KWS Moorhead

How are we going to control weeds in the short term?

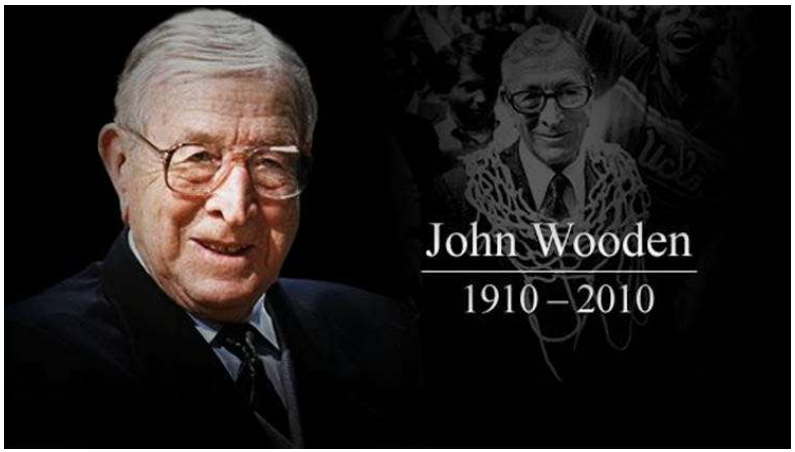
- Focus groups at Renville, Wahpeton and Moorhead in November and December 2025
- Growers, ag-retailers, crop consultants and cooperative agriculturalists
- 2 hour brainstorming session with action items for followup

Integrated Weed Management



Slide adapted from Bob Hartzler, Iowa State University

"It's the details. Little things make big things happen"

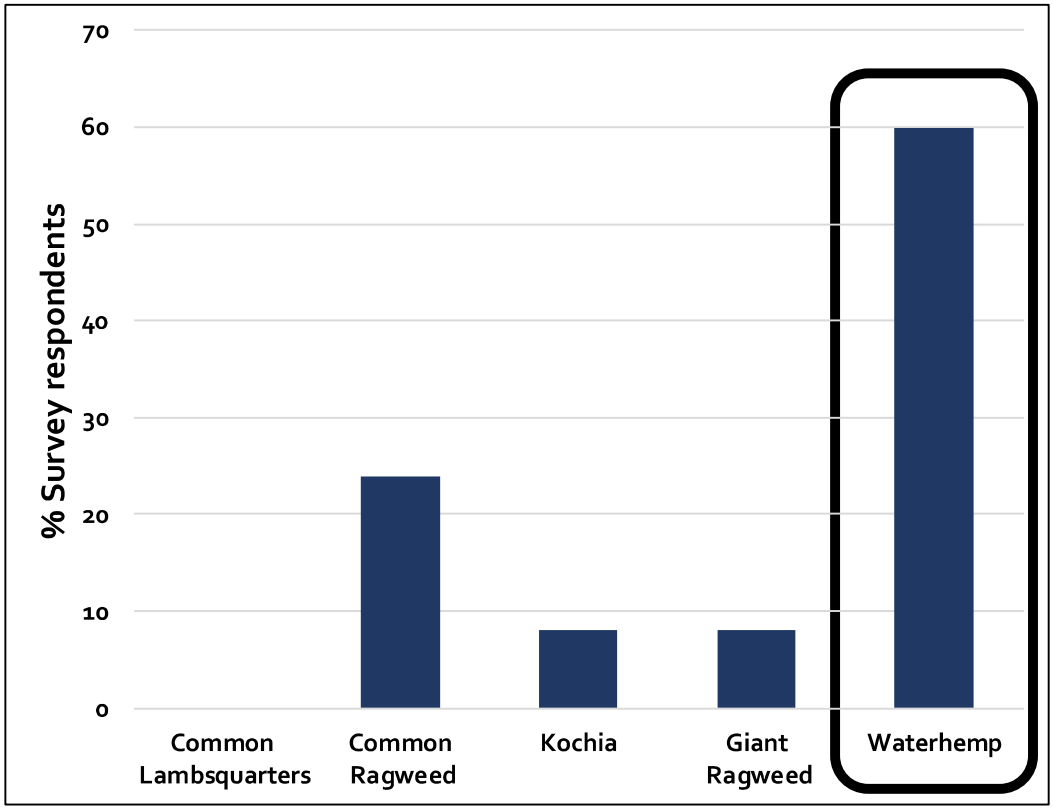


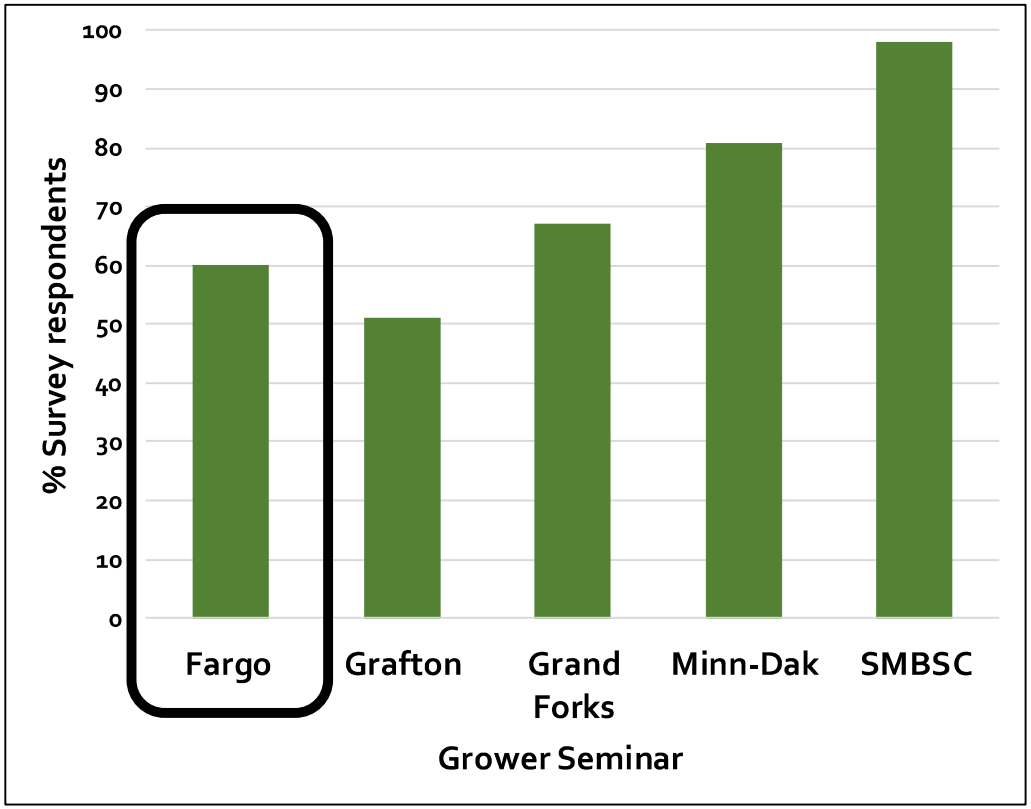
It's the weed management details. Little things potentially make weed-free crop fields a possibility

Outline:
Use the winter season to get back into the classroom

- Waterhemp control in sugarbeet; across the crop sequence
  - Chemical control
  - Cover and nurse crops
  - Electricity
  - Harvest seed destructor
- Kochia control
- Common ragweed control

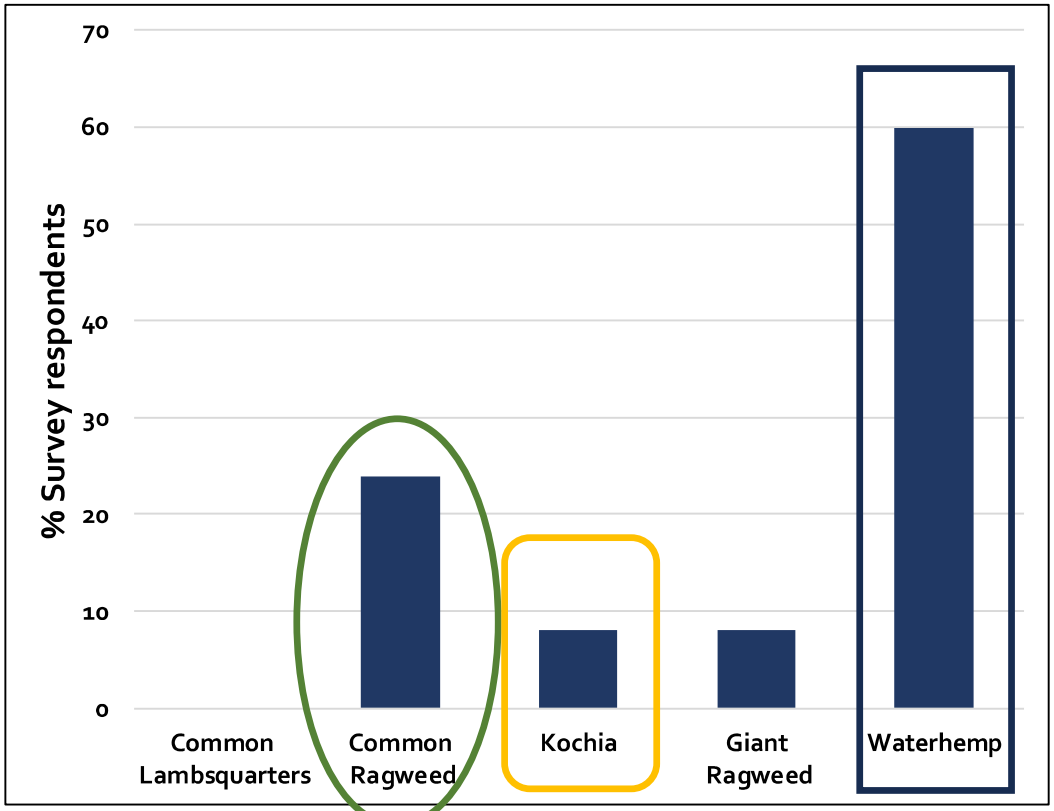
What was your worst weed control challenge in 2024? How do you compare to other regions[a]?

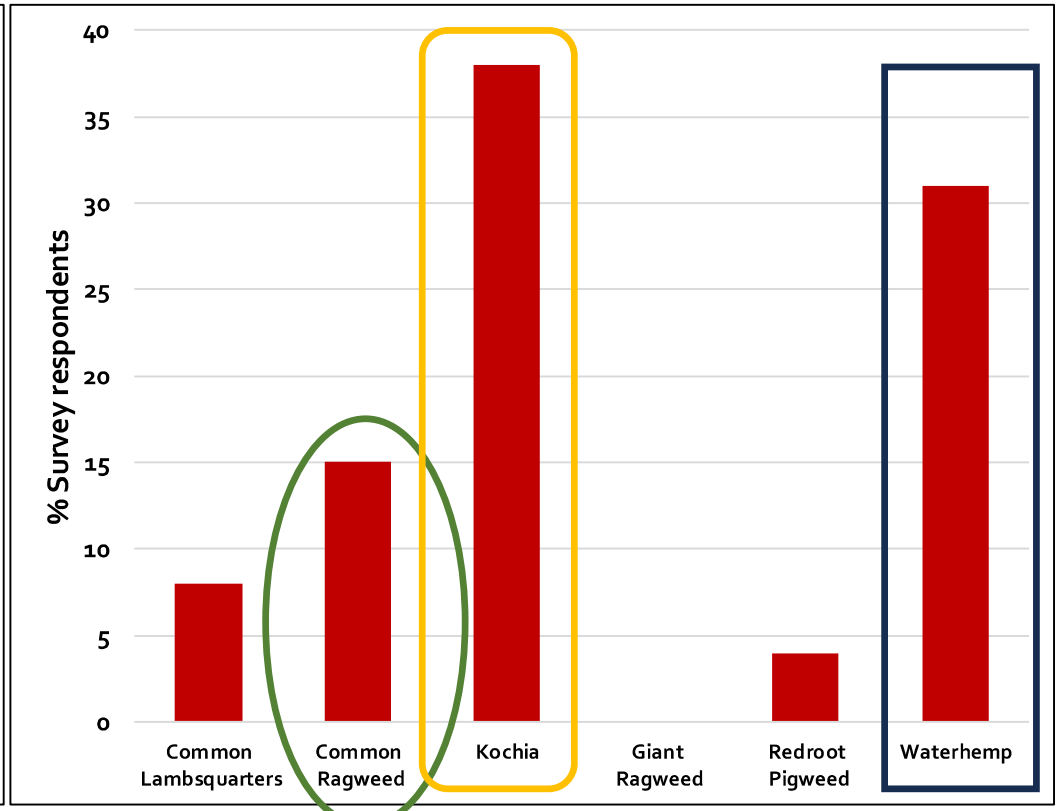




[a]Turning Point Survey, 2025 Sugarbeet Growers Seminars

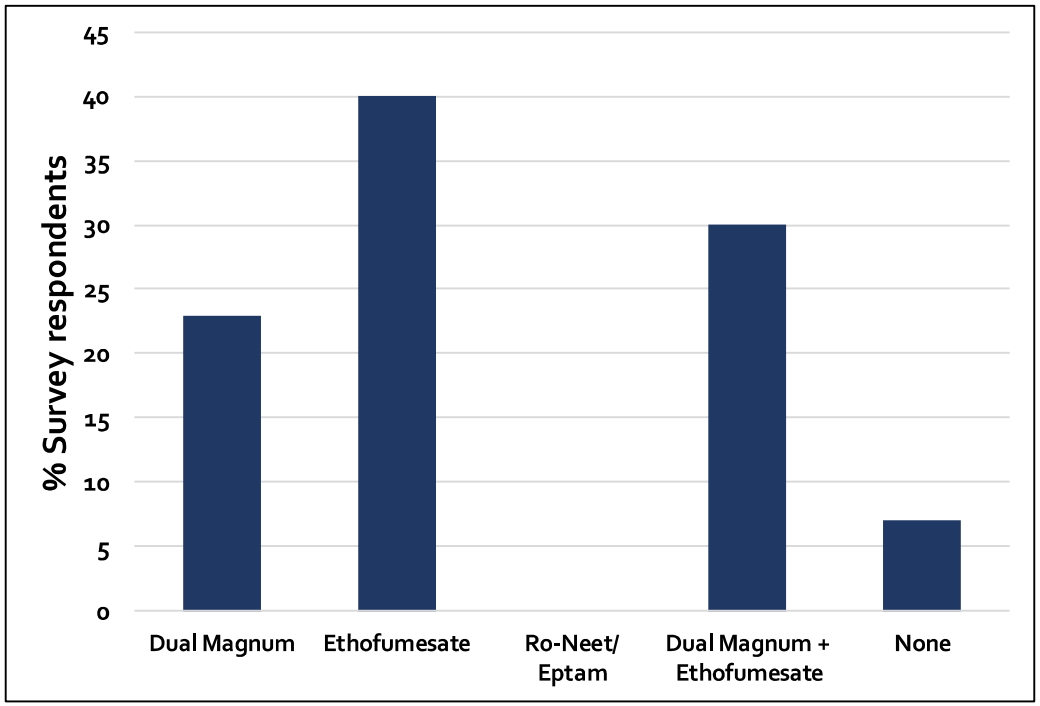
What was your worst weed, second worst weed control challenge in 2024[a]?

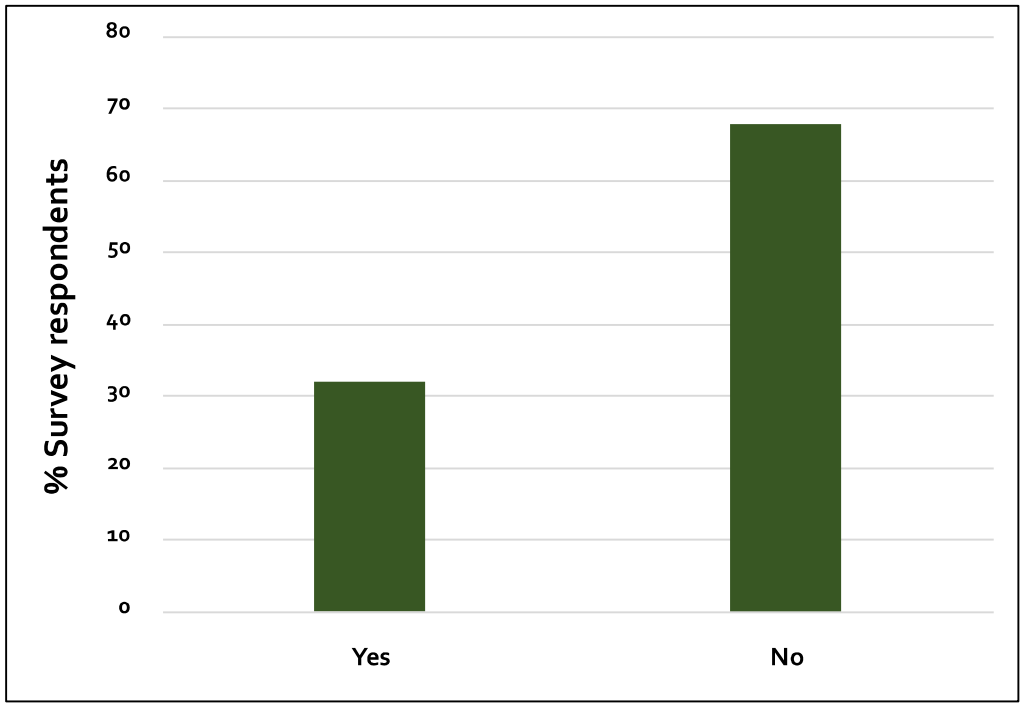




[a]Turning Point Survey, 2025 Sugarbeet Growers Seminars

Which soil-applied herbicide did you use at planting? Was ethofumesate activated with tillage?[a]





[a]Turning Point Survey, 2025 Sugarbeet Growers Seminars

Ethofumesate in 2025
Group 15

Ethofumesate brands for sugarbeet production

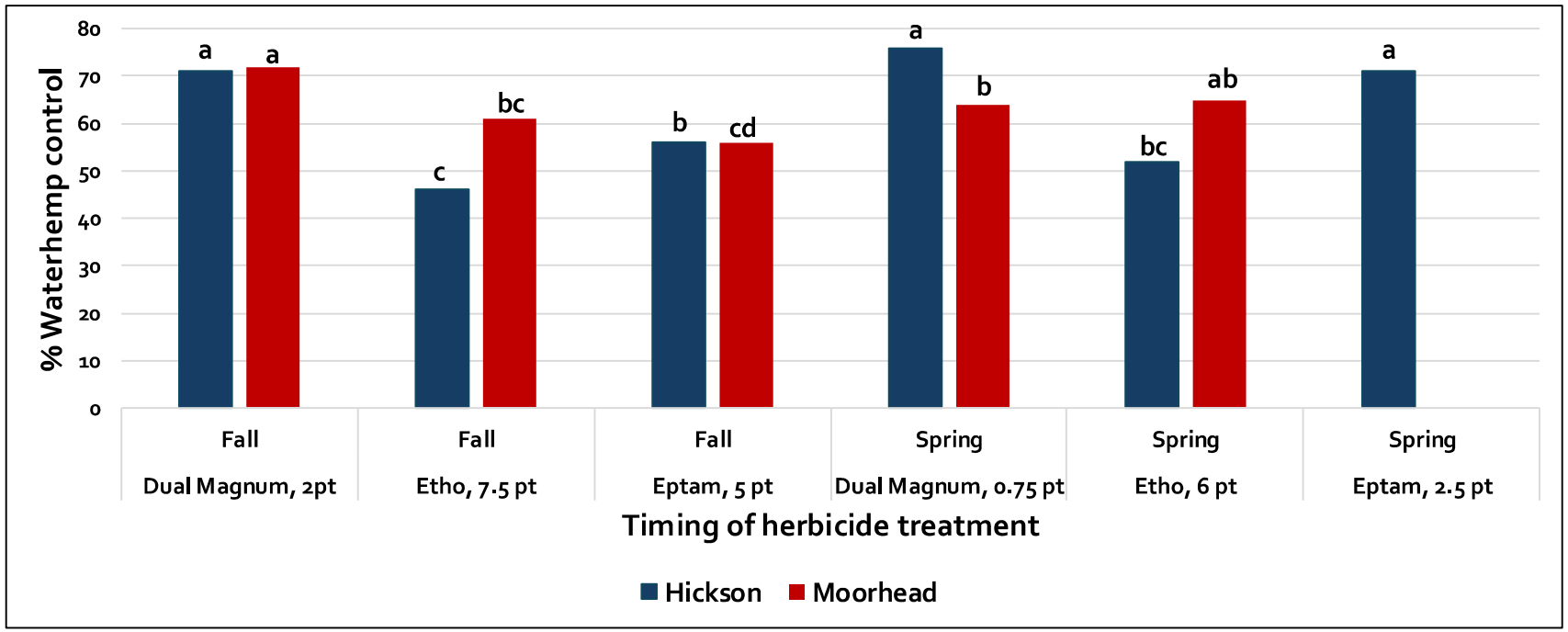
- Nortron, Bayer CropScience
- Ethotron, UPL NA Inc.
- Ethofumesate 4SC, Farm Business Network
- Maxtron 4SC (3.78 lb/G), ALBAUGH, LLC
- ~~Nektron SC~~, ~~Atticus~~, ~~LLC~~

UPL

Ethofumesate 101, continued

- Question. Why is ethofumesate performance inconsistent on waterhemp?
  - As compared to Outlook, ethofumesate has a high KOC value meaning it has a high affinity for binding to soil colloids
  - Ethofumesate is less water soluble than Outlook
- Question. Does rainfall overcome these characteristics?
  - We have increased the use rate
  - We have incorporated ethofumesate
  - Pushing water volume to 20 gpa probably will improve consistency, especially in residue
  - We have attempted fall application to increase the odds of activation
- Question. Does ethofumesate bind to wheat or corn stalk residue?
  - The literature states residue can intercept spray
  - I can't find any information stating etho binds to corn stalks

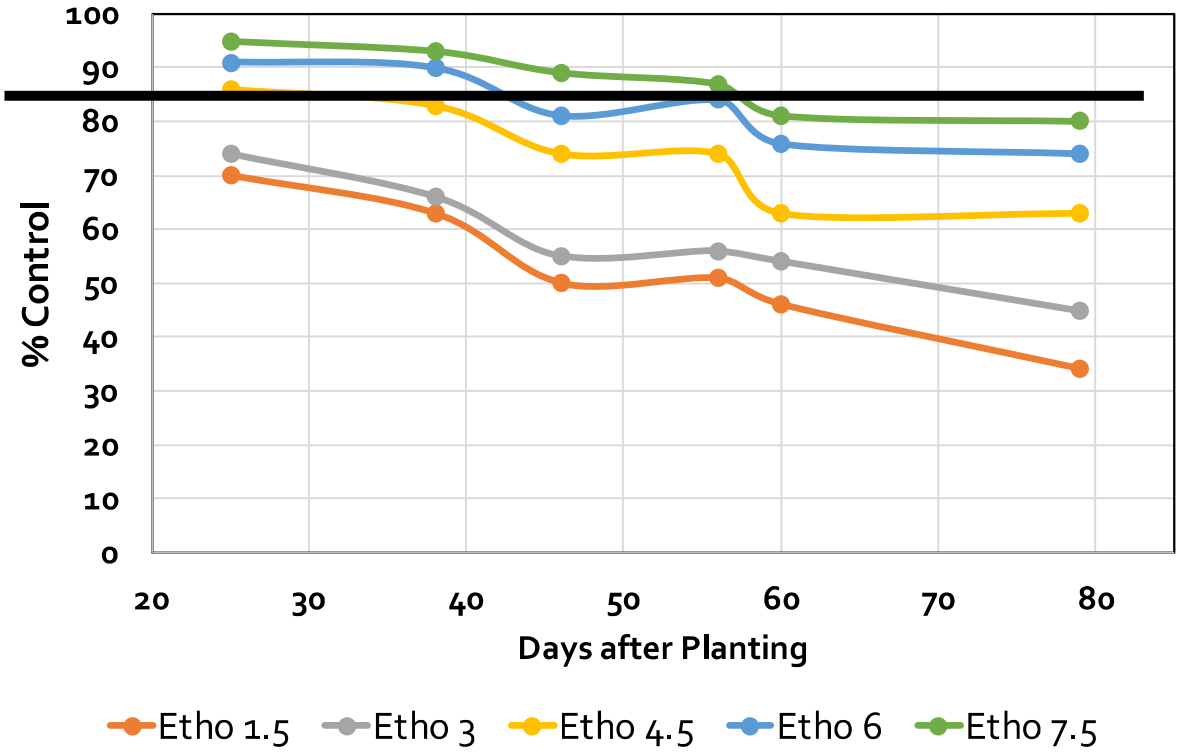
Waterhemp control in response to fall or spring applied treatment, 71 and 73 DAP, Hickson and Moorhead, 2025.[ab]



[a]Treatments sharing the same letter are the same at the 0.10 level.

[b]All treatments contained 2-times Roundup PowerMax3 mixed with ethofumesate at the 2- and 6-lf stage.

Waterhemp control in response to ethofumesate PRE, Lake Lillian, MN, 2020



	Days after planting					
	25	38	46	56	60	79
Etho 1.5	70	63	50	51	46	34
Etho 3	74	66	55	56	54	45
Etho 4.5	86	83	74	74	63	63
Etho 6	91	90	81	84	76	74
Etho 7.5	95	93	89	87	81	80

	greater than 85%
	84% to 78%
	77% to 65%
	less than 65%

Wheat cover crop in Wilkin County, 2014

Best practices for using PRE herbicides and nurse crops

- Wheat and barley are sensitive to ethofumesate applied at greater than 3 pt/A
- Rye spring seeded is also sensitive to ethofumesate
- Nurse crops tolerate Dual Magnum more than ethofumesate
- Spring seeded rye does not vernalize and does not provide a longer lasting carcass as compared to wheat and barley

What should we use for waterhemp control in 2026?

- Ethofumesate, 4.5 to 6 pt/A
- Dual Magnum at 8 to 12 fl oz/A
- Dual Magnum at 16 lf oz/A after May 1
- Etho + Dual Magnum at 3 pt + 12 fl oz/A

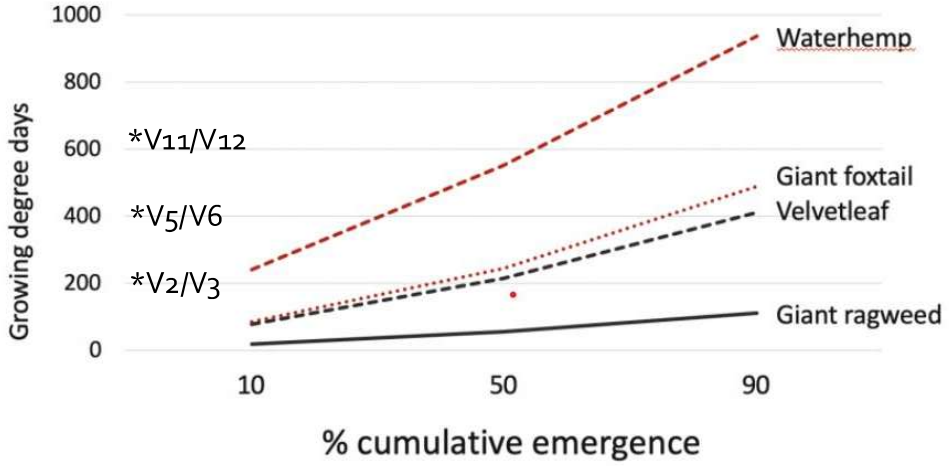


Figure 1. Relationship between growing degree days and emergence of four weeds. Werle, Sandell, Buhler, Hartzler and Lindquist. 2014. Weed Sci. 62:267-279.

The layered residual is strongly contributing to season-long waterhemp control

I think it is time to revisit our layby approach

*According to Holen and Dexter

Peters' is proposing…

Herbicide	Previous Rate	Suggestion for 2026	Maximum use rate	Application timing
	fl oz/A	fl oz/A	fl oz or pt/A	Sgbt stage
Outlook / Outlook	12/12	16 to 21	24	12-lf
S-meto / S-meto	16 / 16	20 to 24	2.6[a]	60d PHI
Acetochlor/ acetochlor [b]	40 to 48 / 40 to 48	48 to 64	8	8-lf

[a]POST maximum use rate. Dual Magnum applied in the fall or PRE is incremental
[b] Warrant or Enversa

I also am Research only! l in sugarbeet) and Treflan layby in sugarbeet

What about etho POST with Roundup PowerMax3? You have 12 fl oz/A to use POST. Use it.

Waterhemp control from postemergence herbicides, across locations and years

Herbicides[1]	Herman 2014	Moorhead 2015	Herman 2015	Lake Lillian 2015	Average
	----------% visual control[2]----------				
glyphosate	36	66	20	61	46
glyphosate + ethofumesate	58	81	40	66	61
glyphosate + Betamix	65	86	40	68	65
gly + etho + Betamix	69	88	73	78	78

[1]Roundup alone with Prefer 90 NIS at 0.25% v/v and N-Pak AMS at 2.5% v/v. Roundup tank-mixes with Destiny HC at 1.5 pt/A and N-Pak AMS at 2.5% v/v.
[2]Visual percent waterhemp control at preharvest evaluation

Waterhemp control results from Truvera™ sugarbeet experiments across years

Truvera®
Truly versatile weed control.

1. XtendiMax mixed with ethofumesate. XtendiMax offers instant soil residual in a dry spring.
2. XtendiMax early POST. ExtendiMax control waterhemp escapes at the 2-lf stage (early lay-by application).
3. A soil residual herbicide POST remains important.
4. The soil residual herbicide should be applied at the 2- to 4-lf stage vs. the 6- to 8-lf stage.
5. Glufosinate mixed with glyphosate at the 6- to 8-lf stage controls waterhemp escapes.


Untreated Control


Etho + XtendiMax/Warrant+RUP+ etho/RUP+etho+gluf


Our waterhemp control standard
Etho+ Dual Magnum/RUP+etho+ Outlook/RUP+etho+Warrant


Etho+XtendiMax/Etho+XtendiMax/RUP+etho+gluf

For waterhemp control: need 3-4 effective active ingredients in a program. POST when weeds are less than 3-inch. PRE mandatory for time management constraints and overall effectiveness.

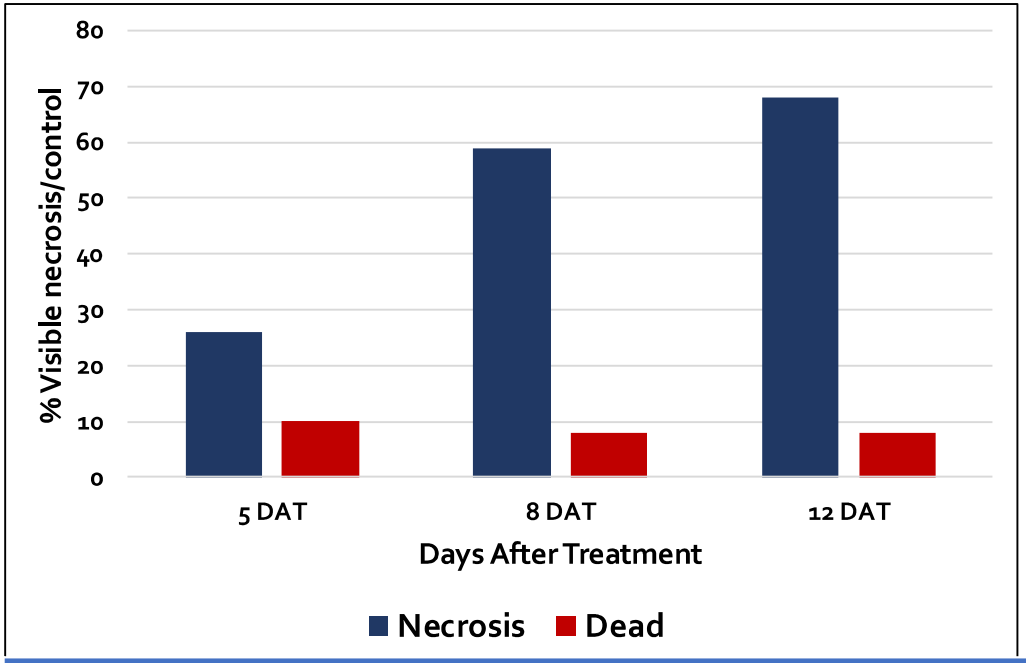
	Wheat	Sugarbeet	Corn	Soybean
PRE	14	15	15 27	3 4 5 14 15
POST/PRE	15	15	15	15
POST	27 6 4		4 5 27	4 10

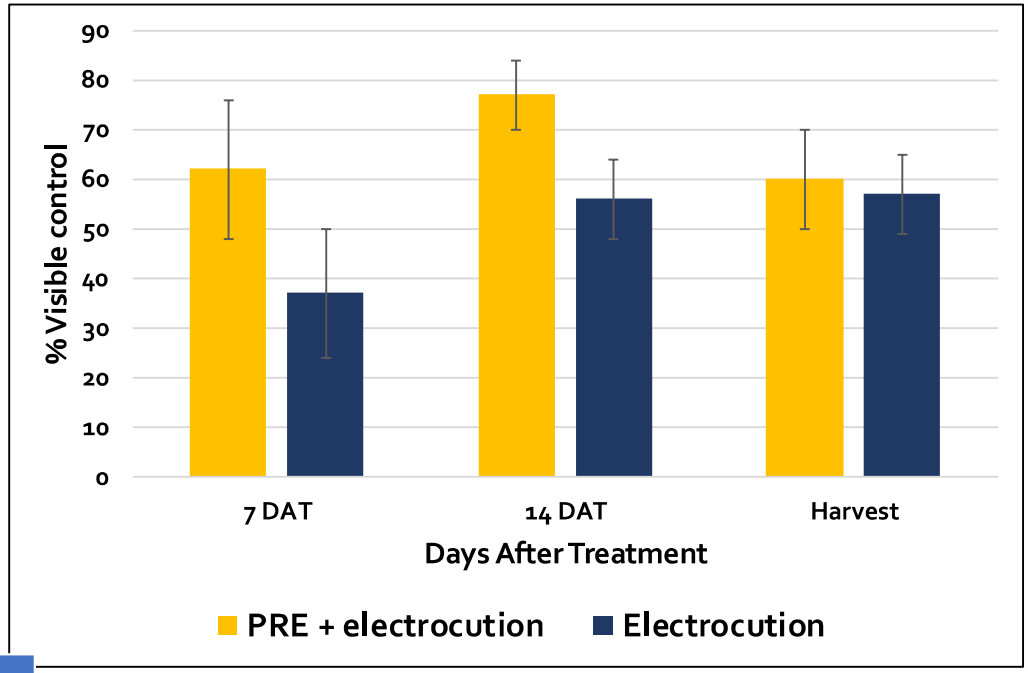
- Lots of 15s
- Not much for waterhemp control in sugarbeet
- Lots of options in soybean; I'm not saying waterhemp control in soybean is easy

Scratch pad new in 2025

Waterhemp control with electrocution

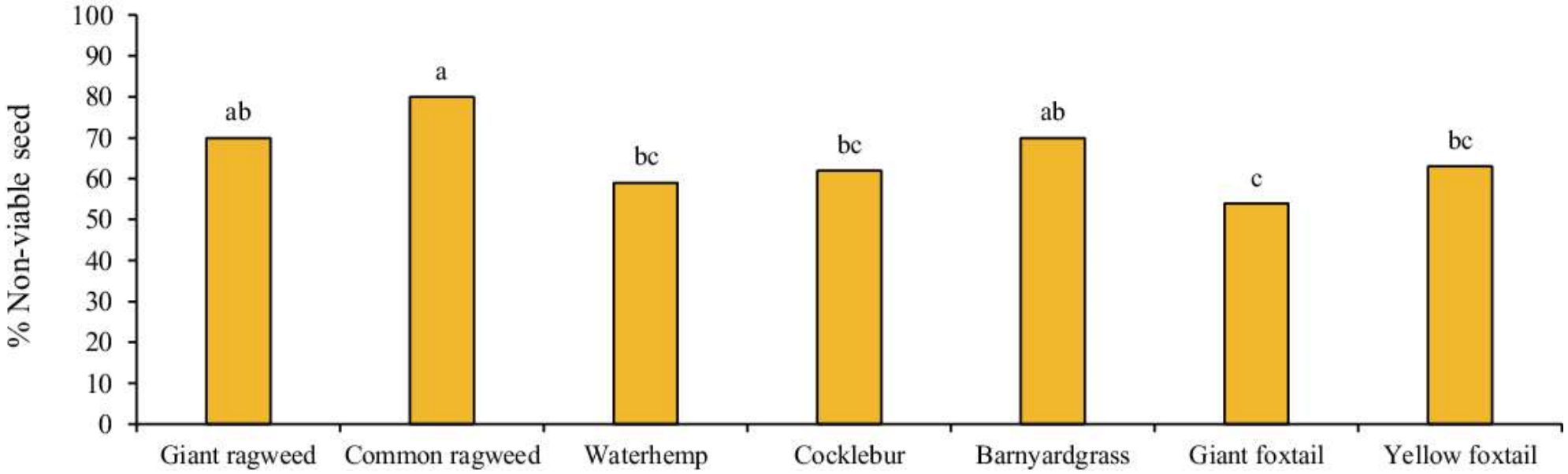
Peters and Blomquist, 2023; midsouth universities, 2026



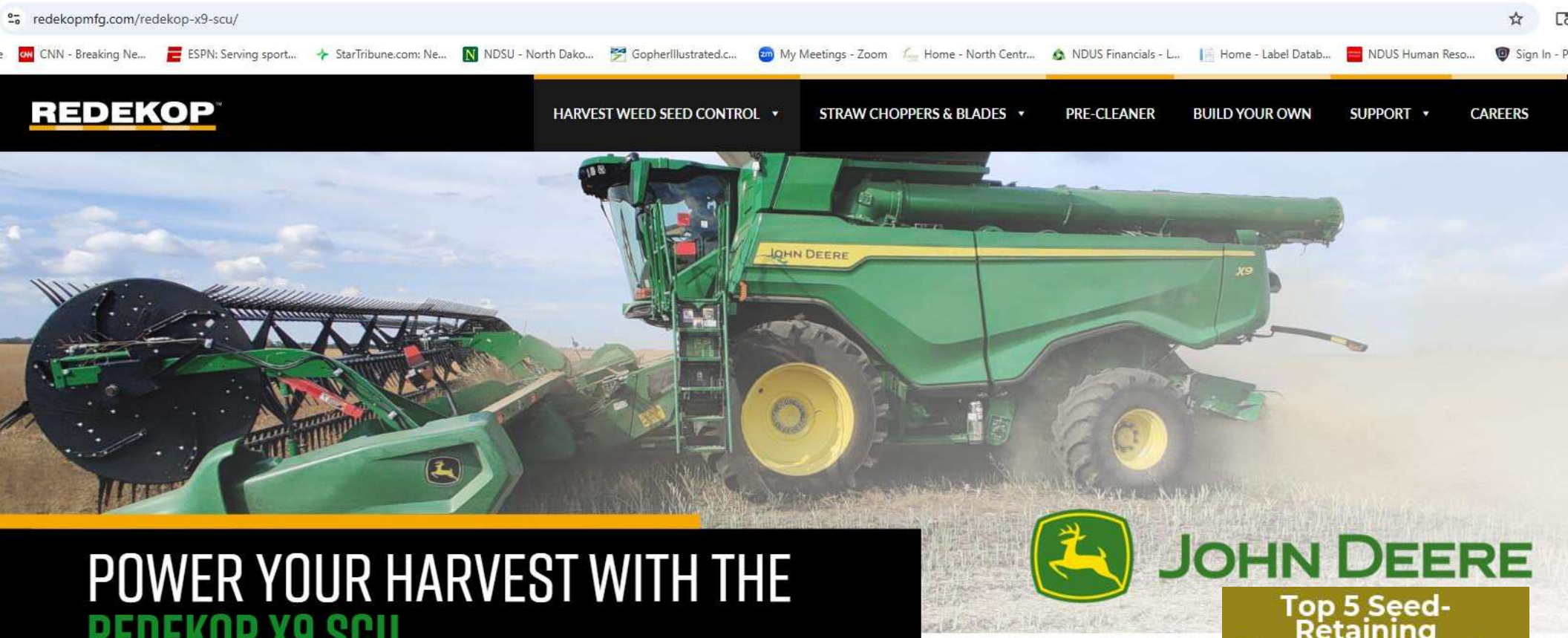


Notes
5 DAT - Flowers/stems below canopy
8- DAT - Regrowth from leaf axis; lower branch growth; regrowth above sugarbeet canopy
12 DAT Majority actively regrowth from lower and middle axil, waterhemp above sugarbeet canopy

Electrocution reduces the number of viable seed that are returned to the soil seedbank



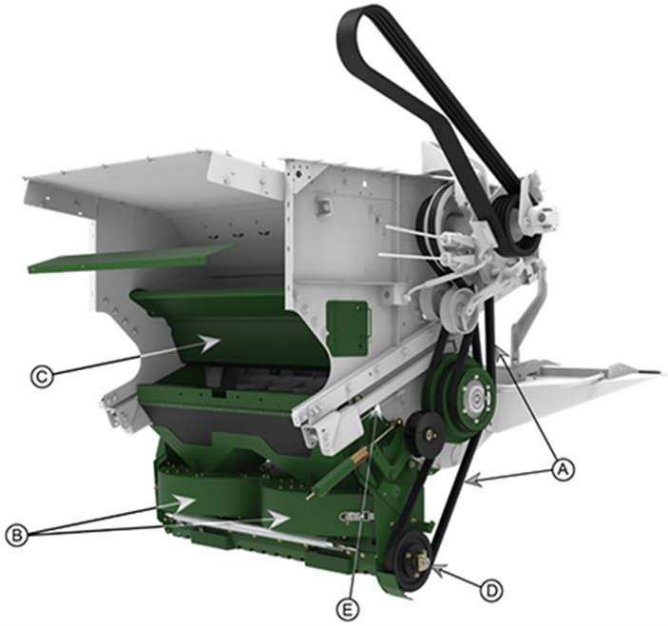
Schreier et al. 2022
Univ. of Missouri



Top 5 Seed-Retaining Broadleaf Weeds

1. Smooth pigweed
2. Palmer amaranth
3. Hemp sesbania
4. Waterhemp
5. Jimsonweed

- Weed seed kill rates were 99% at 28% chaff moisture
- Higher chaff flow rates reduced seed kill rates
- ‘green waterhemp’



Tony Kramer
Product Manager - Planting and Harvest Technology
RDO Equipment Co.
Cell - 701.680.7531

Volunteer Barley

With HWSC

Without

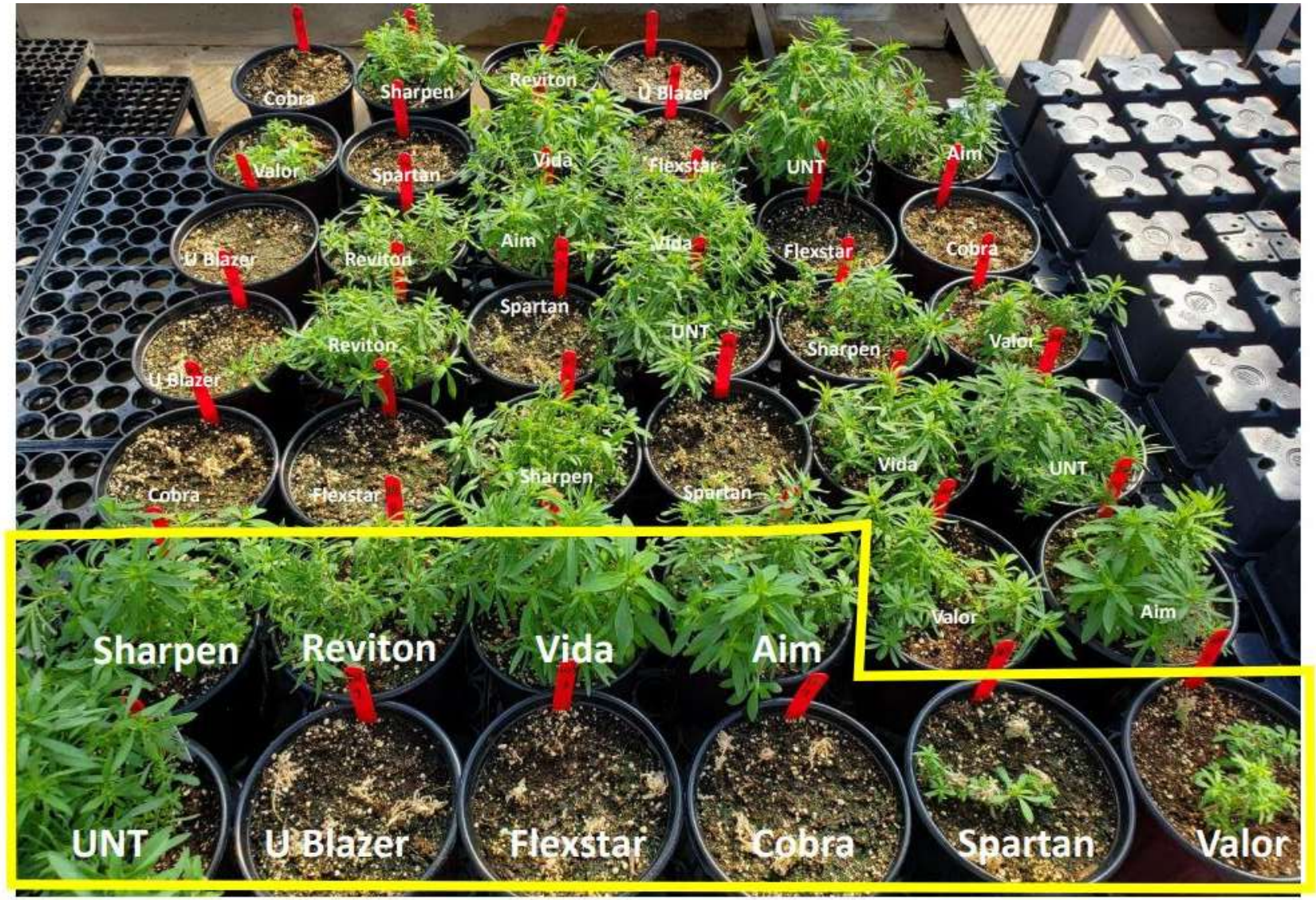
Best practices for kochia control

1. Control kochia in the crop sequence, especially spring wheat before sugarbeet
2. Ethofumesate at 6 to 7.5 pints per acre PRE
3. Paraquat after kochia emergence but before sugarbeet emergence

- Gramoxone SL 3.0 at 1.3 pt/A with non-ionic surfactant at 1 qt/100G in 15 to 20 gpa water carrier
- What about when its cold? <55F?
- Jason Hanson, Rock and Roll Agronomy, says increase the rate to 2 pt/A and mix MSO (1G/100G) with NIS and AMS and use 20 gpa water carrier

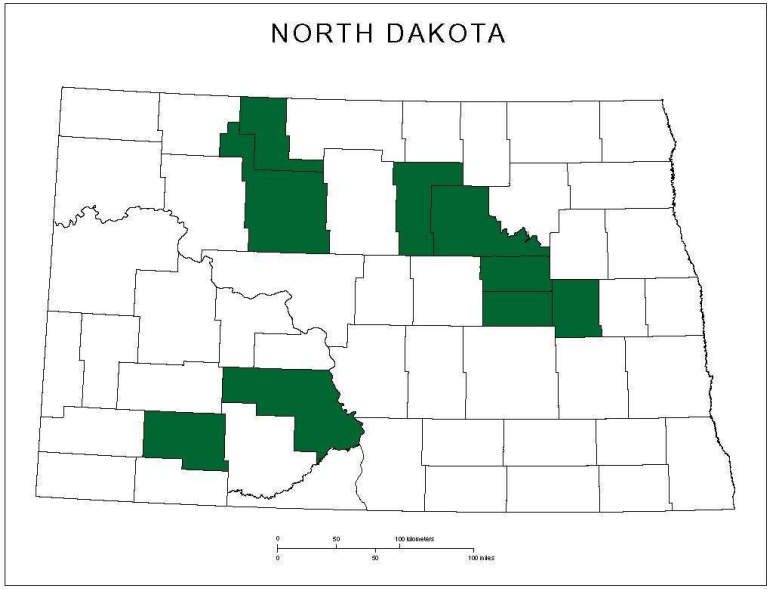
Group 14 Resistance

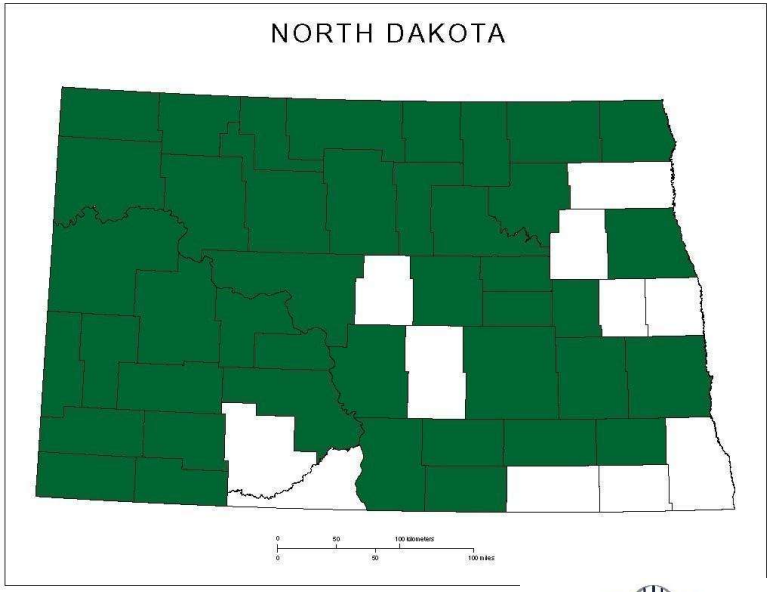
- Kochia remains sensitive to the diphenyl ethers
- This story is changing fast!



Slide courtesy of Brian Jenks, NDSU

ND 2023 vs 2026





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Best practices for kochia control

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- Gramoxone SL 3.0 at 1.3 pt/A with non-ionic surfactant at 1 qt/100G in 15 to 20 gpa water carrier
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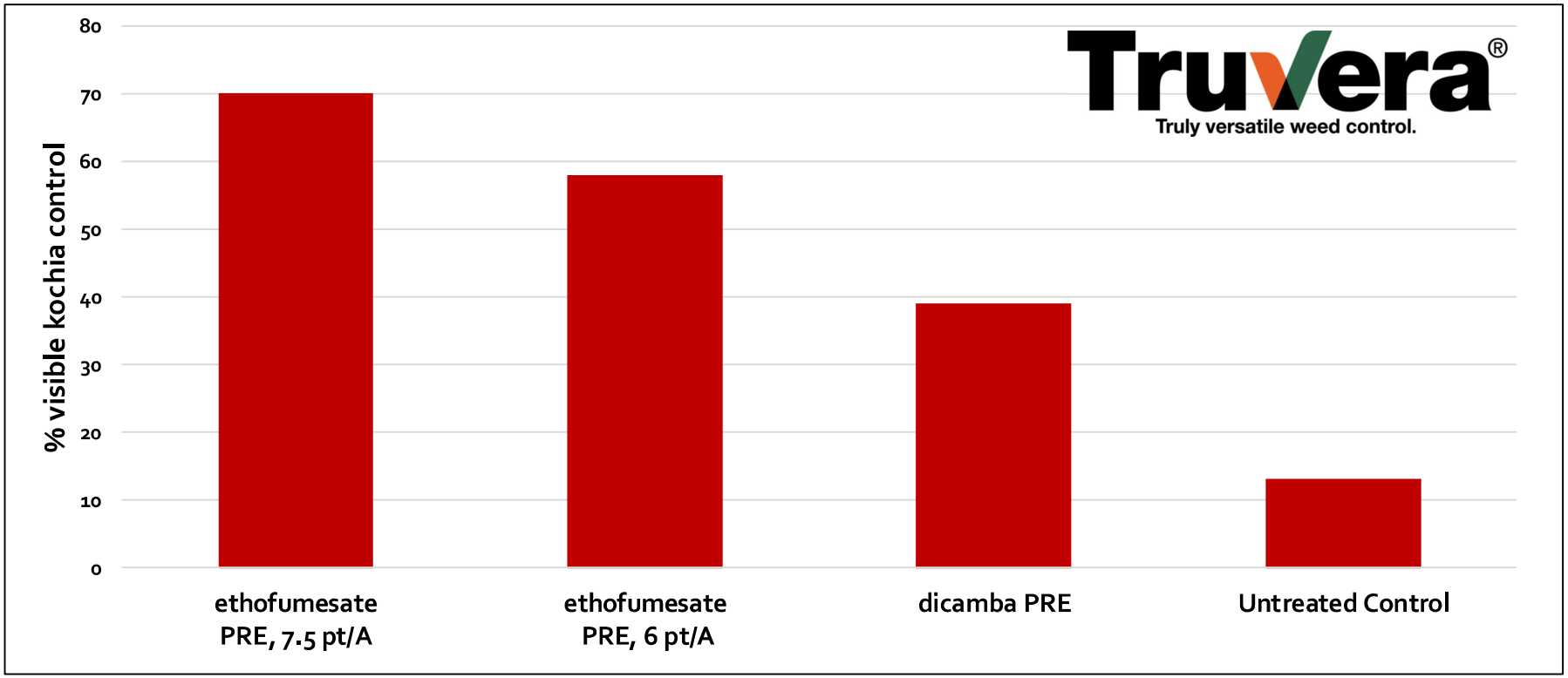
- Jason Hanson, Rock and Roll Agronomy, says increase the rate to 2 pt/A and mix MSO (1G/100G) with NIS and AMS and use 20 gpa water carrier

Kochia control in response to PRE treatment, 20 DAP, Felton, MN 2025



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Best practices for kochia control

4. Glyphosate on sensitive kochia (fence-line kochia). Roundup PowerMax3 (full rates) mixed with a high quality adjuvant and ammonium sulfate. Kochia up to 3-inch tall.

- How much kochia is glyphosate sensitive?
- Joe Ikley (NDSU) randomly sampled 100 kochia escapes and has found that the first 60 tested are glyphosate resistant
- 100% of samples positive for glyphosate resistance

MESSAGE: Test your kochia for herbicide tolerance

Best practices for kochia control

5. Spin-Aid mixed with ethofumesate or Spin-Aid mixed with ethofumesate, Roundup PowerMax3 and Stinger HL on GR kochia
   - Start early on small kochia and spray on 7-day intervals
   - Spin-Aid rates increase as sugarbeet stage increases
   - Two or three applications

Kochia control from Spin-Aid, 11 DAAC, greenhouse, December/January 2023-24

Kochia control with Spin-Aid

		Kochia Control		
Herbicide Treatment	Rate	June 3 12 DAAD	June 19 28 DAAD	June 26 35 DAAD
	fl oz/A	----------(% visible control)----------		
Spin-Aid (SA)	12	50 d	25 d	15 d
SA / SA	12 / 24	68 c	50 c	30 c
SA / SA / SA	12 / 24 / 32	78 b	65 b	39 bc
Etho / SA / SA	6 p / 12 / 16	80 ab	65 b	41 b
Etho / SA / SA / SA	6 p / 12/ 16/ 24	89 a	79 a	59 a
LSD (0.10)		10	7	9

[a]Spin-Aid mixed with ethofumesate at 4 fl oz per acre with MSO or HSMOC at 1 pt/A
[b]Spin-Aid applied on 7 day intervals


B
Spin-Aid, 12/24 fl oz/A


C
Spin-Aid, 12/24/32 fl oz/A


A
Spin-Aid, 12 fl oz/A


D
Etho, PRE /Spin-Aid, 12/16 fl oz/A

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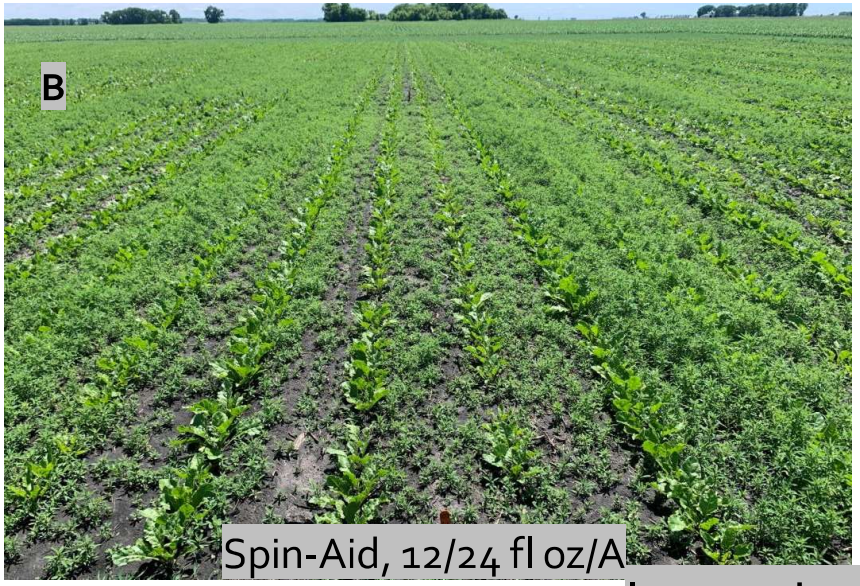
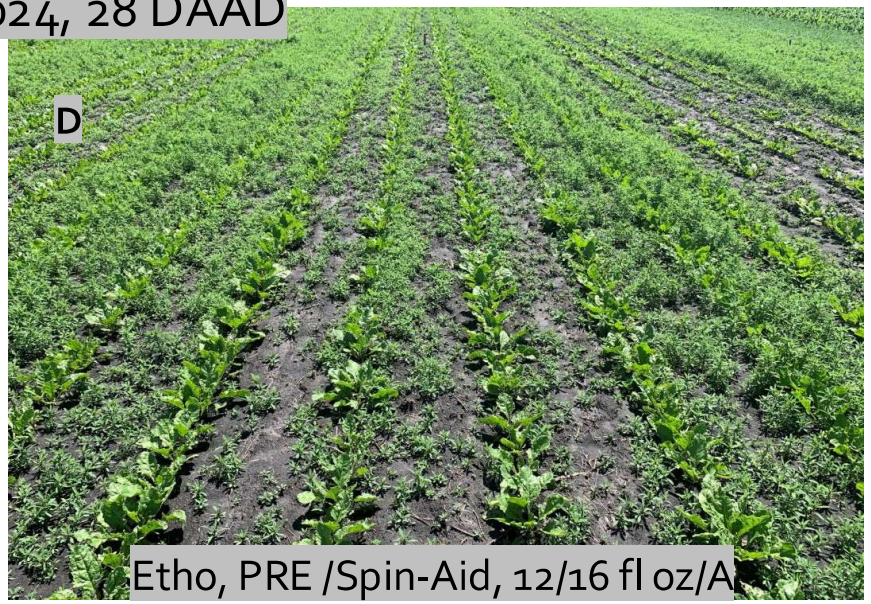


Image: June 19, 2024, 28 DAAD



Kochia control, Felton (F) and Felton-Hagen (FH), 2025

Spin-Aid	SHL and RUPM3	Etho PRE	F 47 DAP	F 57 DAP	FH 57 DAP	FH 63 DAP
Number of apps	Y/N	Y/N	----------(% Control)----------			
3	N	N	59 CD	49 e	44 D	51 cd
3	Y	N	66 C	50 e	65 C	50 cde
2	Y	Y	**84 AB**	**65 bc**	**79 A**	61 bc

Control, June 9, 2025, Felton, MN

PRE/20 / 24 + etho + RUPM3 + SHL, 26 DAT

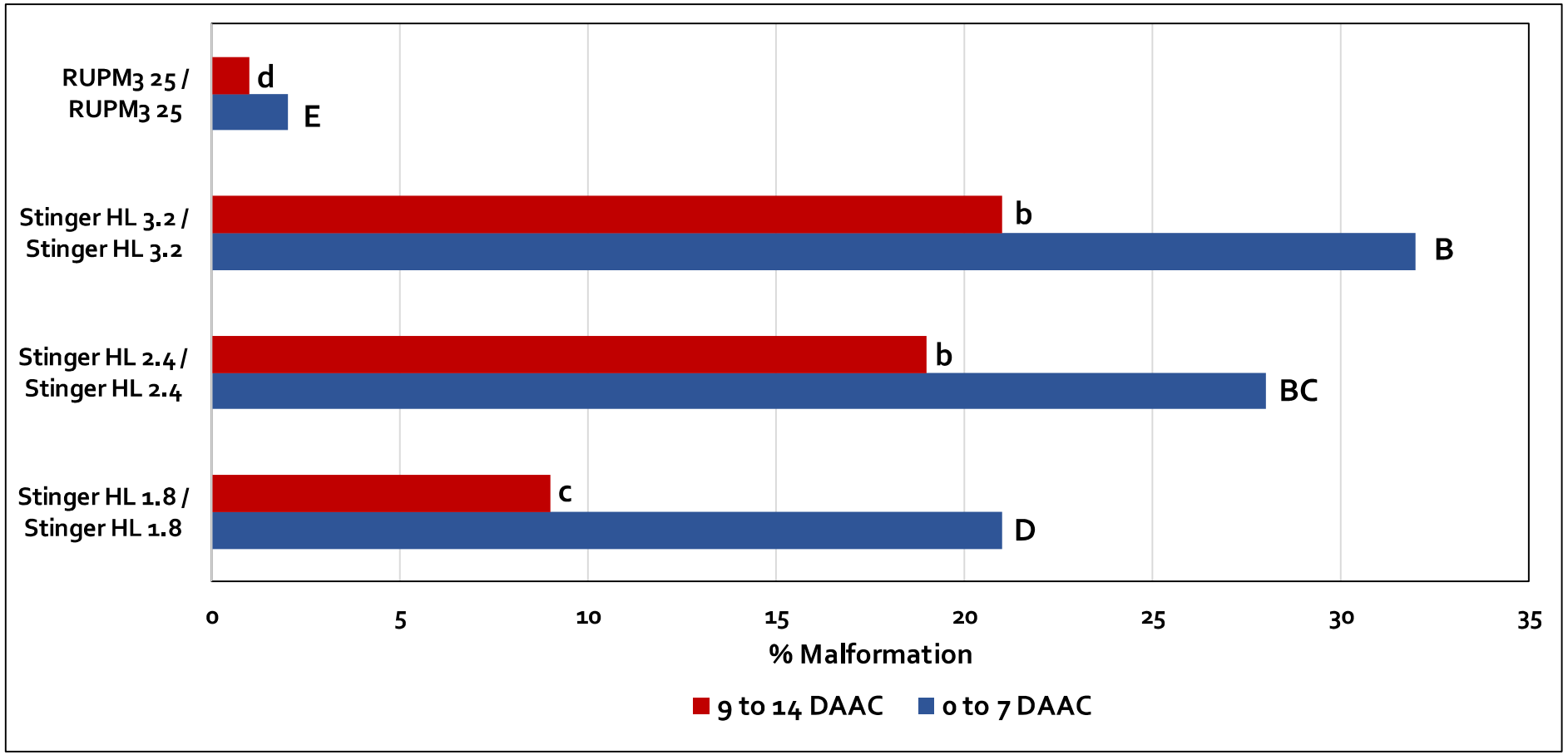
Summary from field experiments in 2024 and 2025

1. Stinger HL and Roundup PowerMax3 mixed with Spin-Aid and etho improved kochia control as compared to Spin-Aid and etho alone.
2. Micro-rate program/concept suppressed kochia size but has not consistently reduced kochia number.
3. Focus has been on kochia first and the Spin-Aid rate to tolerate sugarbeet. What if we focus on the Spin-Aid rate to kill kochia and time to sugarbeet growth stage?

Best Management Practices for Stinger HL application and ragweed control

- Stinger HL at 2.4 fl oz/A must be our lowest rate with a single application.
- 2-times Stinger HL at 1.8 fl oz/A gave greater than 90% control or for multiple flushes.
- Applied Stinger HL to ragweed less than 2-inch.
- Time Stinger HL application to ragweed size rather than sugarbeet stage.
- May need to separate glyphosate and Stinger HL application or Stinger HL and Spin-Aid application if you want to delay termination nurse crop to 4-lf sugarbeet.

Sugarbeet malformation[ab], across locations, 2025



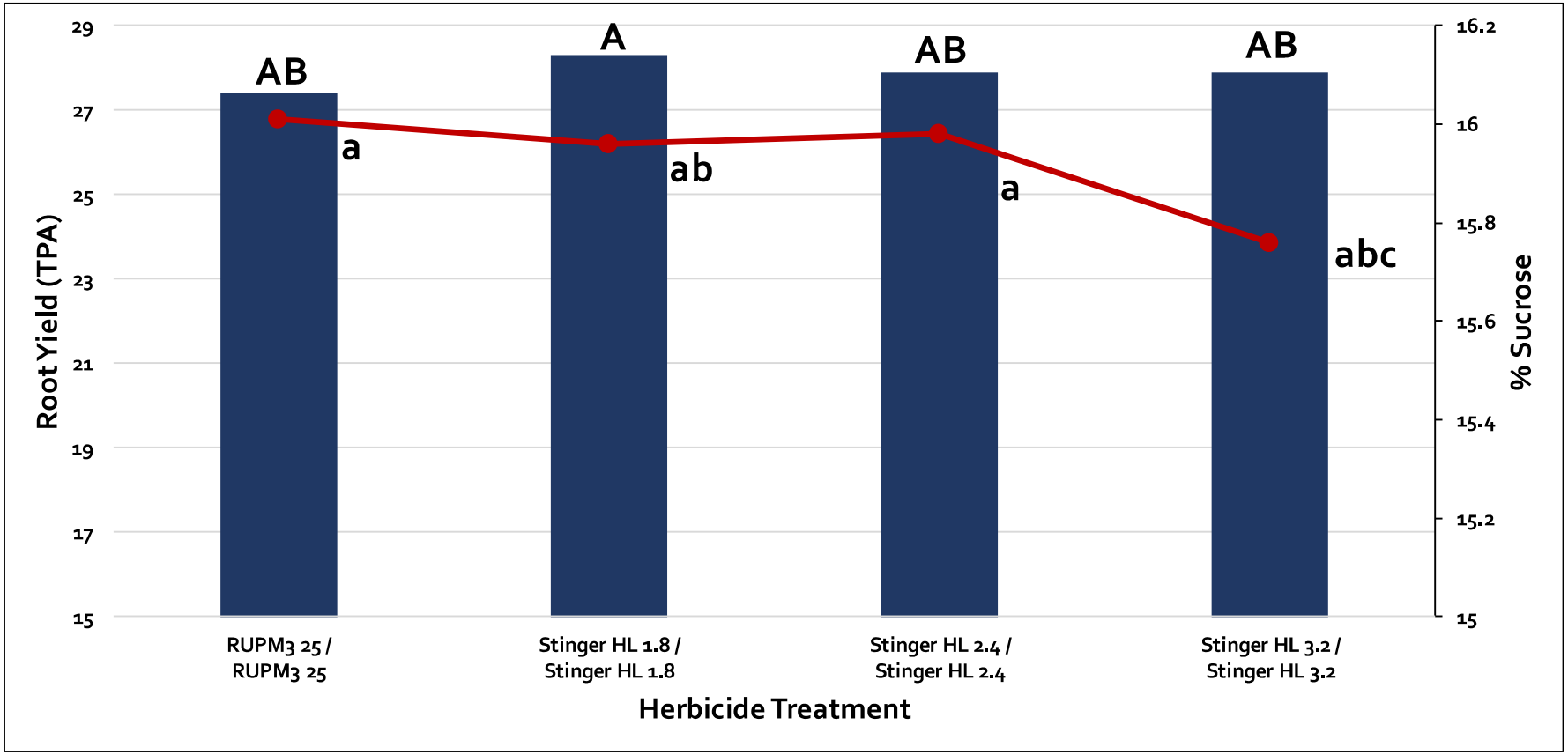
[a] Stinger HL mixed with Roundup PowerMax3; applied at V2 and V6.

[b] Visible percent sugarbeet malformation following 2-time Stinger HL application

June 11, 2025
Prinsburg, MN

Photo Credits:
David Mettler

Stinger HL[a] did not reduce sugarbeet root yield or percent sucrose, across locs, 2025.[a]



[a]Stinger HL mixed with Roundup PowerMax3 and etho

Weed control summary for 2026

- Scout your fields. Be on the look-out for 'observations' that don't make sense
- Take advantage of genetic testing opportunities for seed from escape plants
- Tank-mixes of effective herbicides; use effective herbicides in the crop sequence
- Compliment mechanical and cultural control strategies with your used of herbicides

Thank you for your continued support

Tom Peters

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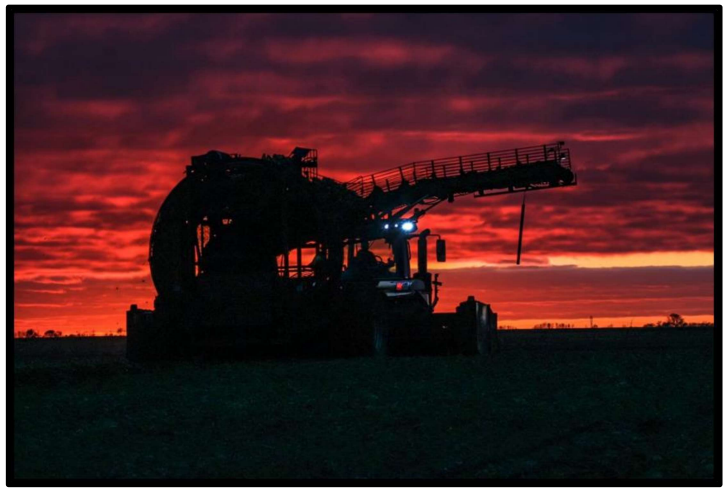

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