Weed Control in Sugarbeet

Grafton Growers Seminar

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University of Minnesota

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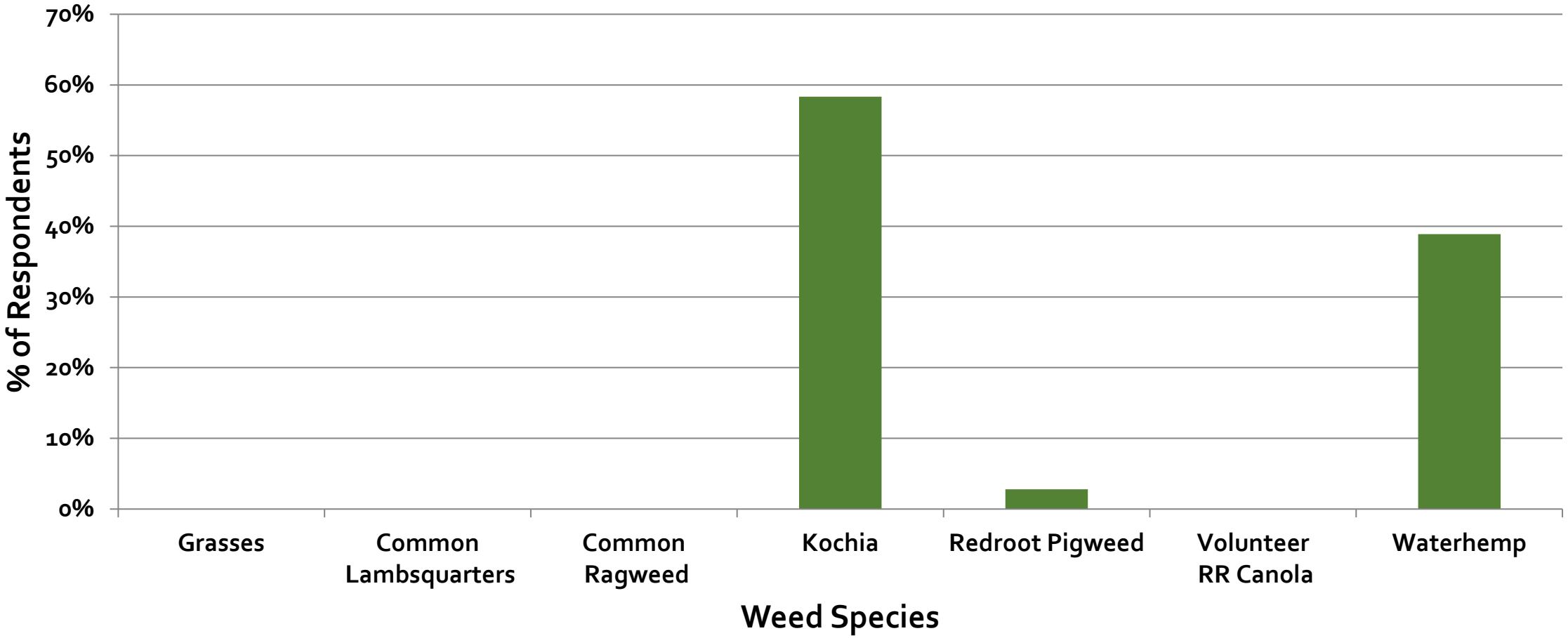
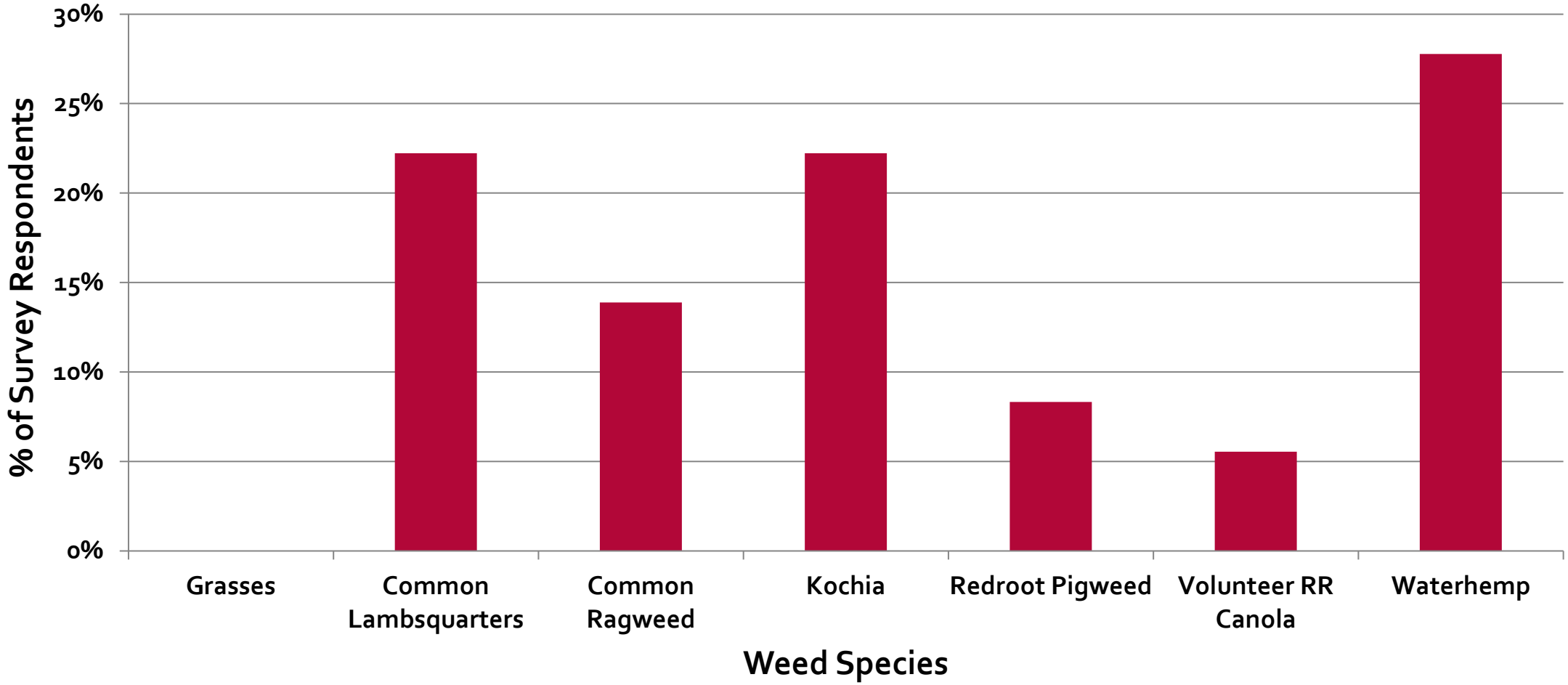
What was your worst weed control challenge? [a]



[a]2024 Grafton Growers Seminar, February 20, 2024

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

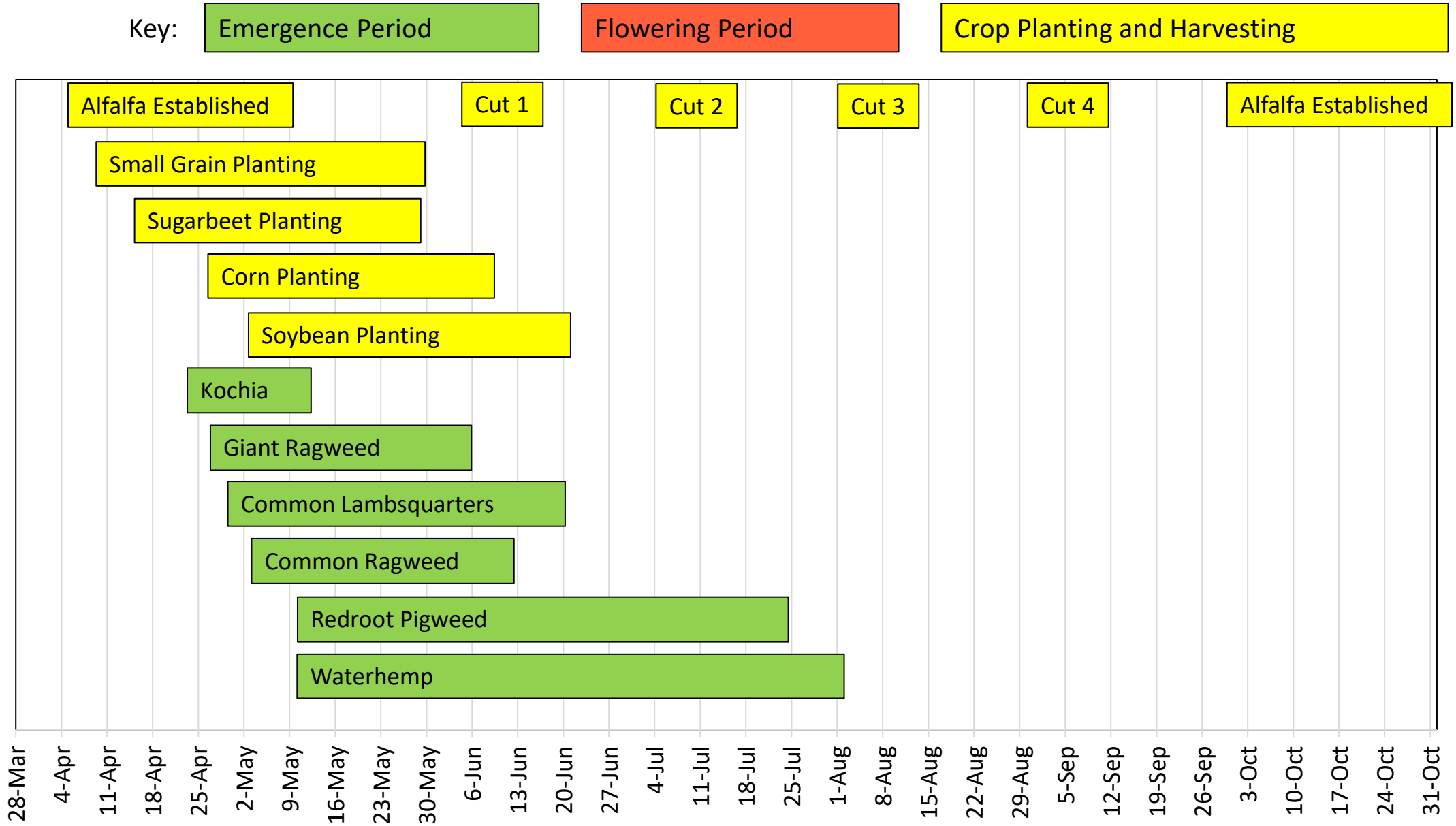


[a]2024 Grafton Growers Seminar, February 20, 2024

Kochia

- Life cycle, summer annual
  - One of the first weeds to emerge in spring
- Seed production, 15,000 seeds per plant
- Biology, very deep rooted, tolerate saline soils
- Biology, extremely competitive; a few plants will reduce yield
- Seed viability, 1 to 2 years
- Many document examples of herbicide resistance
  - ALS (SOA 2)
  - 2,4-D, dicamba, and fluroxypyr (SOA 4)
  - Triazines (5)
  - Glyphosate (SOA 9)
  - PPOs (SOA 14)
  - Multiple resistance in ND, 2+4 + 9, 2+4+9+14

March 26th. The surface 1-inch was thawed and below that it was frozen.
Photo credit, Lee Briese



Adapted from Werle et al. 2014, Goplen et al. 2017, Weedometer 2008

Kochia

- Life cycle, summer annual
  - One of the first weeds to emerge in spring
- Biology, very deep rooted, tolerate saline soils
- Biology, extremely competitive; a few plants will reduce yield
- ~~Seed production, 20,000 to 30,000 seeds per plant~~
- Seed viability, 1 to 2 years
- Many document examples of herbicide resistance
  - ALS (SOA 2)
  - 2,4-D, dicamba, and fluroxypyr (SOA 4)
  - Triazines (5)
  - Glyphosate (SOA 9)
  - PPOs (SOA 14)
  - Multiple resistance in ND, 2+4 + 9, 2+4+9+14

The Crop Sequence in the Red River Valley

Herbicides used to control kochia

Group 3
Sonalan
Treflan
Prowl

Group 4
Starane
Dicamba

Group 5
Atrazine
Metribuzin

Group 6
Basagran
Bromoxynil
Tough

Group 9
Roundup

Group 10
Liberty

Group 27
Armezon+Atr
Callisto+Atr
Huskie
Talinor
Tolvera

Group 15
Anthem Flex
Zidua

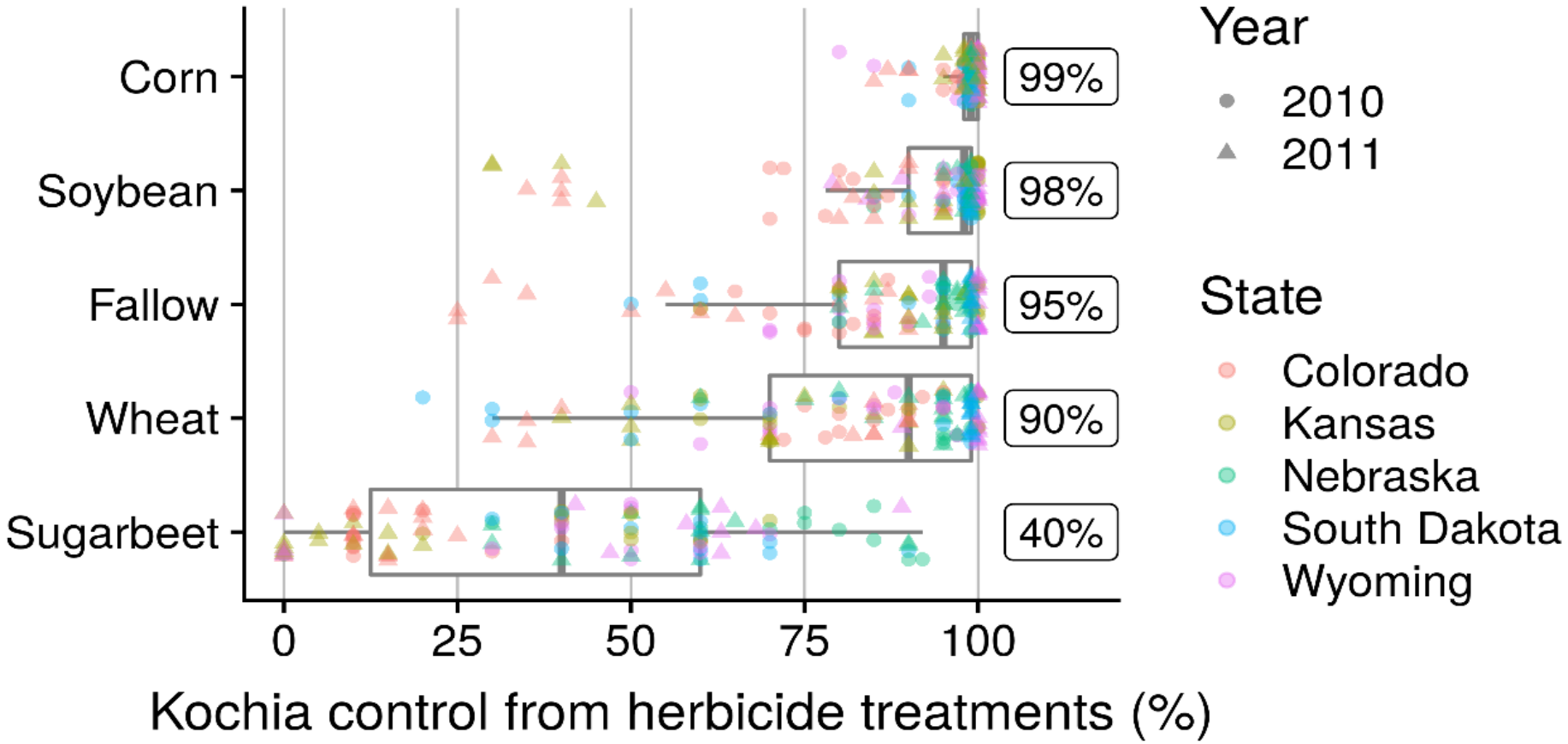
Group 22
Gramoxone

Group 14
Aim
Sharpen
Vida
Reviton
→ Burndown herbicides

Spartan products
Valor
→ Soil-applied herbicides (residual)

Flexstar
Cobra
Ultra Blazer
→ Foliar soybean herbicides

Kochia control, 30 days after final application of herbicide treatment



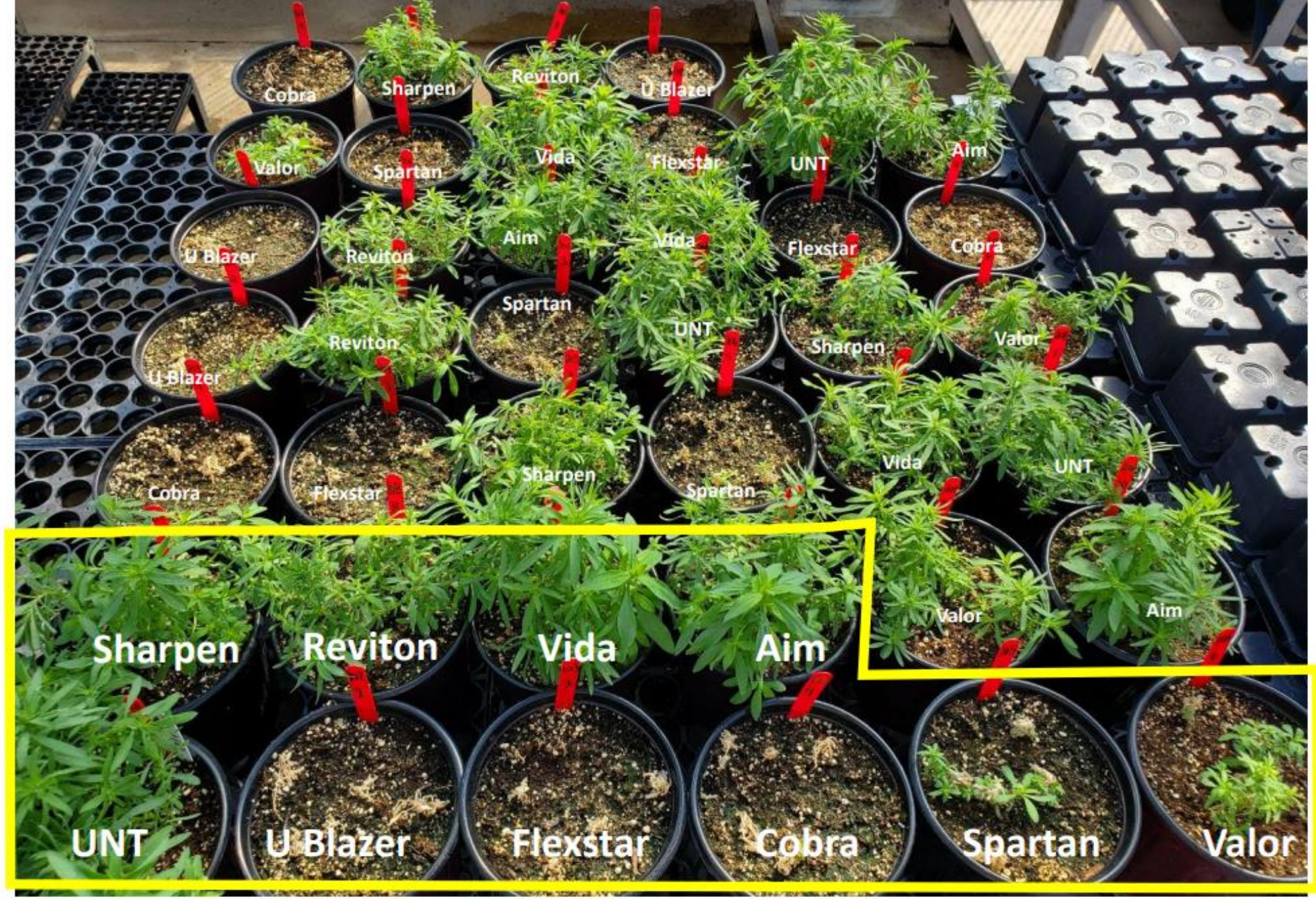
(Sbatella GM et al. 2019)

Kochia control

Fall Zidua/AF (15)

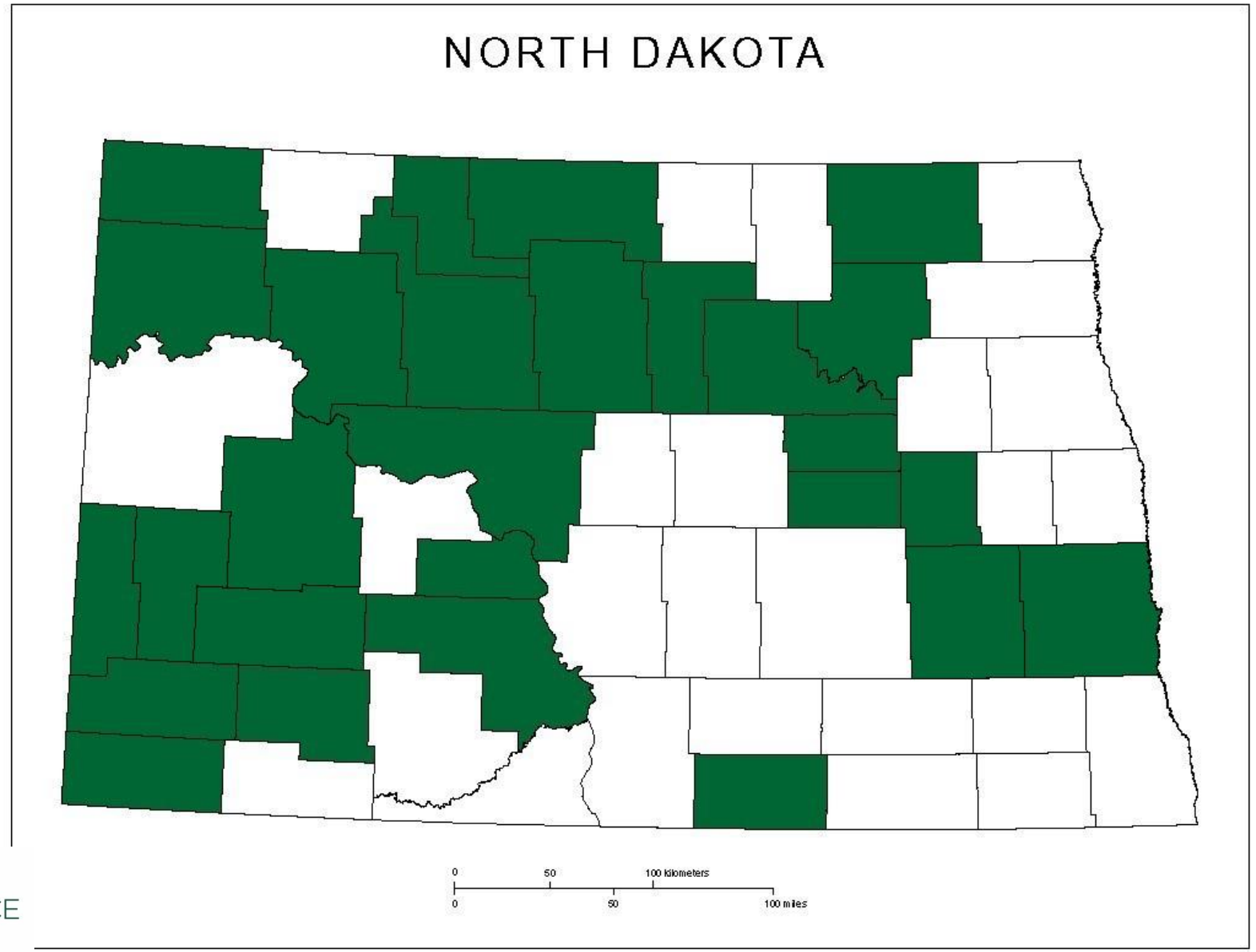
Corn (9)	Soybean (9)	Wheat (7)	Sugarbeet (4)
Gramoxone (22)	Gramoxone (22)	Gramoxone (22)	Gramoxone (22)
Roundup (9)	Roundup (9)	Roundup (9)	
Aim/Sharpen (14)	Aim/Sharpen (14)	Aim/Sharpen (14)	
Dicamba (4)	Dicamba (4) (future?)	Dicamba (4)	
Balance Flexx (27)	Dicamba (4)	Zidua/AF (15)?	Nortron (15)
Zidua/AF (15)	Spartan / Valor (14)		
Fierce (14,15)	Metribuzin (5)		
Atrazine (5)	Zidua/AF (15)		
Dicamba (4)	Tref/Sonalan/Prowl (3)		
Grp27 + ATR (5)	Liberty (10)	Huskie FX (27,6,4)	Spin-Aid (5)
Diflexx (4)	Flexstar, Blazer (14)	Tolvera (27,6)	
Rup (9), Lib (10)	Basagran/Varisto (6)	Starane + Brom (4,6)	

Minot

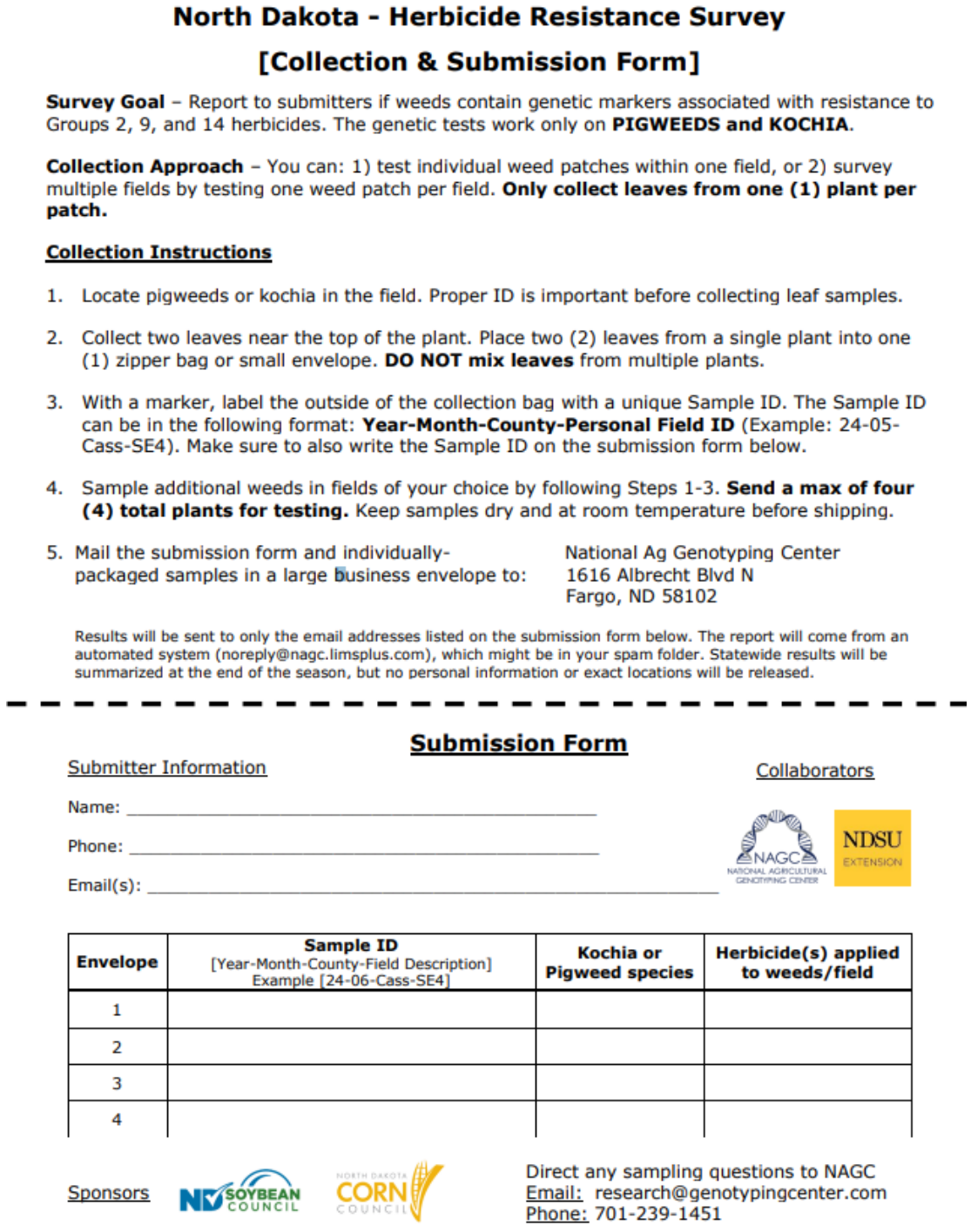


Slide courtesy of Brian Jenks, NDSU

Group 14-R Kochia



- National Ag Genotyping Center will test waterhemp or kochia for herbicide resistance
- Clip a leaf and mail in an envelop
- Pickup a form at the registration table
- No cost! Grant from ND Corn and Soybean Growers



North Dakota - Herbicide Resistance Survey

[Collection & Submission Form]

Survey Goal – Report to submitters if weeds contain genetic markers associated with resistance to Groups 2, 9, and 14 herbicides. The genetic tests work only on **PIGWEEDS and KOCHIA**.

Collection Approach – You can: 1) test individual weed patches within one field, or 2) survey multiple fields by testing one weed patch per field. **Only collect leaves from one (1) plant per patch.**

Collection Instructions

1. Locate pigweeds or kochia in the field. Proper ID is important before collecting leaf samples.
2. Collect two leaves near the top of the plant. Place two (2) leaves from a single plant into one (1) zipper bag or small envelope. **DO NOT mix leaves** from multiple plants.
3. With a marker, label the outside of the collection bag with a unique Sample ID. The Sample ID can be in the following format: **Year-Month-County-Personal Field ID** (Example: 24-05-Cass-SE4). Make sure to also write the Sample ID on the submission form below.
4. Sample additional weeds in fields of your choice by following Steps 1-3. **Send a max of four (4) total plants for testing.** Keep samples dry and at room temperature before shipping.
5. Mail the submission form and individually-packaged samples in a large business envelope to:

National Ag Genotyping Center
1616 Albrecht Blvd N
Fargo, ND 58102

Results will be sent to only the email addresses listed on the submission form below. The report will come from an automated system (noreply@nagc.limsplus.com), which might be in your spam folder. Statewide results will be summarized at the end of the season, but no personal information or exact locations will be released.

Submission Form

Submitter Information

Name: _____

Phone: _____

Email(s): _____

Collaborators

Envelope	Sample ID [Year-Month-County-Field Description] Example [24-06-Cass-SE4]	Kochia or Pigweed species	Herbicide(s) applied to weeds/field
1			
2			
3			
4			

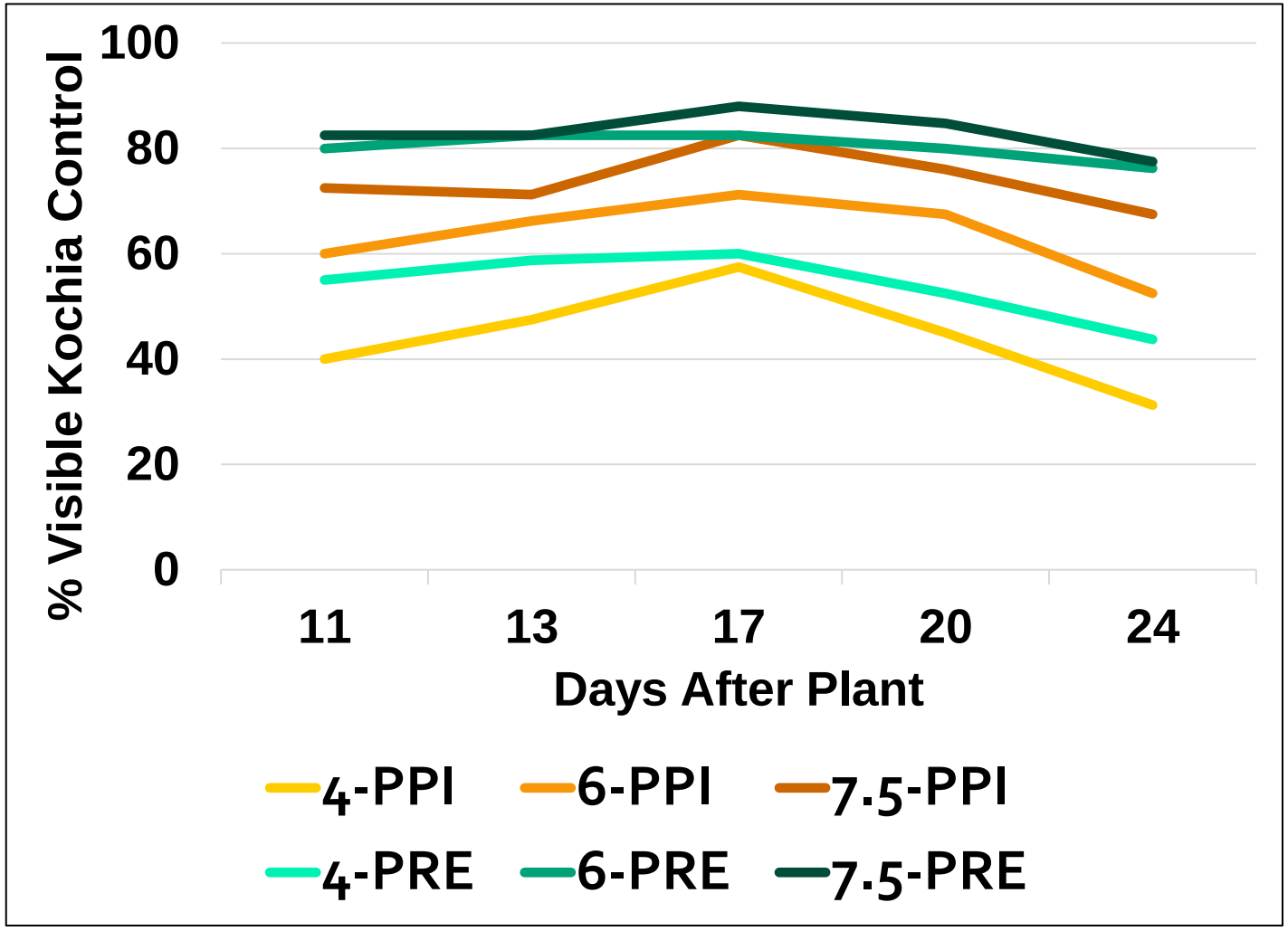
Sponsors

Direct any sampling questions to NAGC
Email: research@genotypingcenter.com
Phone: 701-239-1451

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).

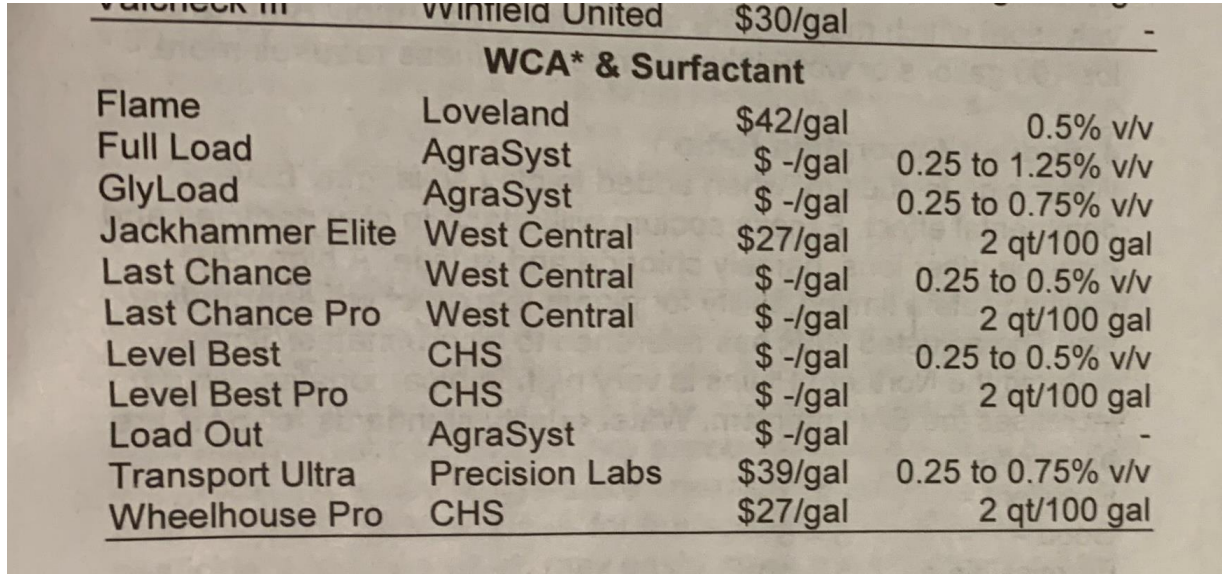
Kochia control in sugarbeet

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

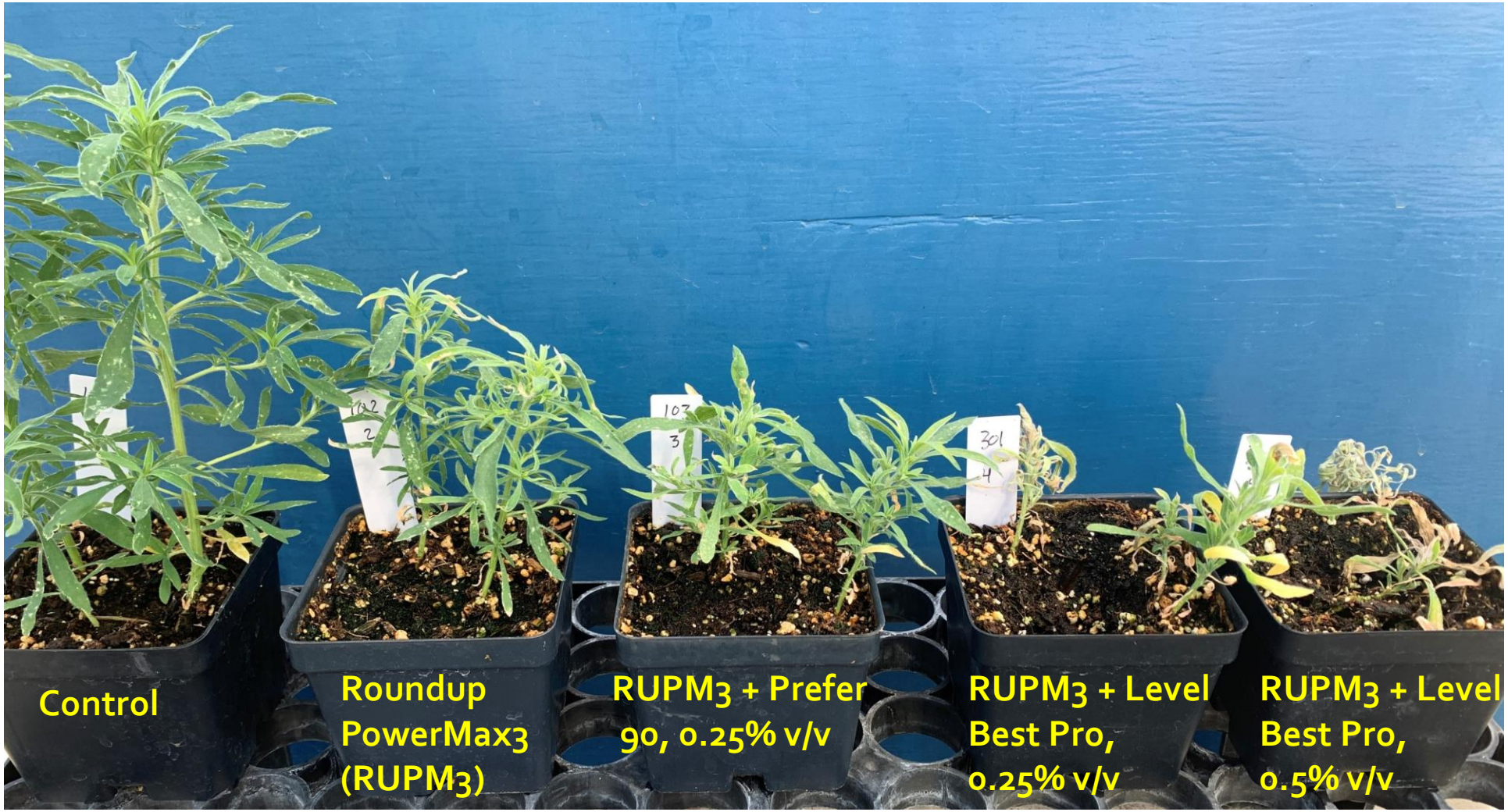
Tallow amine adjuvant

- 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.
- Listed as a Nonionic Surfactant, Water Conditioner, and Deposition Aid. PLEASE CONTINUE TO ADD AMS, liquid or dry.
- Several products, Consult the 2025 NDSU Weed Control Guide.

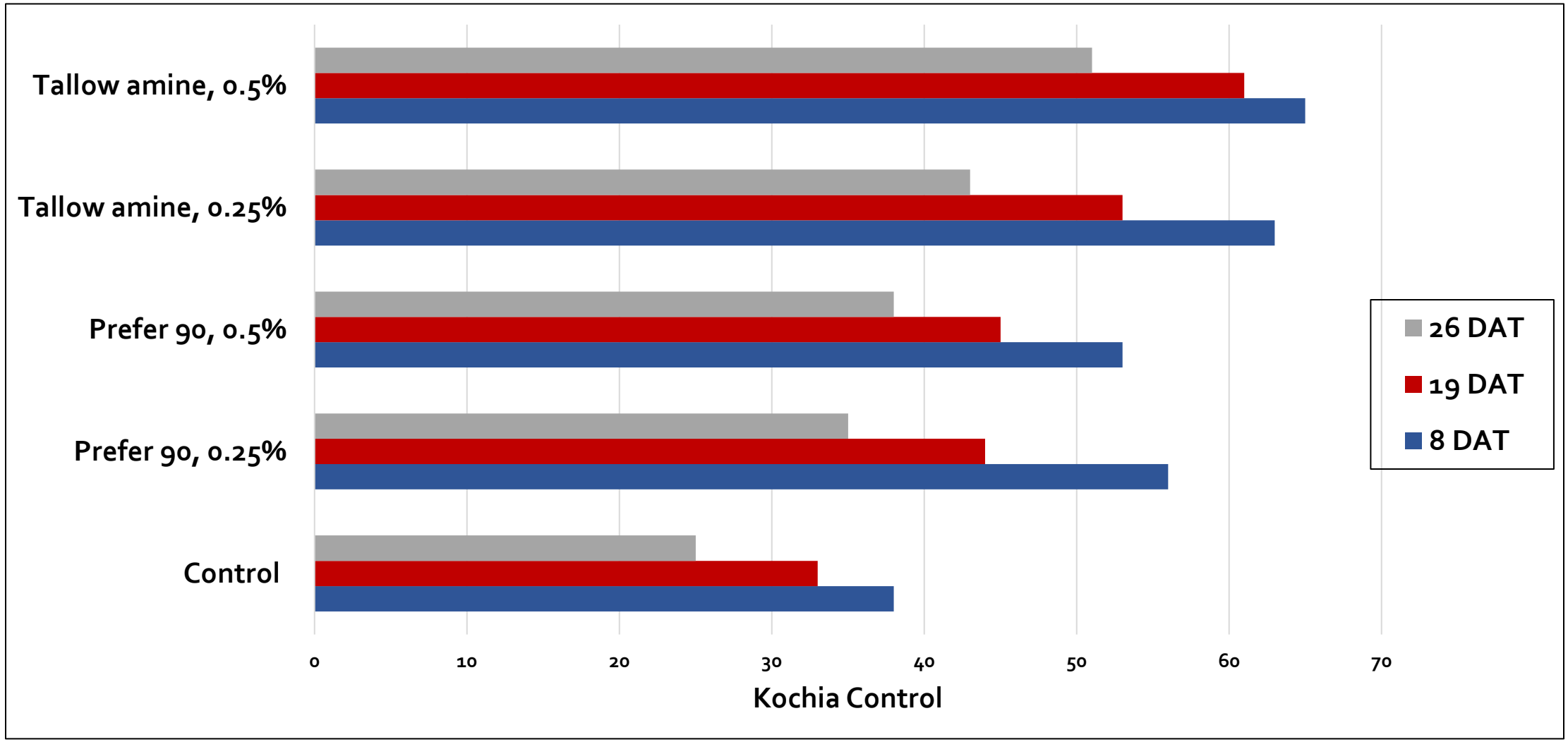


Valucheck III	Winfield United	$30/gal	-
WCA* & Surfactant			
Flame	Loveland	$42/gal	0.5% v/v
Full Load	AgraSyst	$ -/gal	0.25 to 1.25% v/v
GlyLoad	AgraSyst	$ -/gal	0.25 to 0.75% v/v
Jackhammer Elite	West Central	$27/gal	2 qt/100 gal
Last Chance	West Central	$ -/gal	0.25 to 0.5% v/v
Last Chance Pro	West Central	$ -/gal	2 qt/100 gal
Level Best	CHS	$ -/gal	0.25 to 0.5% v/v
Level Best Pro	CHS	$ -/gal	2 qt/100 gal
Load Out	AgraSyst	$ -/gal	-
Transport Ultra	Precision Labs	$39/gal	0.25 to 0.75% v/v
Wheelhouse Pro	CHS	$27/gal	2 qt/100 gal

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



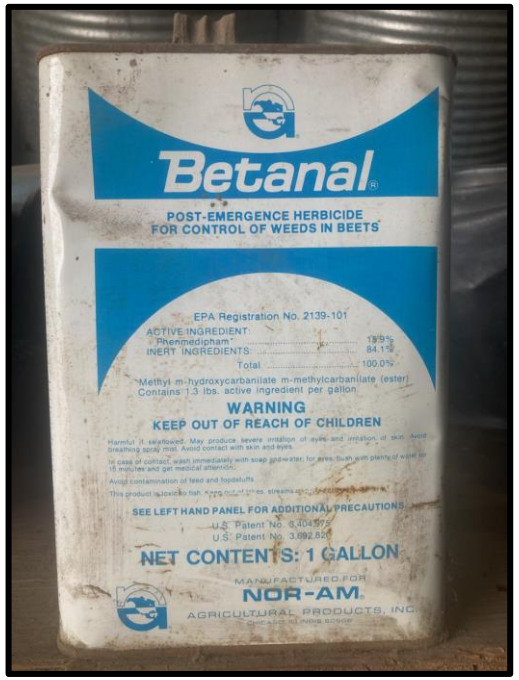
Adjuvants with Roundup PowerMax3 at 30 fl oz/A for kochia control, Felton MN, 2024



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



Belchim USA
GROWING TOGETHER

- 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

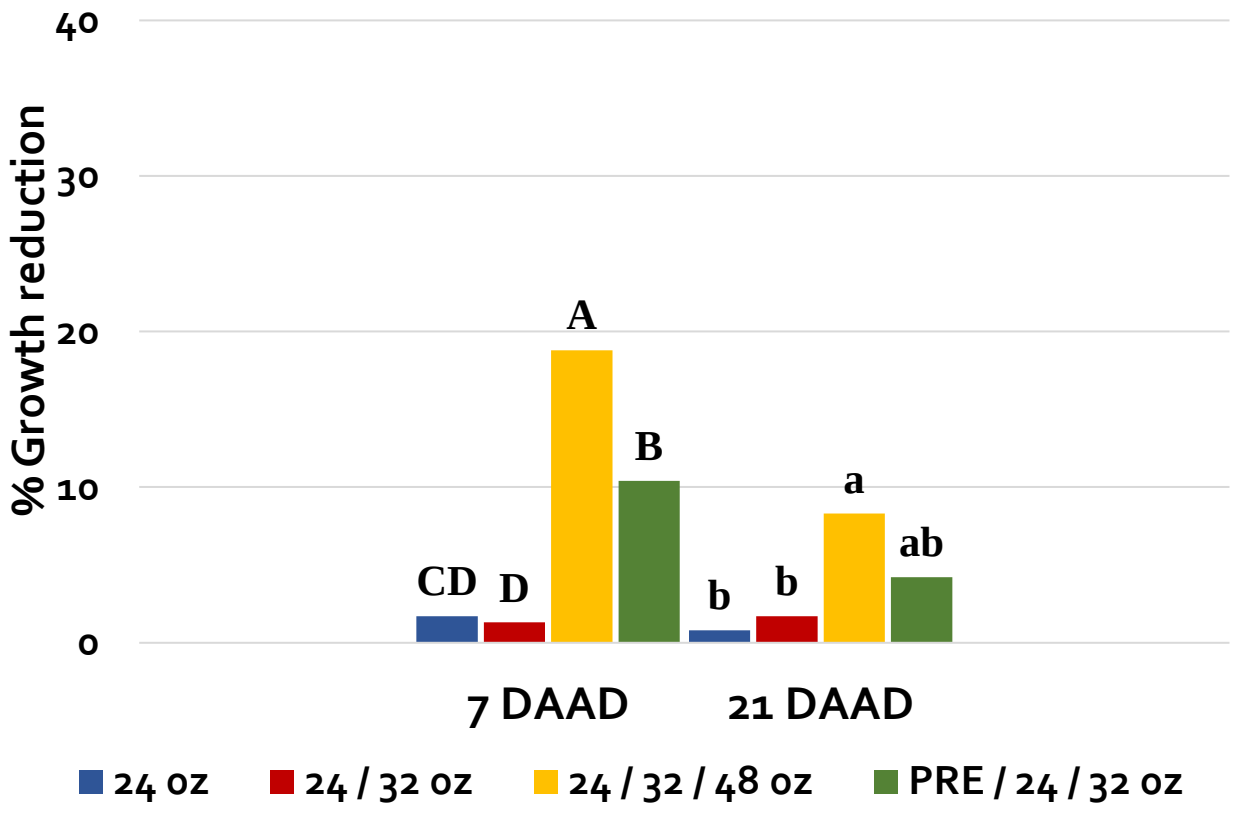
Trt. Num.	Herbicide Treatment [a, c]	Rate	Kochia Control[b]
		(fl oz/A)	----%----
1	Spin-Aid	12	50 d
2	SA/ SA	12 / 16	66 c
3	SA/ SA/ SA	12 / 16 / 24	80 ab
4	PRE / SA/ SA	PRE / 12 / 16	80 ab
5	PRE / SA/ SA/ SA	PRE / 12 / 16 / 24	89 a

[a]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.

[b]lsmeans with different letters significant at P=0.05

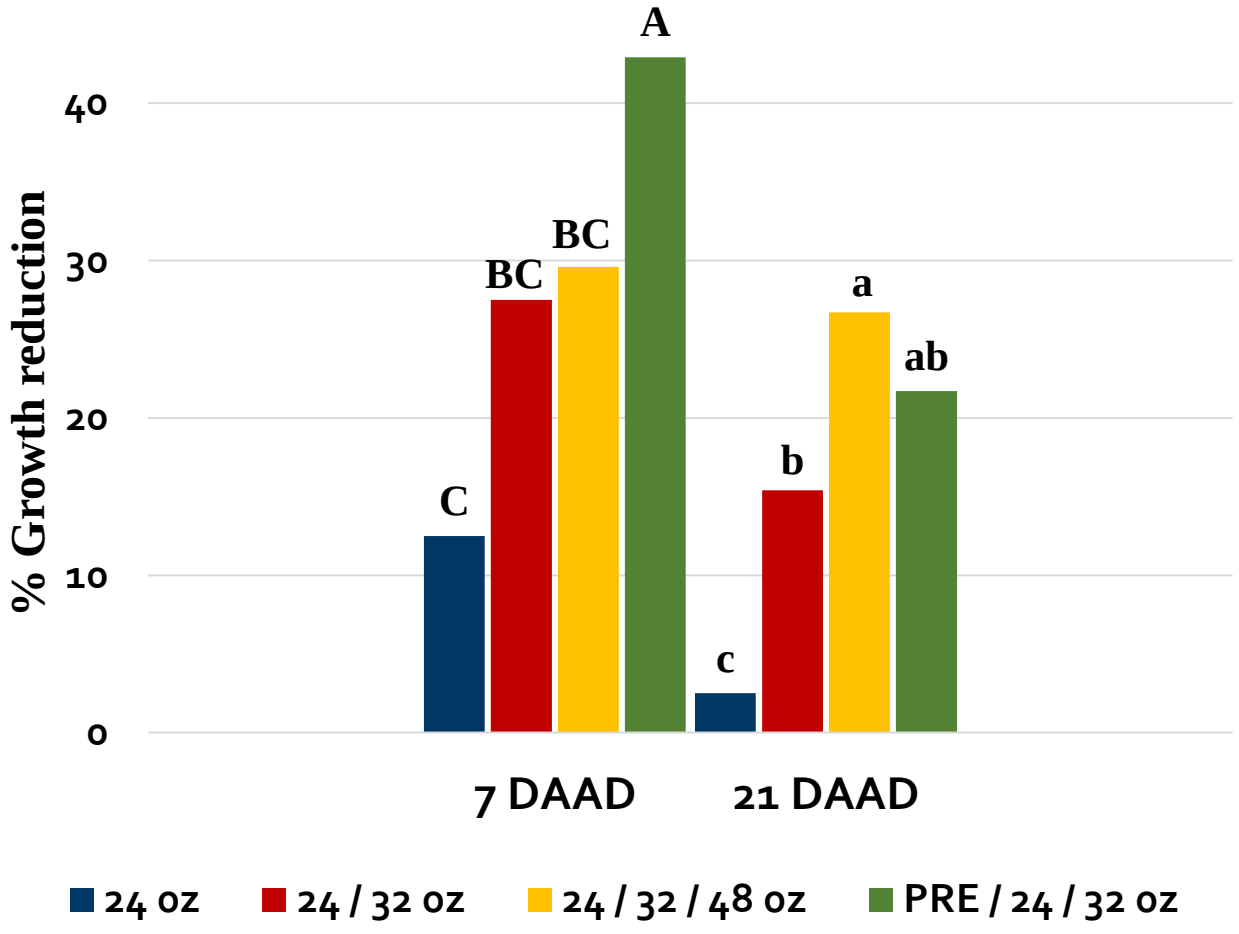
[c]Spin-Aid plus etho, glyphosate, HSMOC at 4 and 25 fl oz/A and 1 pt/A, respectively

Sugarbeet tolerance in response to Spin-Aid at Crookston and Hendrum MN, 2024[a,b,c]



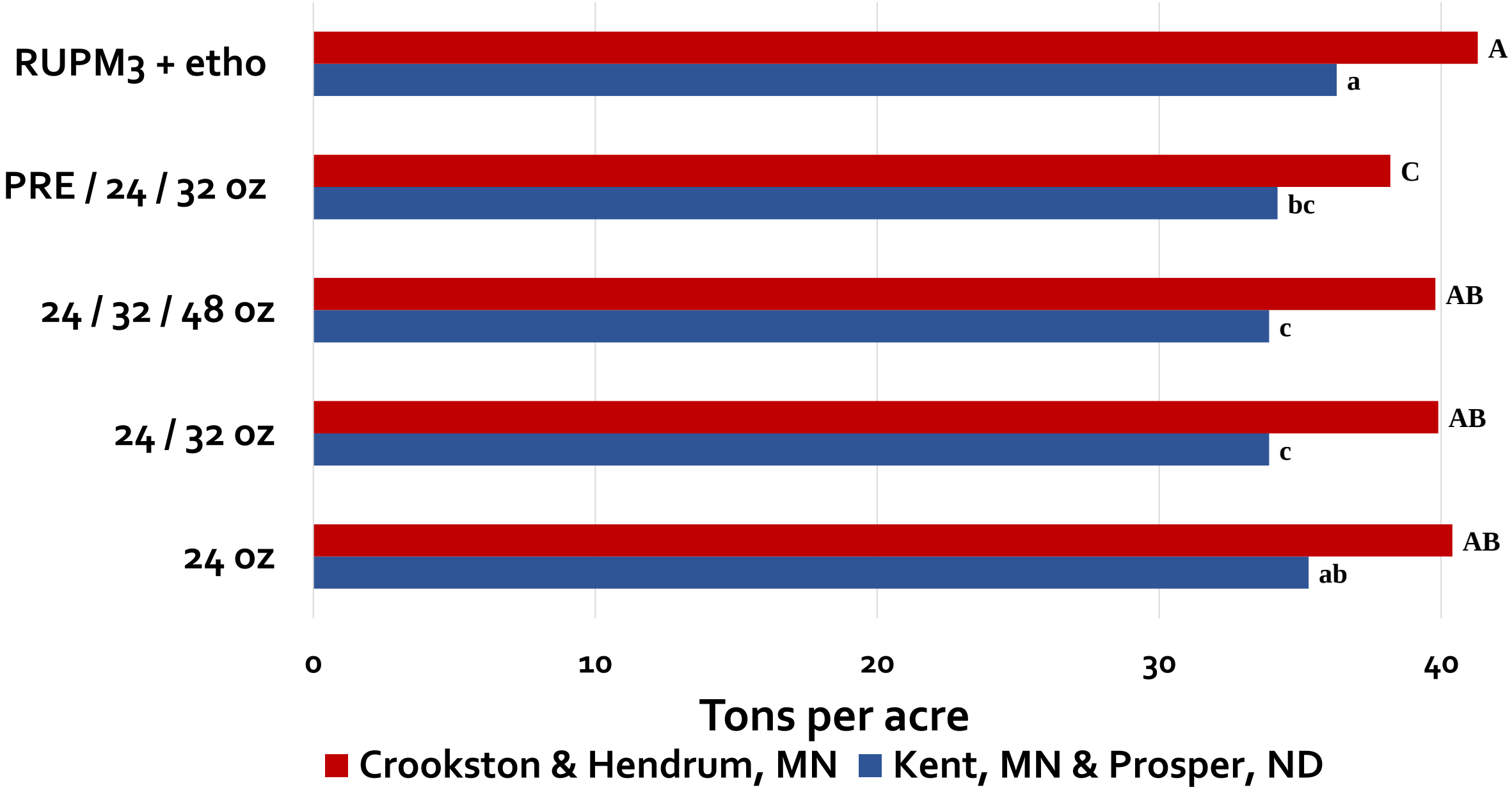
[a]Spin-Aid mixed with etho and RUPM3
[b]Ethofumesate at 6 pt/A
[c]means with different letters significant at P=0.05

Sugarbeet tolerance in response to Spin-Aid at Kent, MN and Prosper, ND, 2024[a,b,c]



[a]Spin-Aid mixed with etho and RUPM3
[b]Ethofumesate at 6 pt/A
[c]means with different letters significant at P=0.05

Sugarbeet root yield in response to treatment[a]



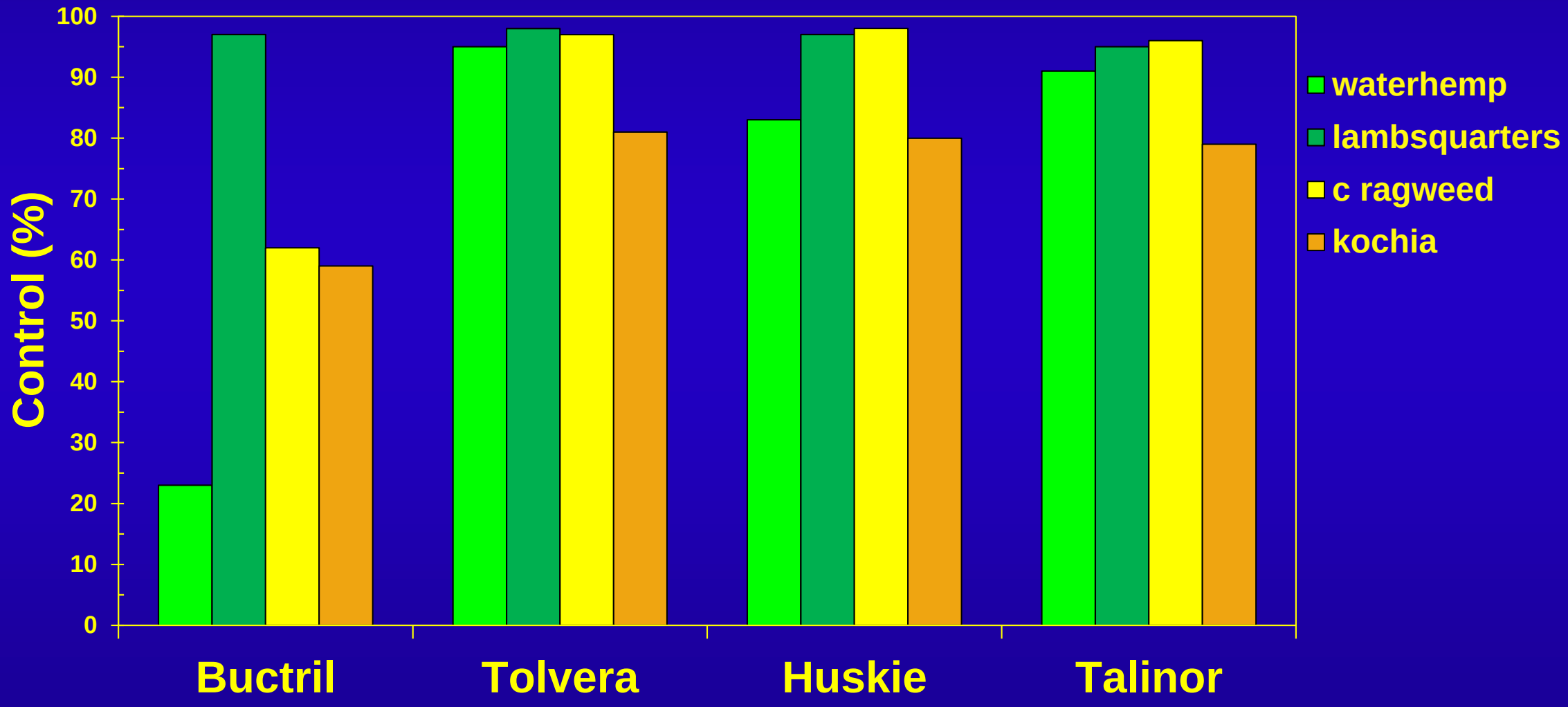
[a]Means sharing the same letter are the same, at P=0.05

Working hypothesis

	Spin-Aid Rate[a]		
Sugarbeet Stage	Cold (<75F) at application	Warm (>75F) at application	Mixed with Stinger HL, etho and/or RUPM3[b]
(Lvs)	----------(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

[a]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.
[b]Spin-Aid mixed with ethofumesate at 4 fl oz per acre with MSO or HSMOC at 1 pt/A

Broadleaf Control with Group 27 Premixes in Spring Wheat



Source: Kirk Howatt

Tolvera

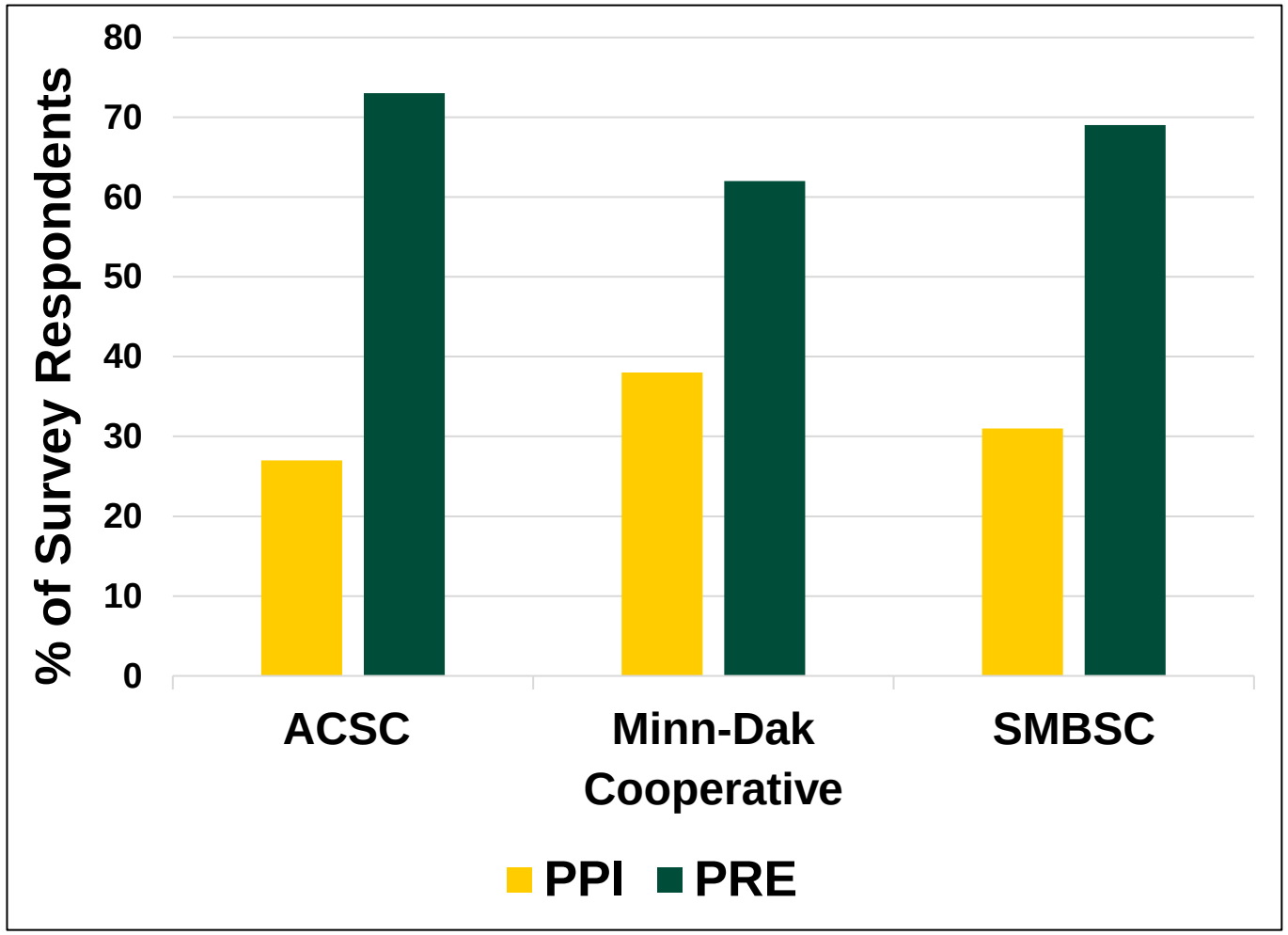
- Spring 2024 launch
- Active ingredients/formulation:
  - tolpyralate + bromoxynil
  - HPPD (group 27) + PSII Inhibitor (group 6)
  - EC formulation
- Use rate of 11.0 – 14.7 fl oz/A
- Labeled POST emergence for wheat (spring, winter, durum) and barley
- Key product features:
  - Dual MOA broadleaf and foxtail herbicide
    - control of herbicide-resistant weeds including kochia and waterhemp
  - Excellent crop rotation flexibility
    - 18 month crop rotation restriction to sugarbeet

Post-Harvest Wheat

Waterhemp Control Program in Sugarbeet

Planting Date	Recommendation
Sugarbeet plant in April or May	Dual Magnum at 0.5 to 1.0 pt/A, ethofumesate at 3 to 7.5 pt/A or Dual Magnum at 0.5 to 0.75 pt/A plus ethofumesate at 2 to 3 pt/A
	Split lay-by application (early postemergence / postemergence). Chloroacetamide herbicides applied at 2-lf sugarbeet fb 6- to 8-lf sugarbeet
June	Continue to scout fields for waterhemp. Control escapes with Ultra Blazer (Section 18ee), Liberty with the Redball™ 915 hooded sprayer (24c), or inter-row cultivation
July	Electric Discharge Systems (WeedZapper™)
August / September	Hand remove waterhemp

Ethofumesate incorporation technique across cooperatives in 2023.[a]



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

[a]Turning Point survey at 2024 grower seminars; ACSC database

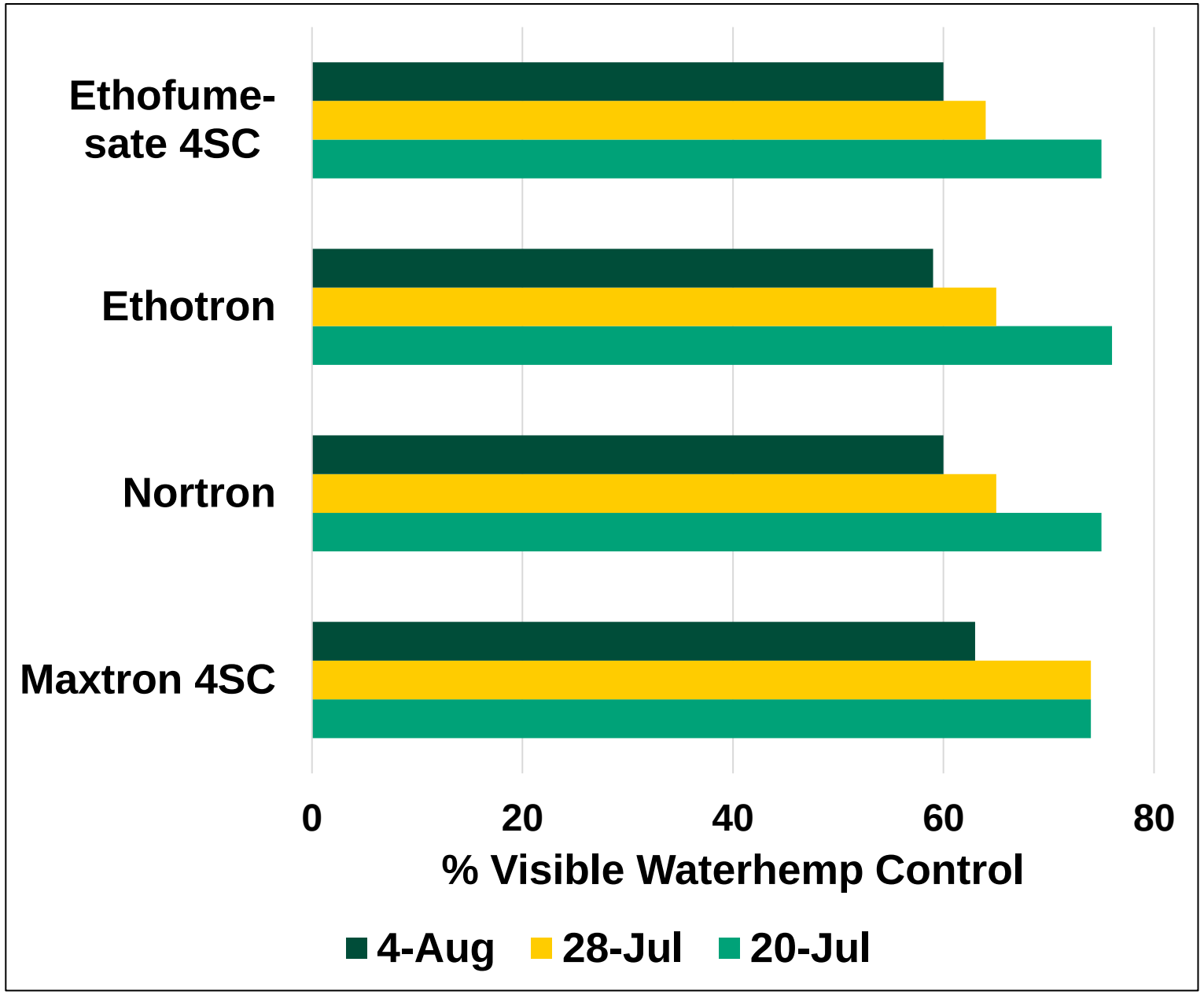
Ethofumesate in 2025
Group 15

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

Brand Comparison Study Results: Moorhead, MN

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



Each treatment includes 25 fl oz/A RUPM3 and 6 fl oz/A Nortron at 2-4 and 6-8 lf stage.

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

Waterhemp Control Program in Sugarbeet

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Thank you to our collaborators

- Sugarbeet Research and Education Board for funding
- Support from the Northwest Research and Outreach Center, Crookston MN
- Our grower cooperators
  - David Arends, Tyler Dahl, Scott Johnson, Keith and Justin Miller, Paul Miller, and Neil Rockstad
- ACSH Moorhead Technical Center, Tyler Grove

Thank you for your continued support

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