

# Weed Control in Sugarbeet

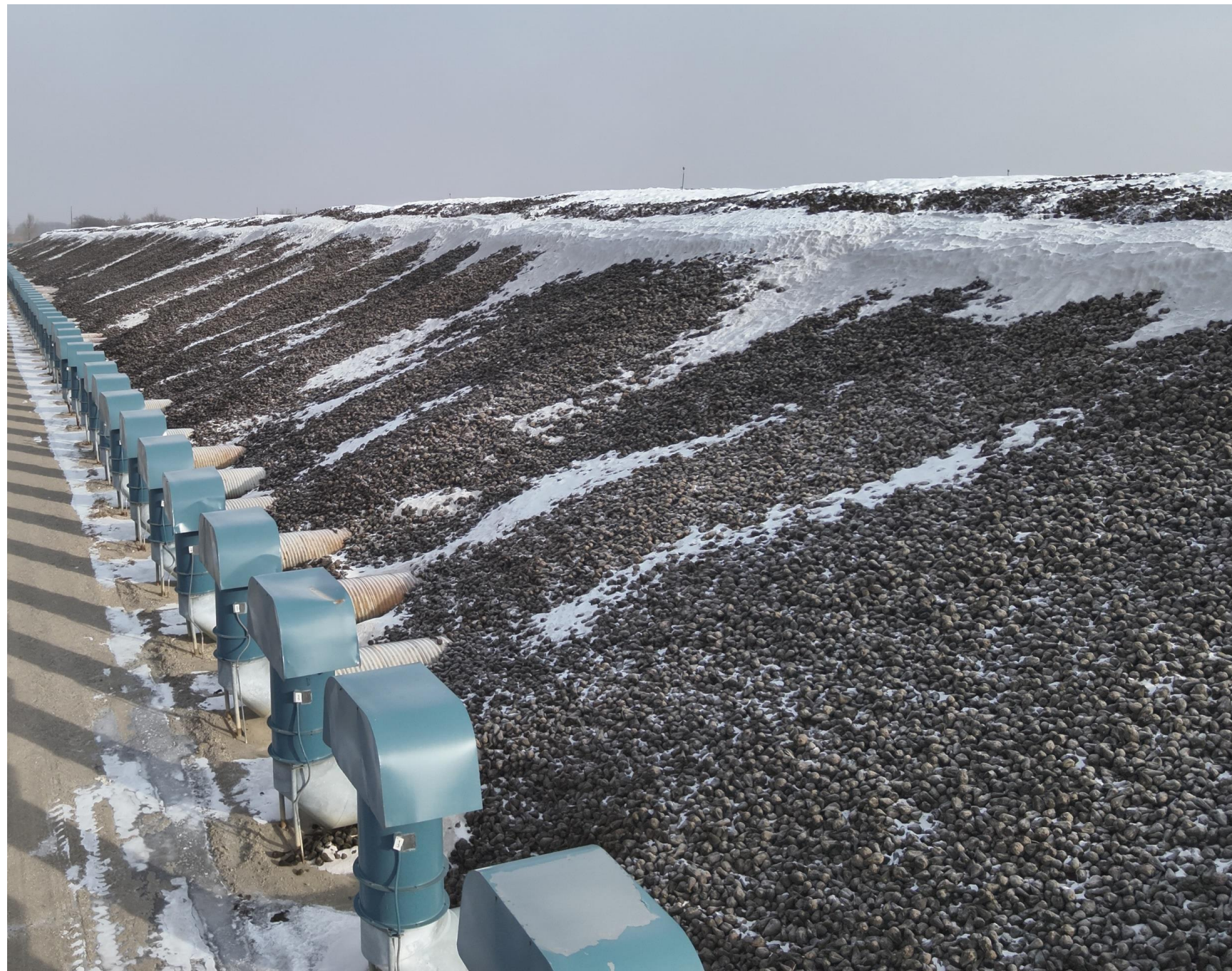
Thomas Peters and Adam Aberle

North Dakota State University and  
University of Minnesota

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# Presentation outline

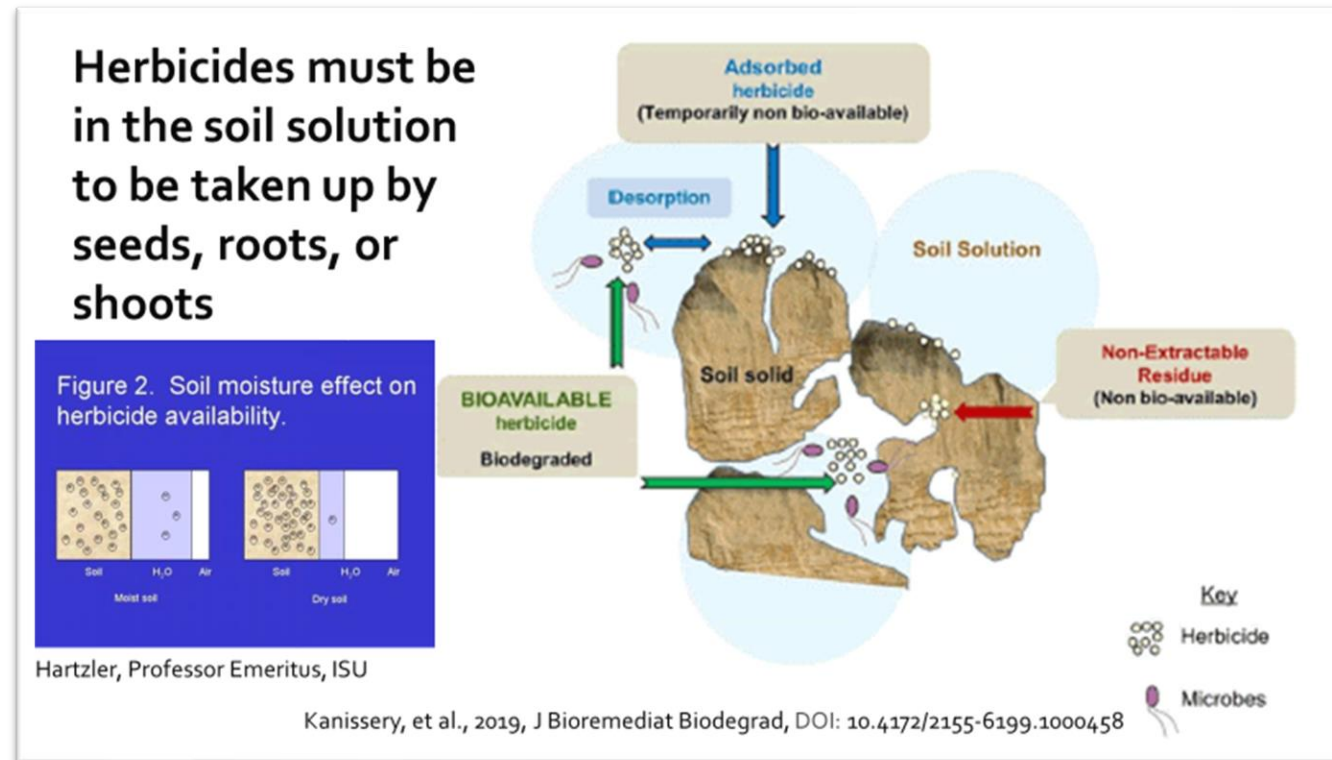
- Ethofumesate
- Label update - Torero
- Acetochlor in the surface water
- Palmer amaranth control in sugarbeet
- Common ragweed control
- Kochia control; tallow amine adjuvants



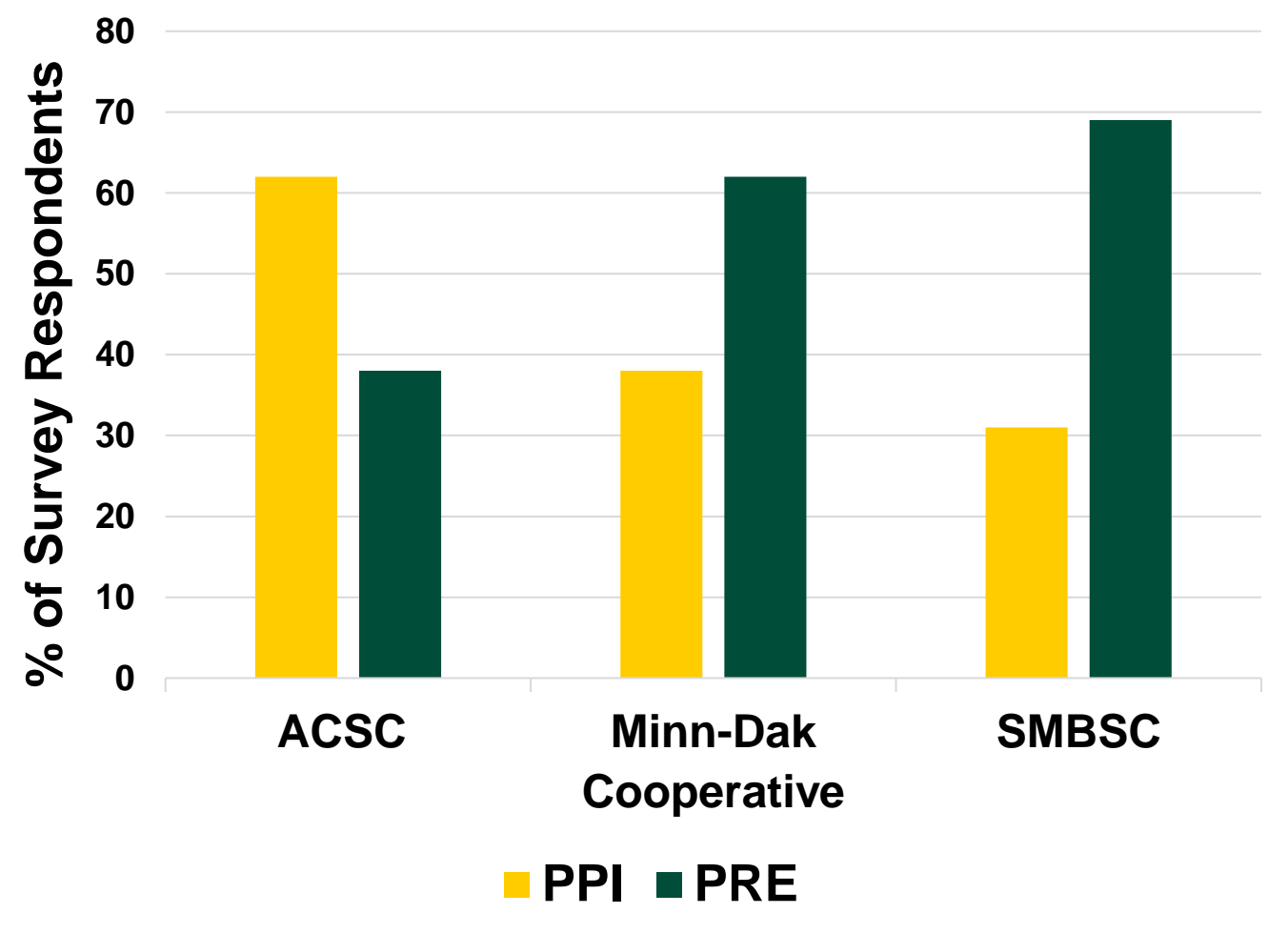


# Ethofumesate use in Sugarbeet

- Soil-applied group 15 herbicide
- Used for PRE, PPI, and POST applications in sugarbeet
- Ethofumesate half life in soil
  - >14 weeks when dry and cold
  - <5 weeks when moist and warm
- Efficacy based on rainfall after application



# Ethofumesate incorporation technique across cooperatives in 2023.<sup>a</sup>

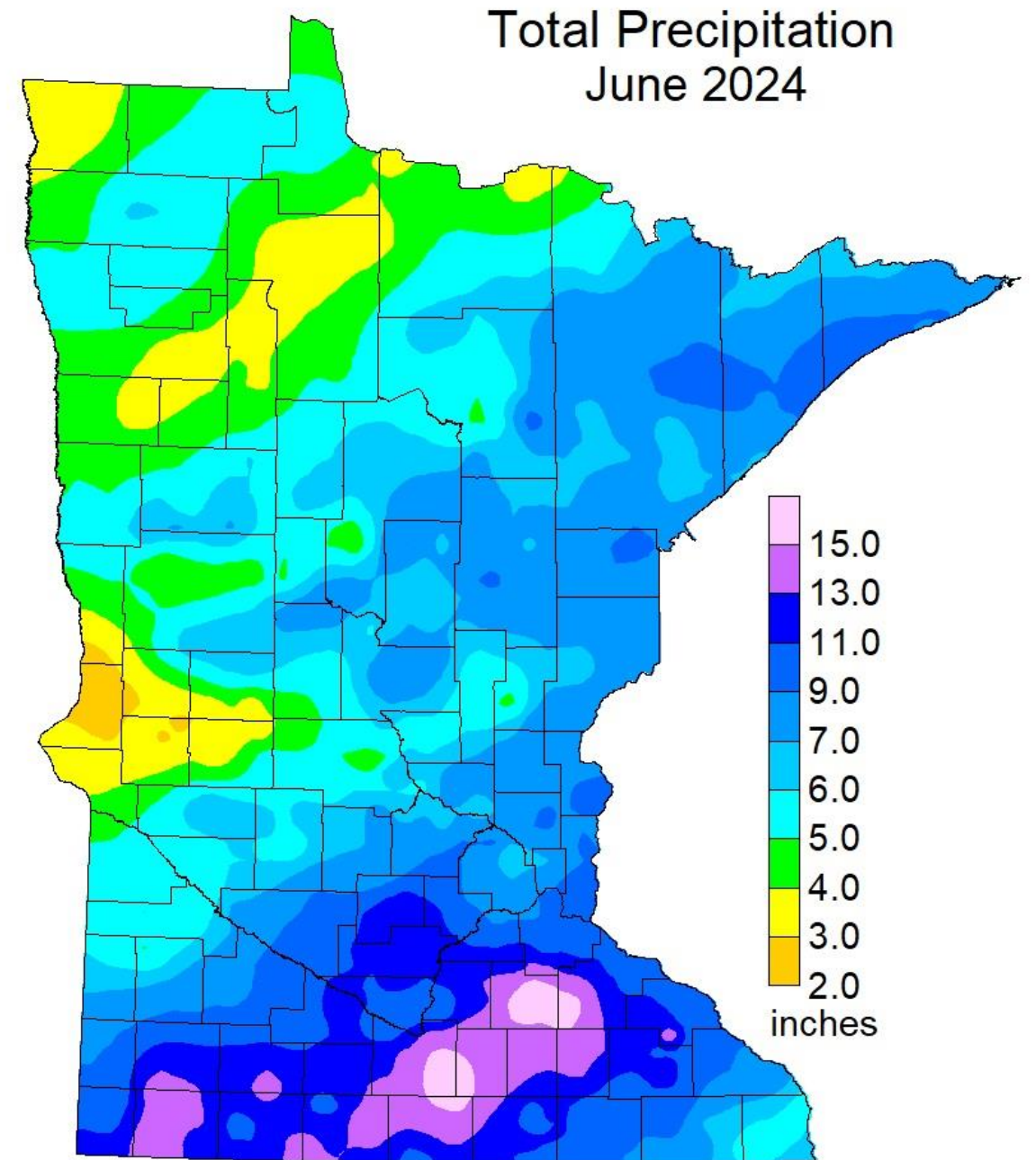


- Incorporation strategies depend by location/COOP
- Early season kochia or waterhemp control is critical to season long control
- Aided by:
  - Timely incorporation into soil
  - Tillage or rainfall

<sup>a</sup>Turning Point survey at 2024 grower seminars

# June 2024 Among the Wettest Months on Record in southern Minnesota

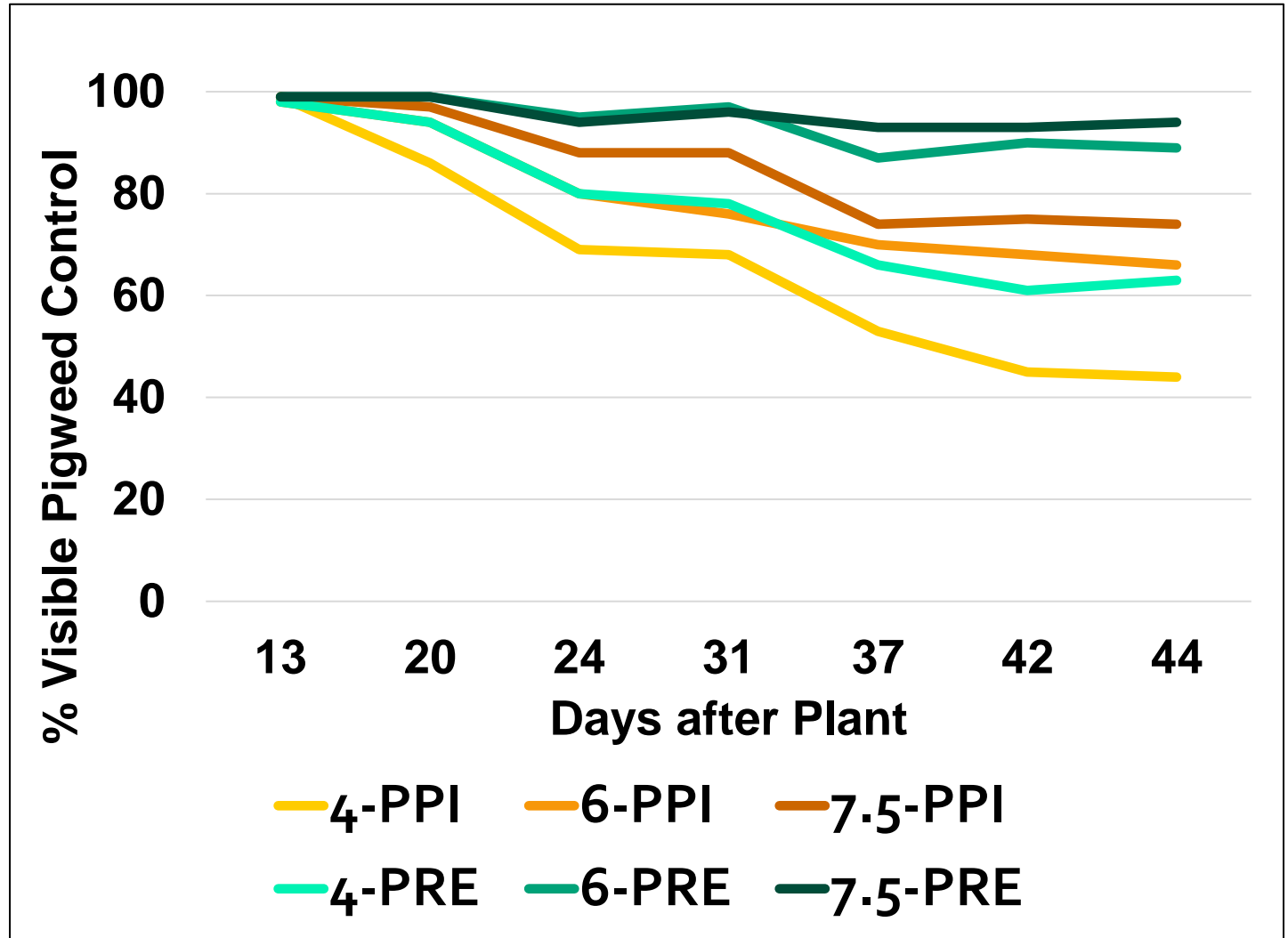
- June 2024 was the fourth-wettest June on record
- The state-average rainfall for the month, based on "gridded" data from NOAA, was 6.8 inches.
- This value was exceeded only by June 1905 (6.9 inches), June 1914 (7.3 inches) July 1897 (7.4 inches), and June 2014 (8.0 inches)



# PPI and PRE Comparison Study Results

- PRE applications performed better than PPI in 2024 due to timely rainfall
- Higher rates provided better control
- 6 and 7.5 pt/A rates PRE provided over 85% control

## Redroot pigweed control in response to ethofumesate, Horace ND, 2024





# Ethofumesate fused sugarbeet cotyledons



# 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

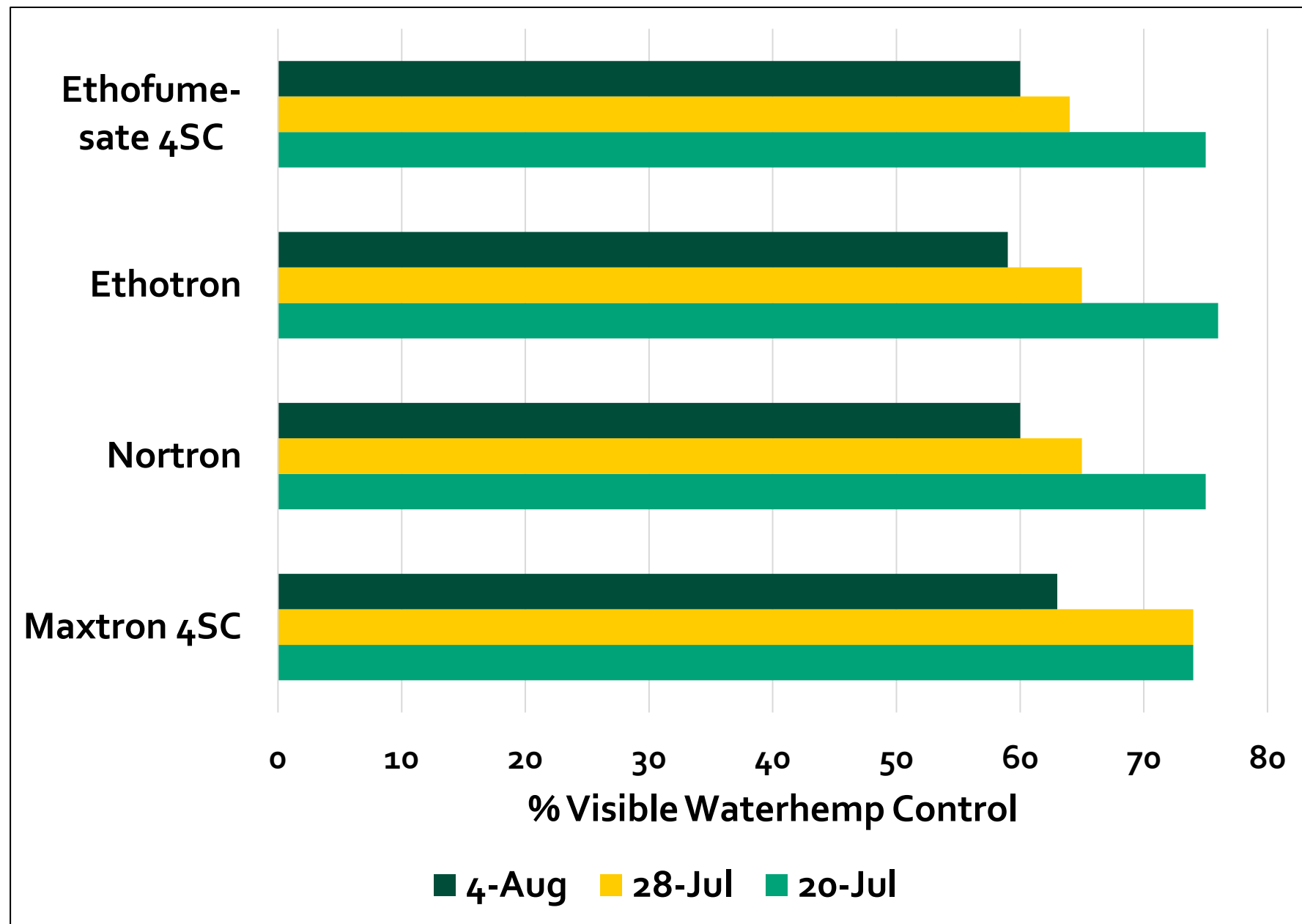


# Do ethofumesate brands provide similar waterhemp control?

- Experiments were conducted near Moorhead, MN and Renville, MN in 2024
- Planting date was May 14, 2024 (Renville) and May 11, 2024 (Moorhead). The Moorhead experiment was replanted June 17, 2024
- Both experiments were affected by excessive rainfall conditions.
- The idea was to compare waterhemp control with various ethofumesate products

# Brand Comparison Study Results: Moorhead, MN

- Waterhemp control 68, 76, and 83 DAP
- No differences between brands
- Waterhemp control averaged 75%, 67%, and 61% across brands



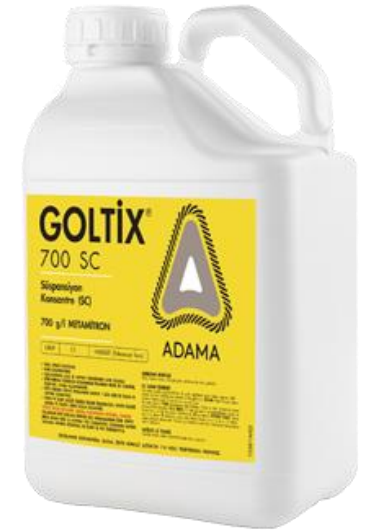
Each treatment includes 25 fl oz/A RUPM<sub>3</sub> and 6 fl oz/A Nortron at 2-4 and 6-8 lf stage.



# Metamitron

## Goltix / Torero

- Metamitron is SOA 5, photosystem II inhibitor herbicide
- Same family has metribuzin (Sencor/Dimetric)
- First released commercially in Germany in 1976.
- Applied PPI, PRE, or POST.
- Very little grass activity
- Moderate activity on common lambsquarters and pigweed species



Aaron Carlson, MS. Thesis, NDSU under Alan Dexter, 2004 to 2006

# Carlson and Dexter, 2004 to 2006

## Sugarbeet Tolerance

- Sugarbeet safety from metamitron PPI or PRE at rates up to 219 fl oz (6.84 qt/A)
- Metamitron at 55 fl oz PPI fb 3-times metamitron POST at 22 to 33 fl oz/A + MSO gave 14% injury

## Weed Control

- Metamitron PPI metamitron generally gave 20% to 40% better control metamitron PRE
- Moderate control (74% - 98%) from PPI metamitron required rates of 175 to 219 fl oz/A
- Metamitron PRE gave less than 78% control of any specie evaluated at any rate applied (44, 88, 131, 175, 219 fl oz/A) and was generally less than 50% control

# Metamitron experiments in 2022 and 2023

Waterhemp control from Goltix or Goltix plus etho at 2 pt/A PRE, 31 DAP, Hickson ND, 2022

Rate	Goltix	Goltix + Ethofumesate
(fl oz/A)	%	%
19.6	15	50
39	10	35
59	20	45
78	25	55

Waterhemp control from Goltix or Goltix plus etho at 2 pt/A PRE, 40 DAP, Blomkest MN, 2022

Rate	Goltix	Goltix + Ethofumesate
(fl oz/A)	%	%
19.6	34	69
39	60	73
59	46	68
78	61	68



# Metamitron experiments in 2022 and 2023

Waterhemp control from Goltix or Goltix plus etho at 2 pt/A PRE, 31 DAP, Hickson ND, 2022

Rate	Goltix	Goltix + Ethofumesate
(fl oz/A)	%	%
19.6	15	50
39	10	35
59	20	45
78	25	55

Waterhemp control from Goltix or Goltix plus etho at 53 fl oz/A PRE, 15 DAP, Blomkest MN, 2023

Rate	Goltix	Goltix + Ethofumesate
(fl oz/A)	%	%
17	40	55
34	33	60
68	53	76
136	40	71

Waterhemp control from Goltix or Goltix plus etho at 2 pt/A PRE, 40 DAP, Blomkest MN, 2022

Rate	Goltix	Goltix + Ethofumesate
(fl oz/A)	%	%
19.6	34	69
39	60	73
59	46	68
78	61	68

Waterhemp control from Goltix or Goltix plus etho at 53 fl oz/A PRE, 23 DAP, Blomkest MN, 2023

Rate	Goltix	Goltix + Ethofumesate
(fl oz/A)	%	%
17	61	69
34	49	75
68	71	76
136	63	75



# Chloroacetamides in 2024

## Group 15

### **Dimethenamid**

- Outlook, BASF

### **Acetochlor (encapsulated)**

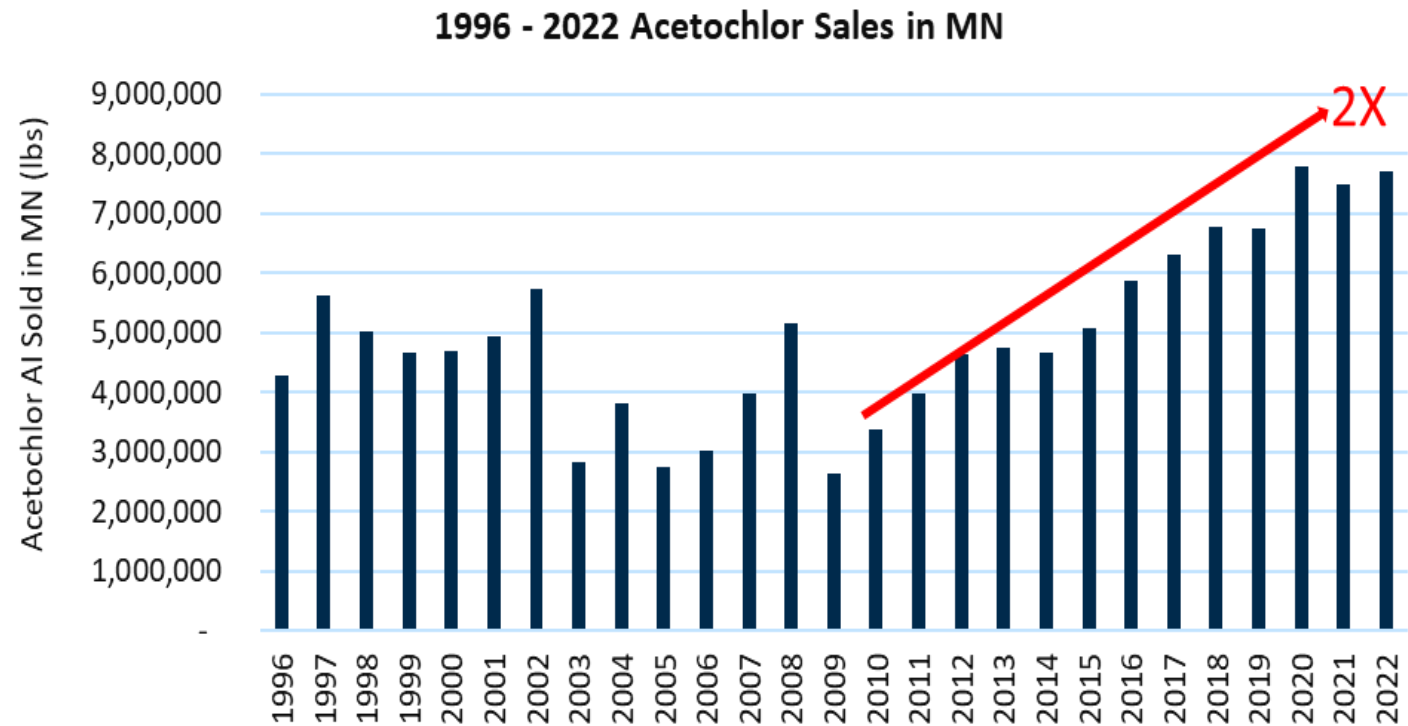
- Warrant, Bayer CropScience
- Enversa, Corteva agriscience
- Arrest CS, Sharda USA LLC

### **S-metolachlor**

- Dual Magnum, Syngenta Crop Protection, LLC
- EverpreX, Corteva agriscience
- Medal, Syngenta Crop Protection, LLC
- Brawl, TENKOZ, Inc.
- Moccasin, UPL NA Inc.
- Charger Basic, WinField United

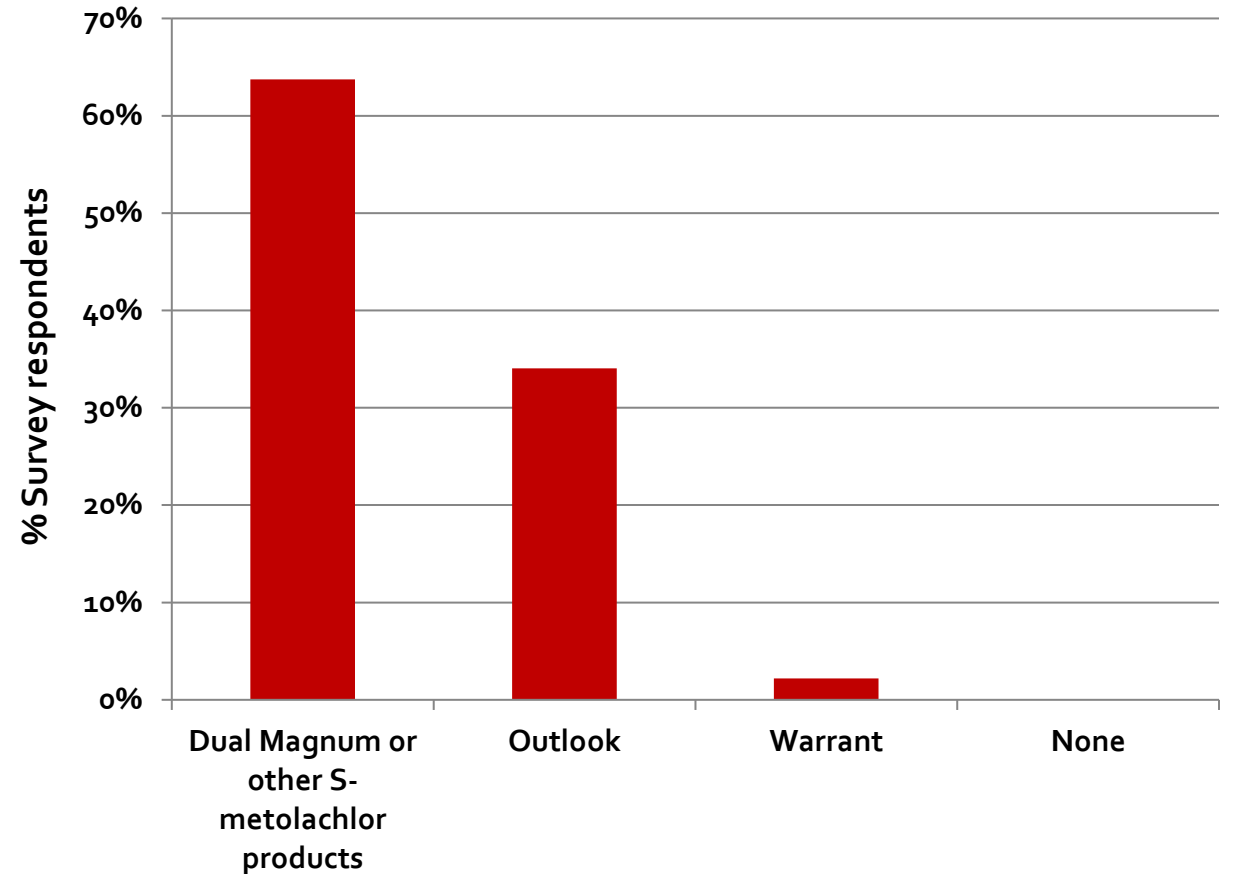
# Acetochlor is a preemergent herbicide registered for agricultural use

- Marketed as SureStart, Tripleflex, Resicore, Harness, and Warrant
- >7 million lb of acetochlor active ingredient sold in Minnesota in 2023
- Applied to 59% of corn acres (2021) and 13% of soybean acres (2020) in Minnesota



# Acetochlor is a preemergent herbicide registered for agricultural use

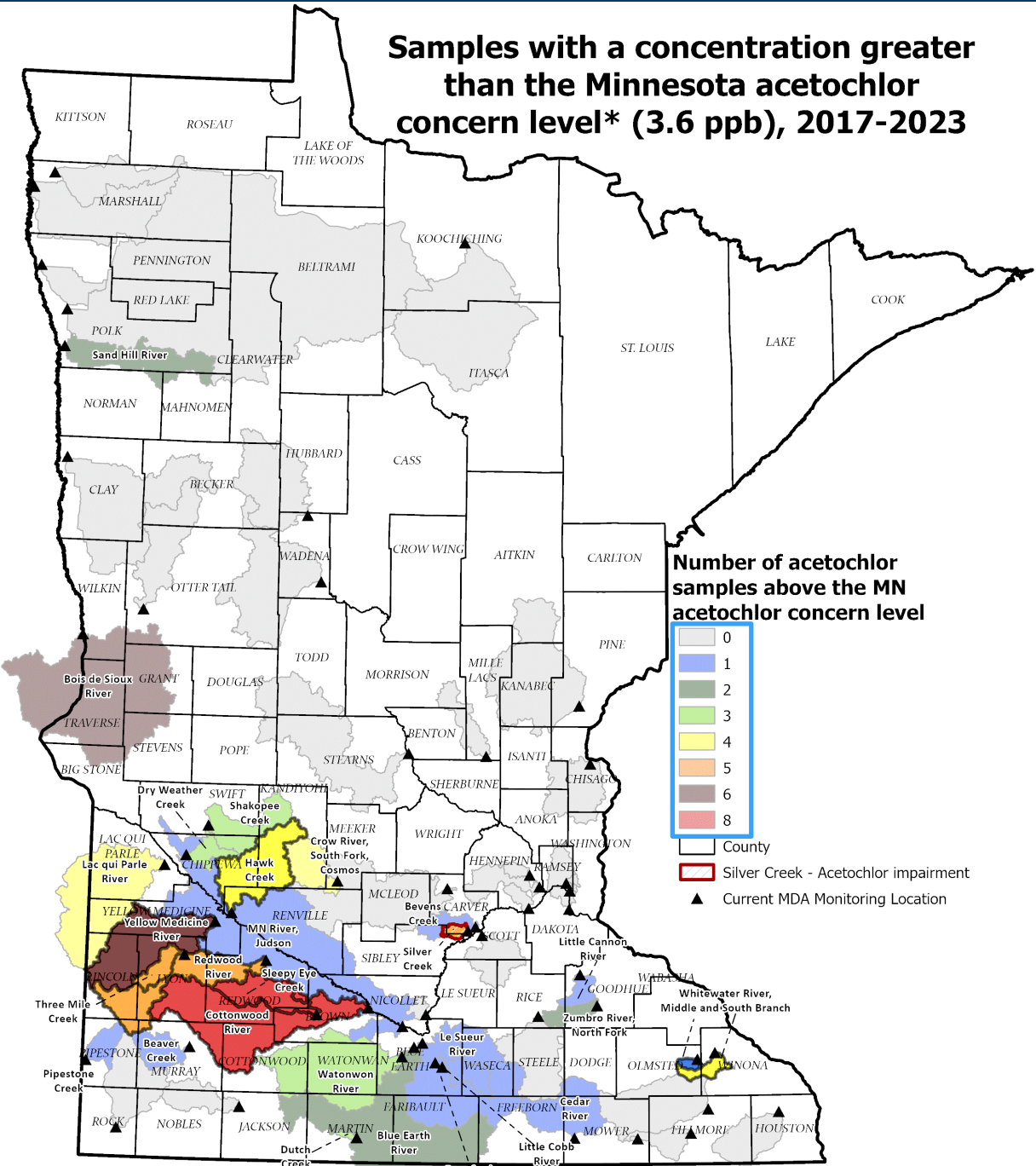
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Survey at the 2023 Wahpeton Growers Seminar, Willmar, MN

# High acetochlor levels are frequently detected in rivers/streams

Samples with a concentration greater than the Minnesota acetochlor concern level\* (3.6 ppb), 2017-2023



\*Concern level is equal to the numeric value of the Minnesota chronic water quality standard. The standard also includes a 4-day average concentration component that needs to be exceeded to violate the standard.

Rivers/Streams	# of detections > 3.6 ppb (2017 - 2023)	Counties
----------------	---	----------

<b>Cottonwood River /Sleepy Eye Creek</b>	8	Cottonwood, Murray, Lyon, Redwood, Brown
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<b>Hawk Creek</b>	4	Chippewa, Kandiyohi, Renville, Meeker
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<b>Yellow Medicine River</b>	6	Lincoln, Yellow medicine, Lyon
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<b>Redwood River /Three Mile Creek</b>	5	Lincoln, Lyon, Redwood
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<b>White Water River, South Branch</b>	4	Winona, Olmsted
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# MDA advises following acetochlor Best Management Practices (BMPs) to keep acetochlor out of surface water

- **Rotate acetochlor products with non-acetochlor herbicides**, like other Group 15 herbicides, or those with different Sites-of-Action.
- **Use non-acetochlor herbicides early in the season** and save acetochlor for early post-emergence application, when possible.

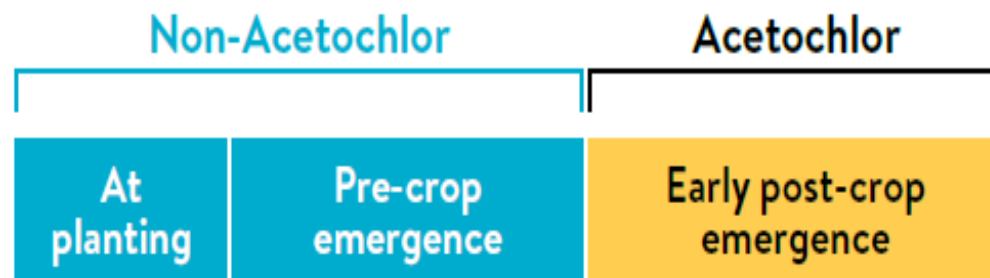




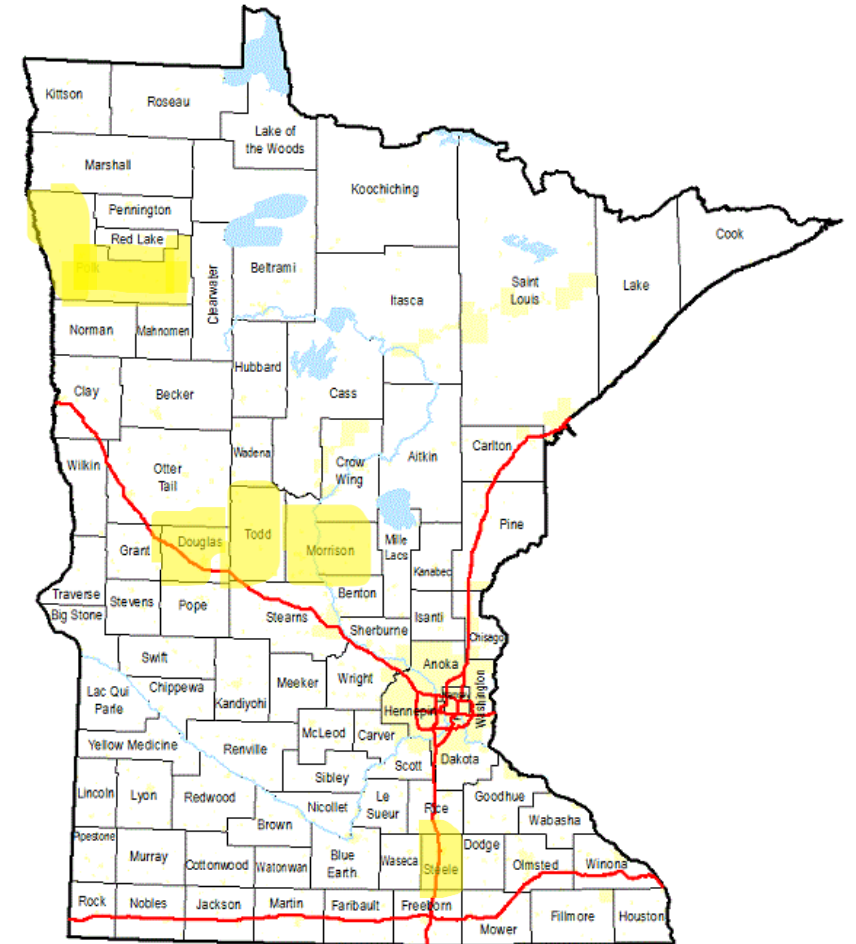




Photo credit: Bob Hartzler, ISU

# 2024 Palmer Amaranth Update

- **Palmer amaranth was discovered at four new locations in four counties**
  - Two were new county finds – Morrison and Steele
  - New locations were found in Douglas and Todd
- **Reemergence identified at a single Polk County site**
  - MDA continues to work with a Polk County Business to eliminate Palmer on their property that originated from dumping excess sunflower screenings



# Current Status of Palmer Amaranth in Minnesota

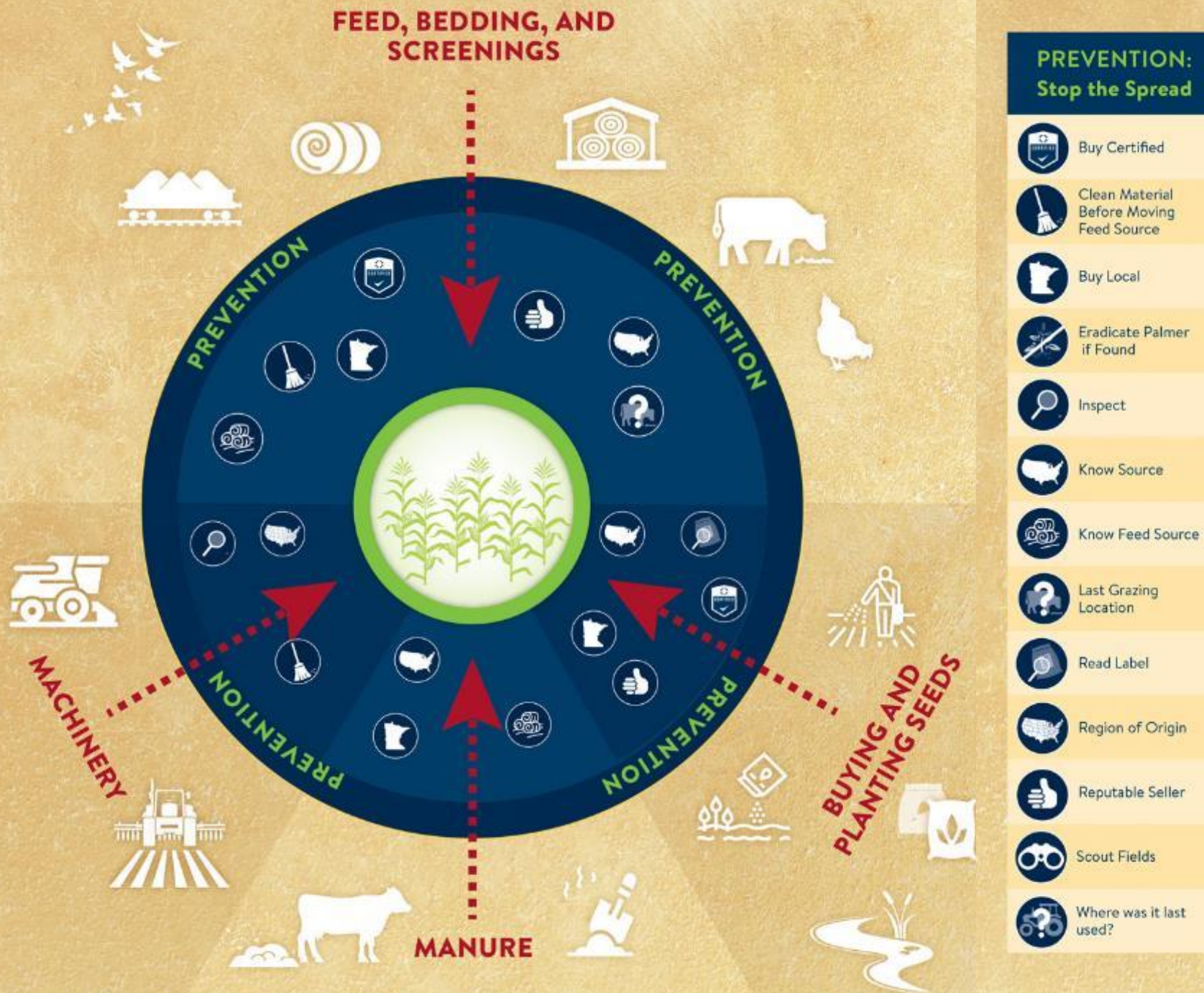
- Palmer amaranth is considered **eradicated** if there have been no plants at a site in 3 years
- **Outcome at 44 sites with Palmer amaranth:**
  - 7 sites in 7 counties are still being managed
  - 15 sites in 10 counties have been **eradicated**!
- **Outcome at 77 sites where introduced:**
  - 33 sites in 20 counties are still being surveyed



# Pathways for the introduction of Palmer amaranth into Minnesota

Identified sources:

- Seed
  - Slender wheatgrass
  - Buffalo grass
  - Proso millet
  - Pearl millet
  - Japanese millet
- Screenings
  - Sunflower
- Manure
  - Sunflower screenings as feed source
- Feed
  - Whole scratch chicken grains



# Materials and Methods

## Factorial Design

### Preemergence herbicide treatment

- None
- Nortron + Dual Magnum (3 + 0.75 pt)
- Nortron + Torero (3 + 4 pt metamitron)
- Nortron (7.5 pt)

### Postemergence herbicide treatment

- RUPM<sub>3</sub>+Nortron/RUPM<sub>3</sub>+Nortron/RUPM<sub>3</sub>+Nortron
- Outlook+RUPM<sub>3</sub>+Nortron/Warrant+RUPM<sub>3</sub>+Nortron
- Outlook+RUPM<sub>3</sub>+Nortron/Warrant+RUPM<sub>3</sub>+Nortron/Dual Magnum+RUPM<sub>3</sub>+Nortron

# Materials and Methods

## Barnes County Diary

- June 1, 2024 – Plant at Eskelson, ND
- June 1, 2024 – Preemergence herbicide application
- June 17, 2024 – POST broadcast application
- June 17, 2024 – POST application, sugarbeet 2-lf stage
- July 3, 2024 – POST application, sugarbeet 6-lf stage
- July 16, 2024 – POST application, sugarbeet 10-lf stage
- August 9, 2024 – terminate experiment

**8 days after glyphosate broadcast application, Eskelson  
ND, June 25, 2024.**



# Palmer amaranth control in response to herbicide treatment, Eskelson ND, 2024

Herbicide treatment	Rate	43-52 DAP	58-69 DAP	Score <sup>a</sup>	Count <sup>b</sup>
	(pt/A)	%	%	(1, 2, 3)	Num
Untreated		67	49 b	2.6	23
Nortron + Dual Magnum	3 + 0.75	74	64 a	2.3	14
Nortron + Torero	0.5 + 8	80	63 a	2.2	14
Nortron	7.5	78	70 a	2.2	14
P value		0.1309	0.0970	0.5373	0.2260

<sup>a</sup> 1= heavy density, 2= moderate, 3 = lighter <sup>b</sup>number of P. amaranth between rows 3 and 4, length of plot



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Nortron	7.5	78	70 a	2.2	14
P value		0.1309	0.0970	0.5373	0.2260

Herbicide treatment	Rate	43-52 DAP	58-69 DAP	Score <sup>a</sup>	Count <sup>b</sup>
	(fl oz/A)	%	%	(1, 2, 3)	Num
RUPM3 + etho (3-times)	25+4	68 b	52 b	2.4	23 b
Outlook/Warrant (3x)	18/64	75 ab	60 b	2.3	16 ab
Outlook/Warrant/D Mag (3x)	18/64/20	81 a	72 a	2.3	10 a
P value		0.0260	0.0239	0.7451	0.0147

<sup>a</sup> 1= heavy density, 2= moderate, 3 = lighter <sup>b</sup>number of P. amaranth between rows 3 and 4, length of plot

**We placed a wire flag at Palmer amaranth height on July 24, 2024. Images were collected on July 29 or 5 days after flagging and on August 8 or 15 days after flagging.**

Image capture July 29



Image capture August 8

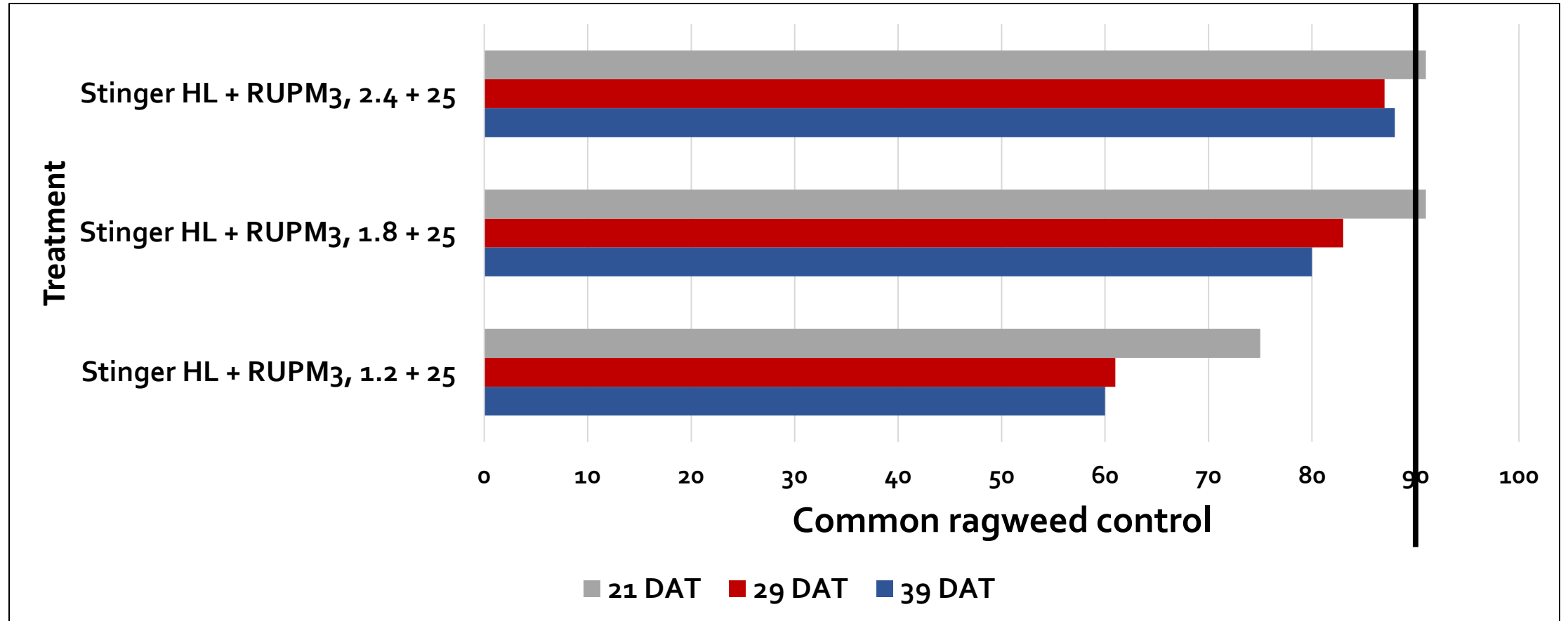


# Summary

1. Palmer amaranth emerged late June at Eskelson, ND in 2024 or approximately 45 to 75 days after when sugarbeet typically are planted.
2. We believe POST Palmer amaranth control program is more important than PRE program.
3. Three-times soil residual herbicides was more efficacious for Palmer amaranth control than two-times soil residual herbicides.
4. Cultural control (sugarbeet planting date and stand establishment) will delay Palmer amaranth establishment.
5. Watchout: treatments provided only fair (65% to 80%) Palmer amaranth control in experiment.



# Common ragweed control in response to treatment, < 2-inch, Halstad, 2022.<sup>a</sup>



<sup>a</sup>Treatment mixed with non-ionic surfactant and liquid AMS

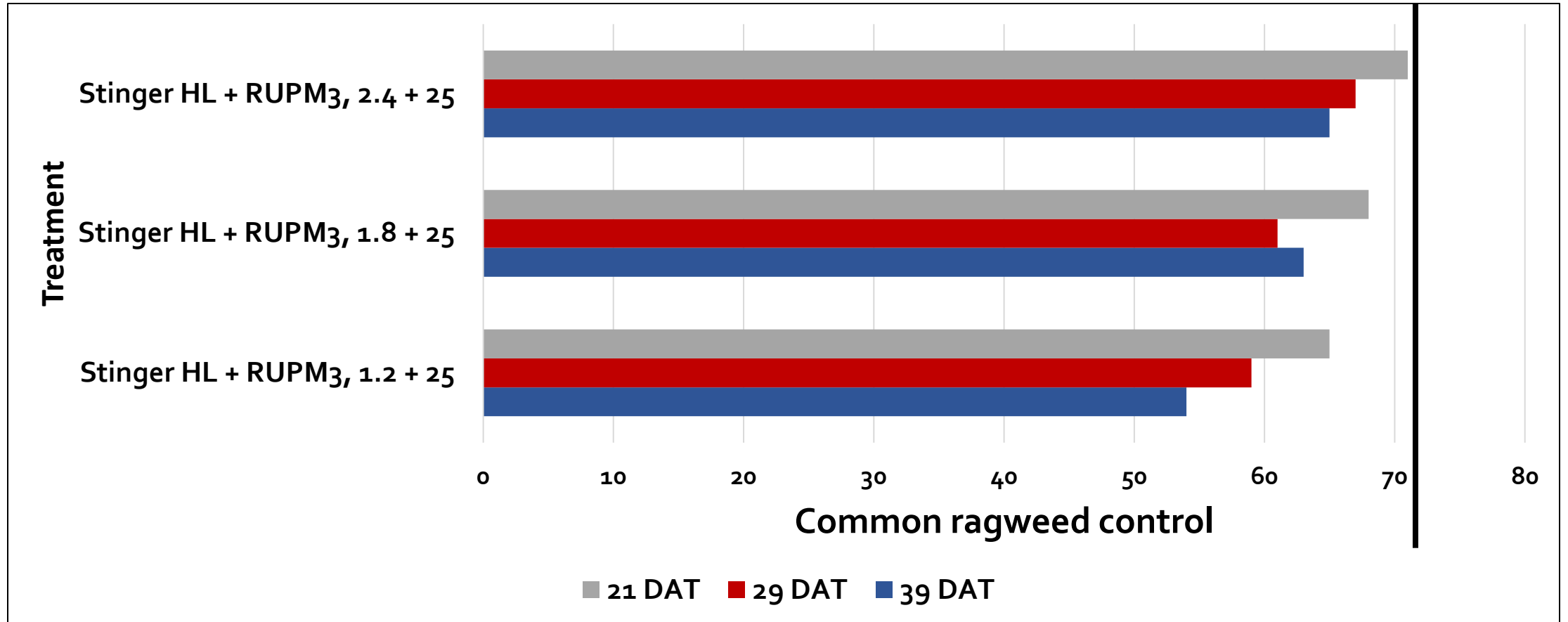
# Common ragweed control, Halstad, MN, 2022

Treatment <sup>a</sup>	Rate	Common Ragweed	Common ragweed control <sup>b</sup>		
			July 8 29 DAAA	July 16 37 DAAA	July 26 47 DAAA
	fl oz/A	inch	%	%	%
Stinger HL + PowerMax3	2.4 + 25	<2	91 b	87 ab	88 a
Stinger HL + PM <sub>3</sub> / Stinger HL + PM <sub>3</sub>	1.5 + 25 / 1.5 + 25	<2 / 10 day	91 b	91 a	89 a
Stinger HL + PM <sub>3</sub> / Stinger HL + PM <sub>3</sub>	1.8 + 25 / 1.8 + 25	<2 / 10 day	95 a	92 a	94 a
LSD (0.10)			4	8	8

<sup>a</sup>Treatment mixed with non-ionic surfactant and liquid AMS

<sup>b</sup>application a applied to ragweed less than 2-inch and 13 days later

# Common ragweed control in response to treatment, 2- to 4-inch, Halstad, 2022.<sup>a</sup>



<sup>a</sup>Treatment mixed with non-ionic surfactant and liquid AMS

# Common ragweed control, Halstad MN, 2022

Treatment	Rate	Common Ragweed	Common ragweed control		
			July 8 21 DAAB	July 16 29 DAAB	July 26 39 DAAB
	fl oz/A	inch	%	%	%
Stinger HL + PowerMax3	2.4 + 25	2-4	71	67 ab	65 b
Stinger HL + PM <sub>3</sub> / Stinger HL + PM <sub>3</sub>	1.5 + 25 / 1.5 + 25	2-4 / 10 day	69	69 a	77 a
Stinger HL + PM <sub>3</sub> / Stinger HL + PM <sub>3</sub>	1.8 + 25 / 1.8 + 25	2-4 / 10 day	70	69 a	79 a
LSD (0.10)			NS	9	6

<sup>a</sup>Treatment mixed with non-ionic surfactant and liquid AMS

<sup>b</sup>application b applied to ragweed greater than 2-inch AND 10 days later



# 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.
- Stinger HL applied to ragweed less than 2-inch vs. greater than 2-inch.
- Time Stinger HL application to ragweed size rather than sugarbeet stage.
- May need to separate glyphosate and Stinger HL application if you want to delay termination nurse crop to 4-lf sugarbeet.

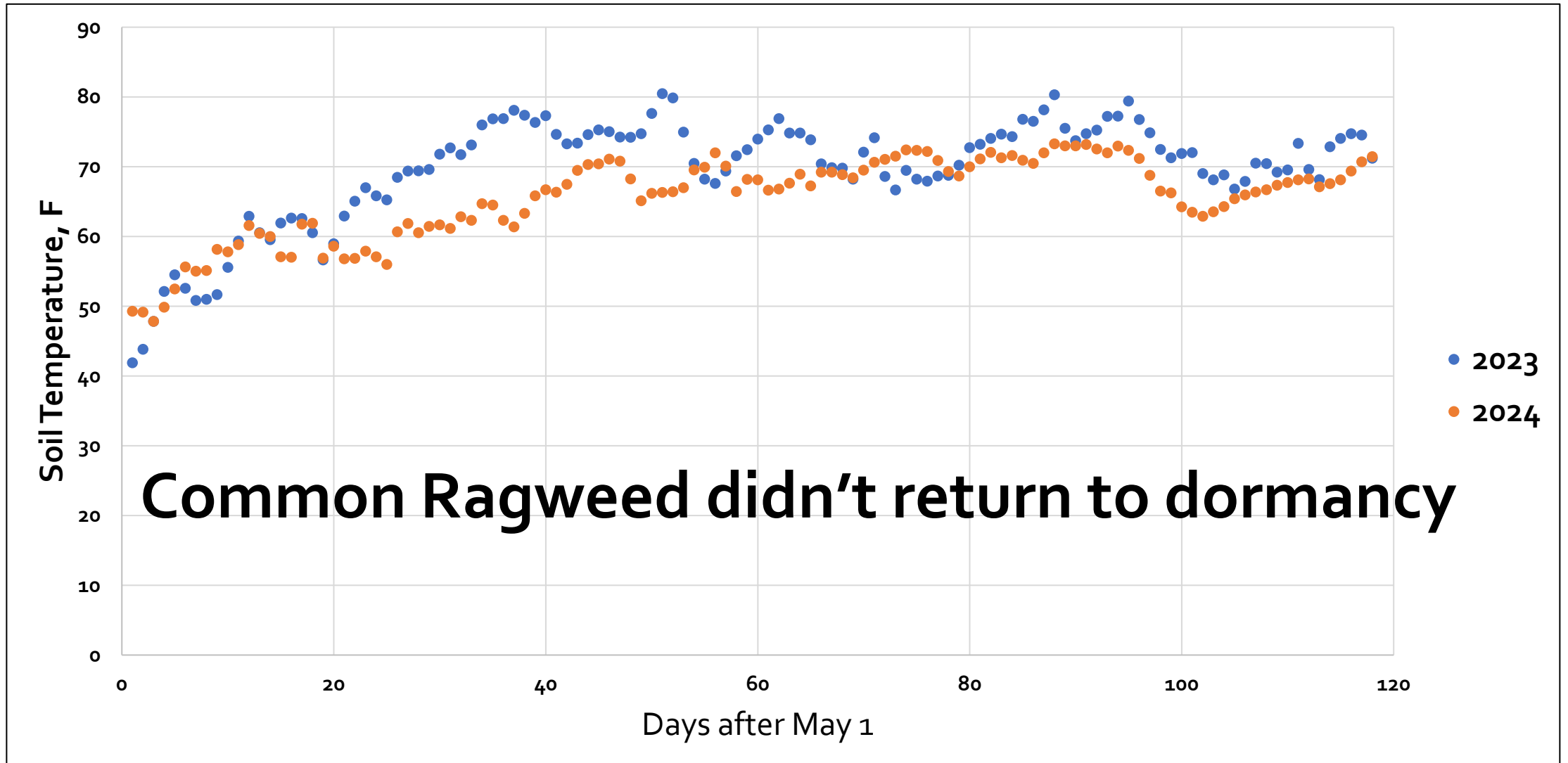




# Why were there so many common ragweed escapes in 2024?

- Timing of the first Stinger HL application was influenced by weather.
- Growers didn't compensate with higher Stinger HL rates for the second application on larger, actively growing ragweed
- Carryover concerns
- Complex tank mixtures
  - Spray timed to waterhemp stage instead of common ragweed stage
- Ragweed continued to emerge well into June

# Daily average soil temperature at 4-inch at Sabin, MN, May 1 to August 15, 2023 and 2024



# Other thoughts about Stinger HL

- 10.5 months **Rotation Interval** with soils greater than 2% organic matter AND rainfall more than 15 inches during 12 months following application
- Some of us measured 6-inch of rain in June, July and August. Very little rain in September and October
- Rainfall is especially important if Stinger HL rate is greater than 3.6 fl oz/A in a season
- Manage clopyralid products in the sequence with sugarbeet

Spring Wheat	Sugarbeet	Corn
WideMatch	Stinger HL	SureStart/II / TripleFlex/II
WideARmatch		Resicore / Resicore XL
Curtail		Maverick
PerfectMatch		Kyro

# Common ragweed control from Stinger, 51 DAT, greenhouse biotype, Minn-Dak and ACS.





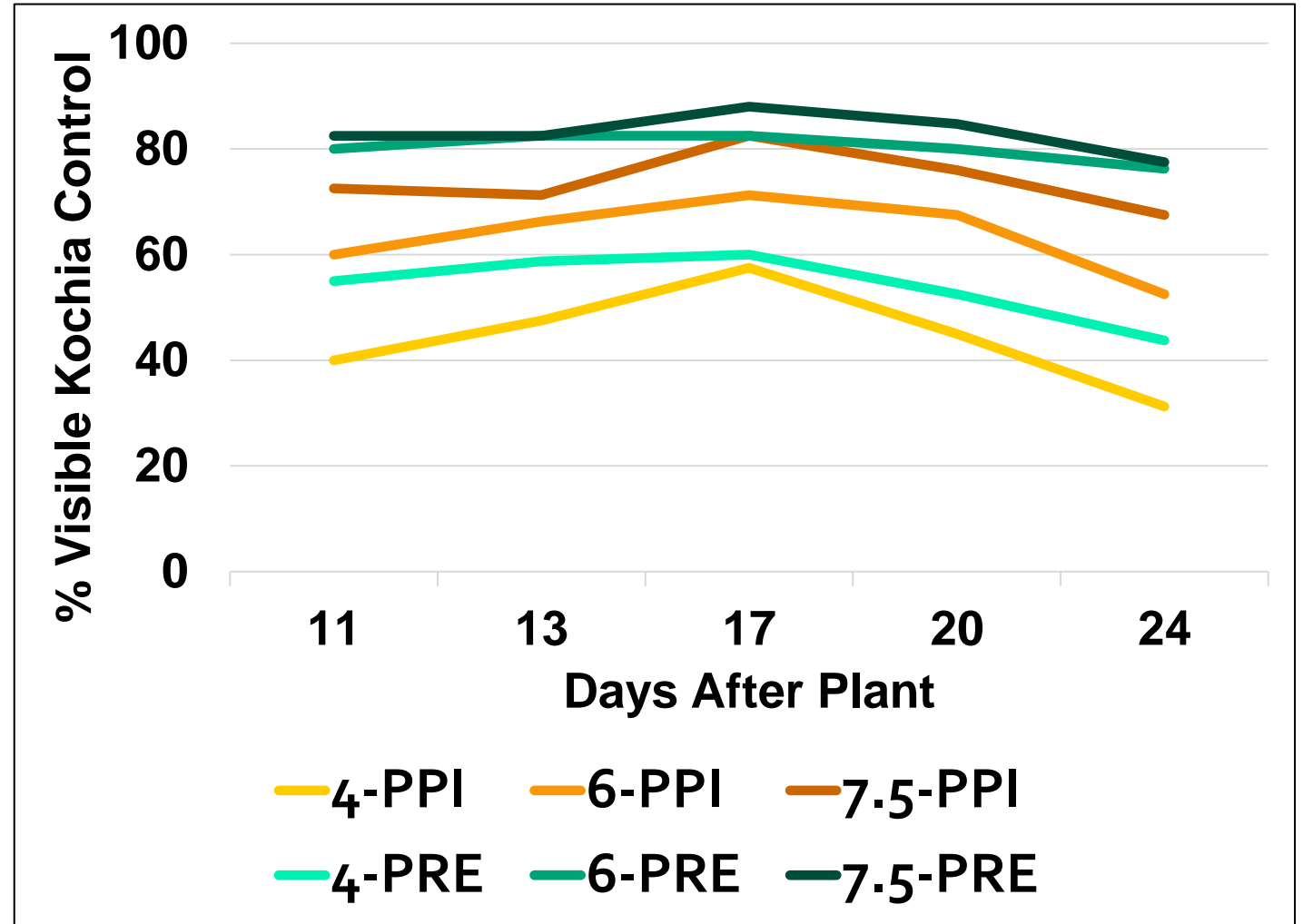




# PPI and PRE Comparison Study Results

- PRE applications performed better than PPI in 2024 due to timely rainfall
- Higher rates provided better control
- 6 and 7.5 pt/A rates PRE provided over 85% control

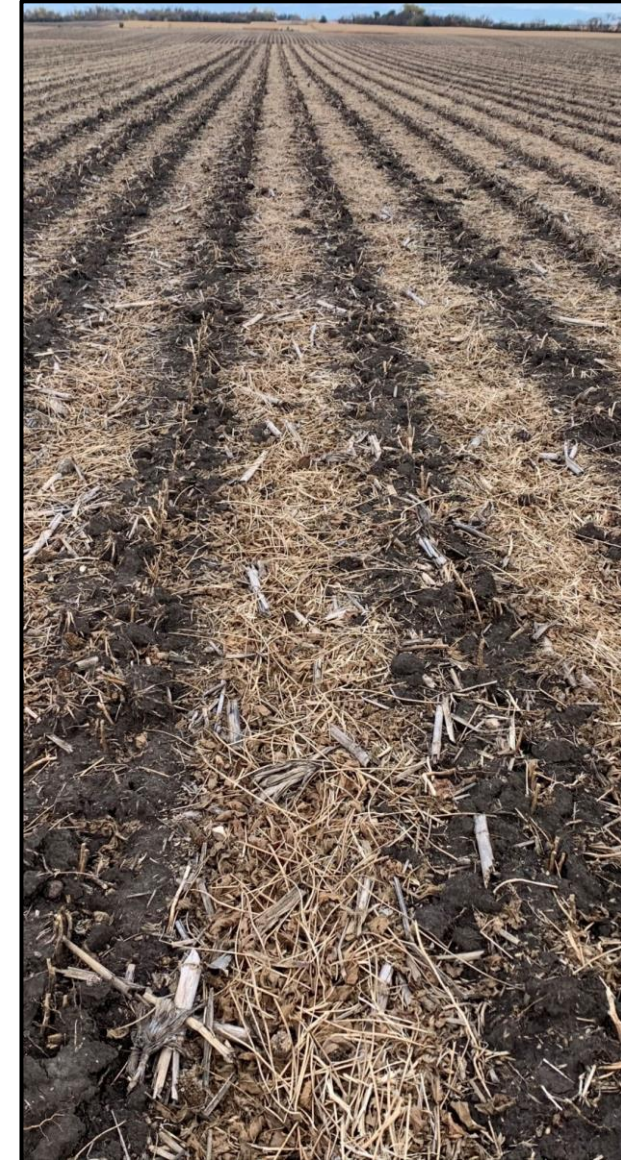
## Kochia control in response to ethofumesate, Horace ND, 2024



# Kochia control in sugarbeet

## Three options

- Paraquat before sugarbeet emerges
  - Use rate depending on vegetation; 1.3 to 2 pt/A (max rate is 2.7 pt/A).
  - Gramoxone alone or in tank mixtures are permitted by ground and by air; a minimum of 10 gal/A by ground and 5 gal/A for aerial application.
  - Use spray nozzles that will produce medium to coarse droplets are recommended.
  - Use an adjuvant, Non-Ionic Surfactant (preferred) at 0.25% v/v (2 pt/100 gal). Crop Oil Concentrate or Methylated Seed Oil at 1.0% v/v (1 gal/100 gal).



# Kochia control in sugarbeet

## Three options

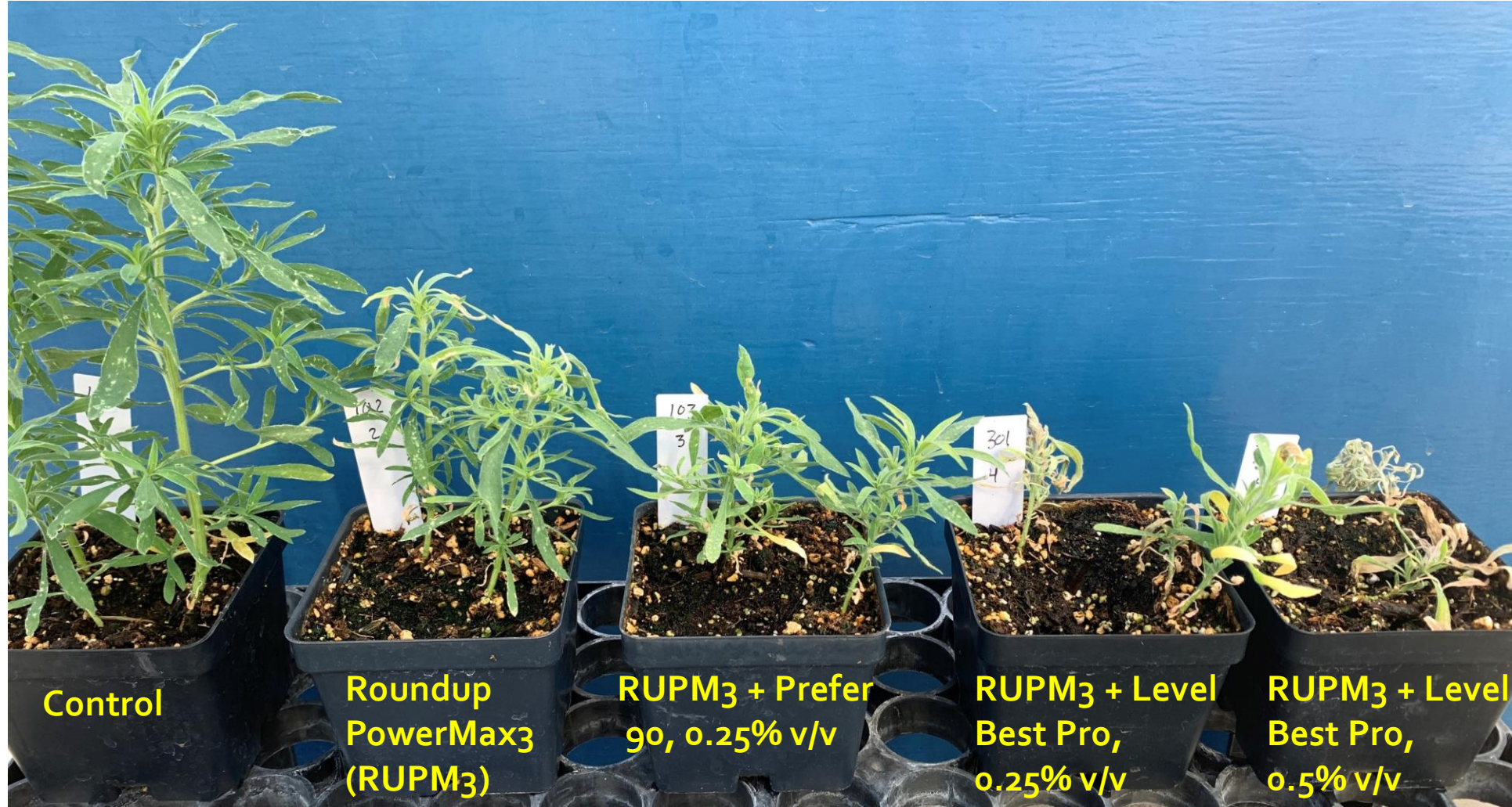
- Glyphosate sensitive kochia (fence-line kochia)
- Roundup PowerMax3 (full rates) mixed with a high quality adjuvant and ammonium sulfate
- Kochia up to 3-inch tall
- Shop for the best adjuvant you can source
  - ethoxylate tallow amine adjuvant



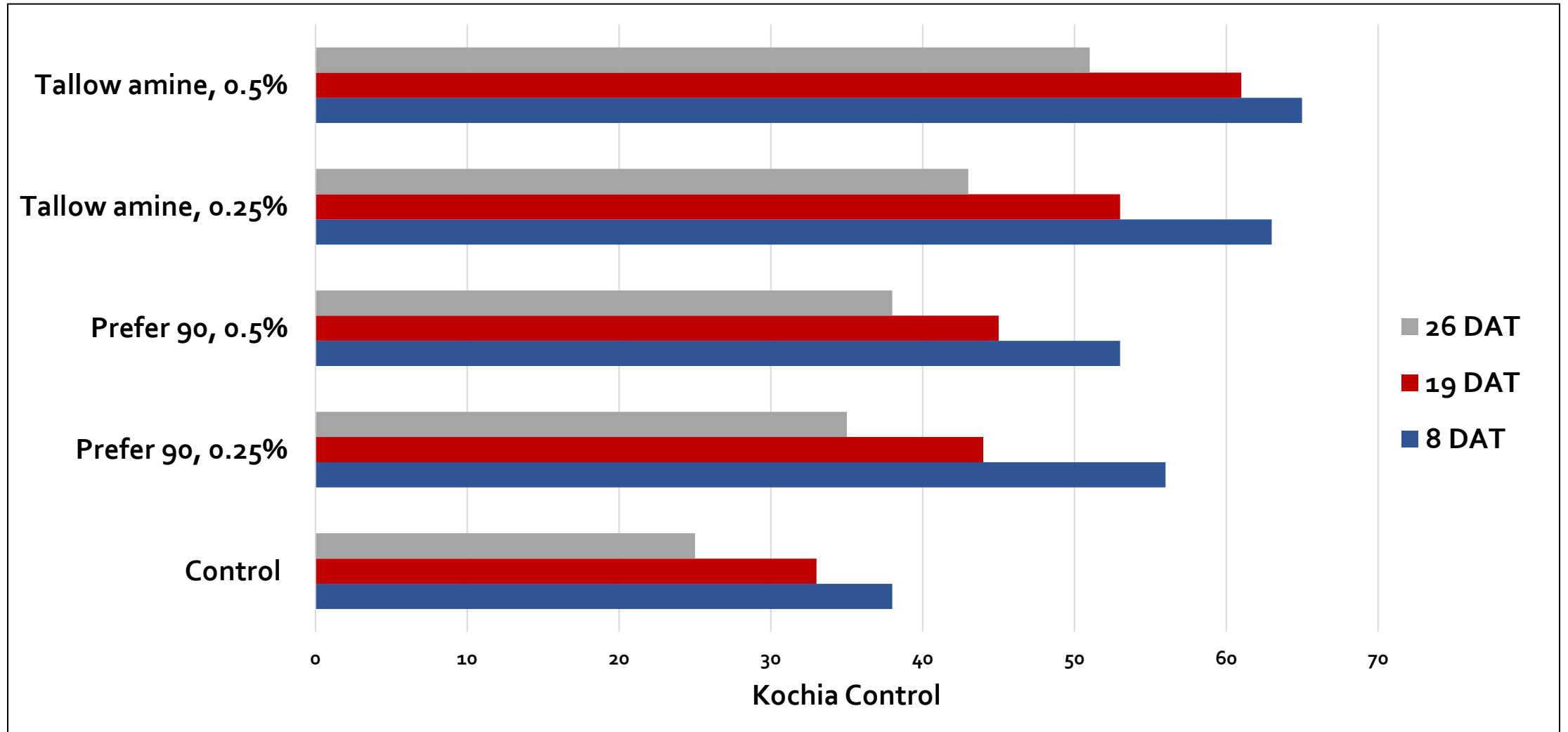
# Tallow amine adjuvant

- Ethoxylated tallow amine (ETA) adjuvant was in the original glyphosate formulation.
- It was viewed by most old time weed scientists as the best formulation ever produced.
- ETA was repackaged as Level Best, non-ionic surfactant and water conditioner
- Level Best Pro is a non-ionic surfactant, water conditioner and deposition agent in 2024
- Last Chance; Last Chance Pro

# Kochia control from Roundup PowerMax3 alone or with surfactants, 11 DAT, greenhouse, 2024.



# Adjuvants with Roundup PowerMax3 at 30 fl oz/A for kochia control, Felton MN, 2024



# Kochia control in sugarbeet

## Three options

- Redevelopment of phenmedipham combines historical field and recent greenhouse and field experiments
- Spin-Aid, Betanal, 'Blue Can'
  - Spin-Aid + ethofumesate; Spin-Aid + ethofumesate + RUPM3
  - Small kochia



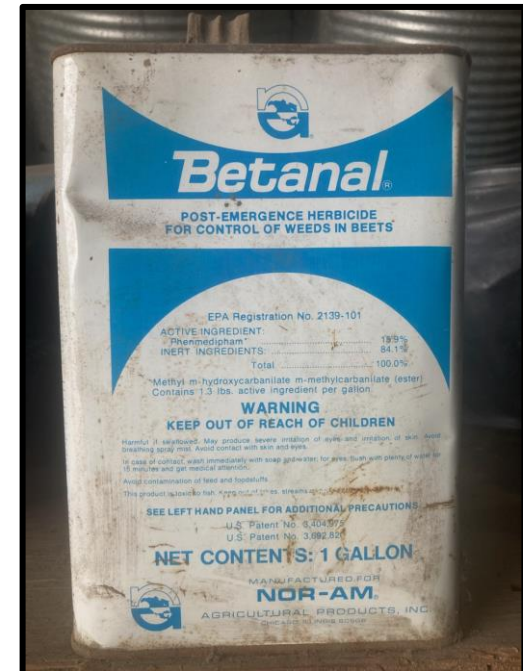
- dime-size
- 4-leaves



- quarter-size
- 6- to 9-leaves



- too big
- Scout early next year



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





# Kochia Control 14 DAAD, Felton MN, 2024

Trt. Num.	Herbicide Treatment <sup>a, c</sup>	Rate	Kochia Control <sup>b</sup>
		(fl oz/A)	----%----
1	Spin-Aid	12	50 d
2	SA/ SA	12 / 16	66 c
3	SA/ SA/ SA	12 / 16 / 24	80 ab
4	PRE / SA/ SA	PRE / 12 / 16	80 ab
5	PRE / SA/ SA/ SA	PRE / 12 / 16 / 24	89 a

<sup>a</sup>Spin-Aid mixed with 4 fl oz/A ethofumesate. High surfactant methylated oil concentrate at 1 pt/A and AMS at 2.5% V/V.

<sup>b</sup>Means with different letters significant at P=0.05

<sup>c</sup>Spin-Aid plus etho, glyphosate, HSMOC at 4 and 25 fl oz/A and 1 pt/A, respectively

# Working hypothesis

	Spin-Aid Rate <sup>a</sup>		
Sugarbeet Stage (Lvs)	Cold (<75F) at application	Warm (>75F) at application	Mixed with Stinger HL, etho and/or RUPM <sub>3</sub> <sup>b</sup>
	----- (fl oz per acre) -----		
Cotyledon	16	12	12
Early 2-lf (horns)	20	16	16
2-4 lf	28	24	24
4 lf	32	28	28

<sup>a</sup>Spin-Aid will be applied on 5-7 day intervals when sugarbeet are actively growing and on 10 day intervals when sugarbeet are not growing.

<sup>b</sup>Spin-Aid mixed with ethofumesate at 4 fl oz per acre with MSO or HSMOC at 1 pt/A





# Congratulations to our Student Athletes

- Extension Sugarbeet undergraduate students
- L-R, Bryce Friday, Mason Miller and Isaac Zatechka with the 2025 FCS national championship trophy
- Sometime well after midnight....



# Thank you to our collaborators

- Sugarbeet Research and Education Board; Carson Klosterman and Matt Hasbargen
- Emma Burt and Minn-Dak Farmers Coop research team, Claire Moffet, Emma Burt and Brad Schmidt
- Our grower cooperators
  - Pat Freese and Tony and Trenton Hought

# Thank you for your continued support

Tom Peters

- Extension Sugarbeet Agronomist and Weed Control Specialist

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