

Waterhemp Control in Sugar Beets

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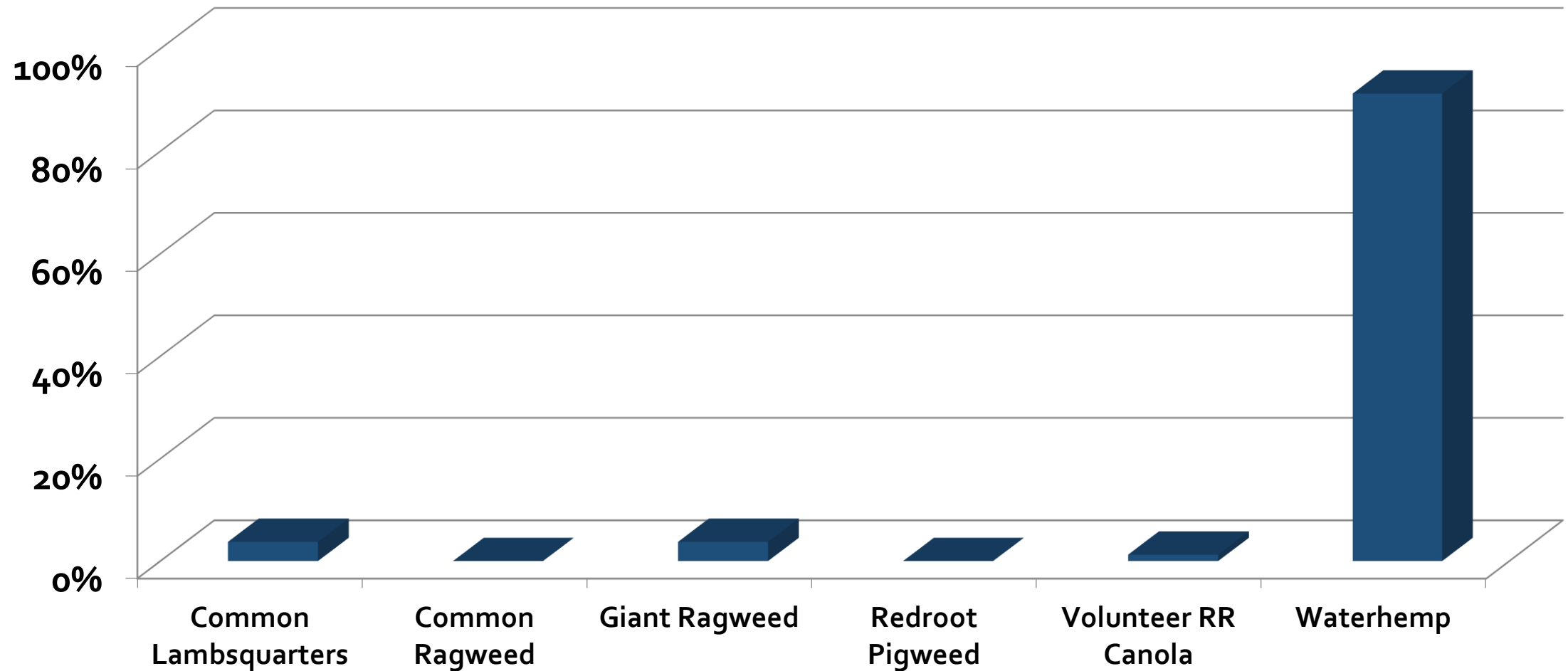
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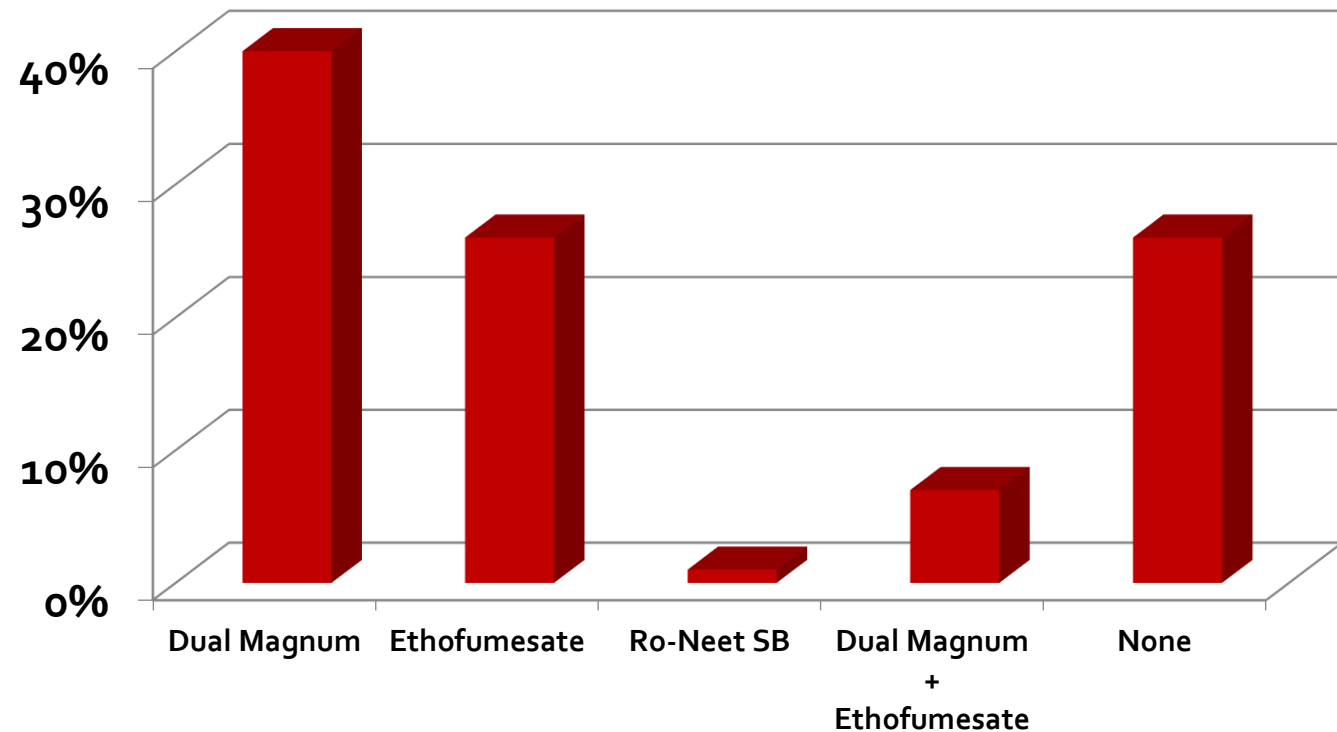
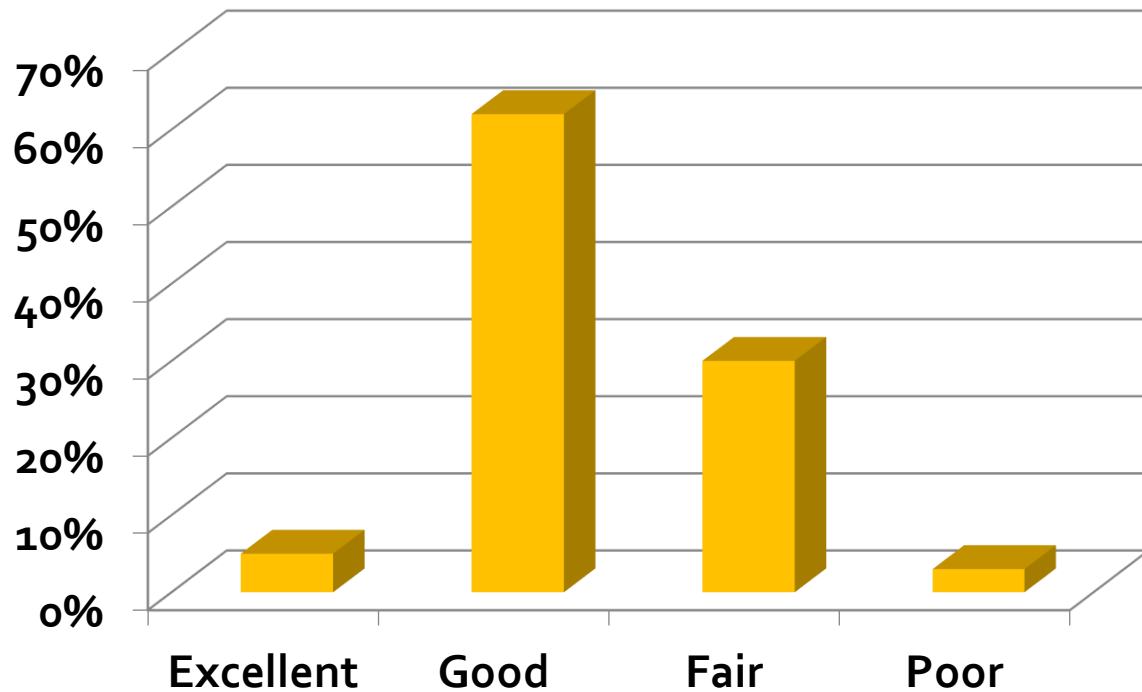
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What was your worst weed problem?¹



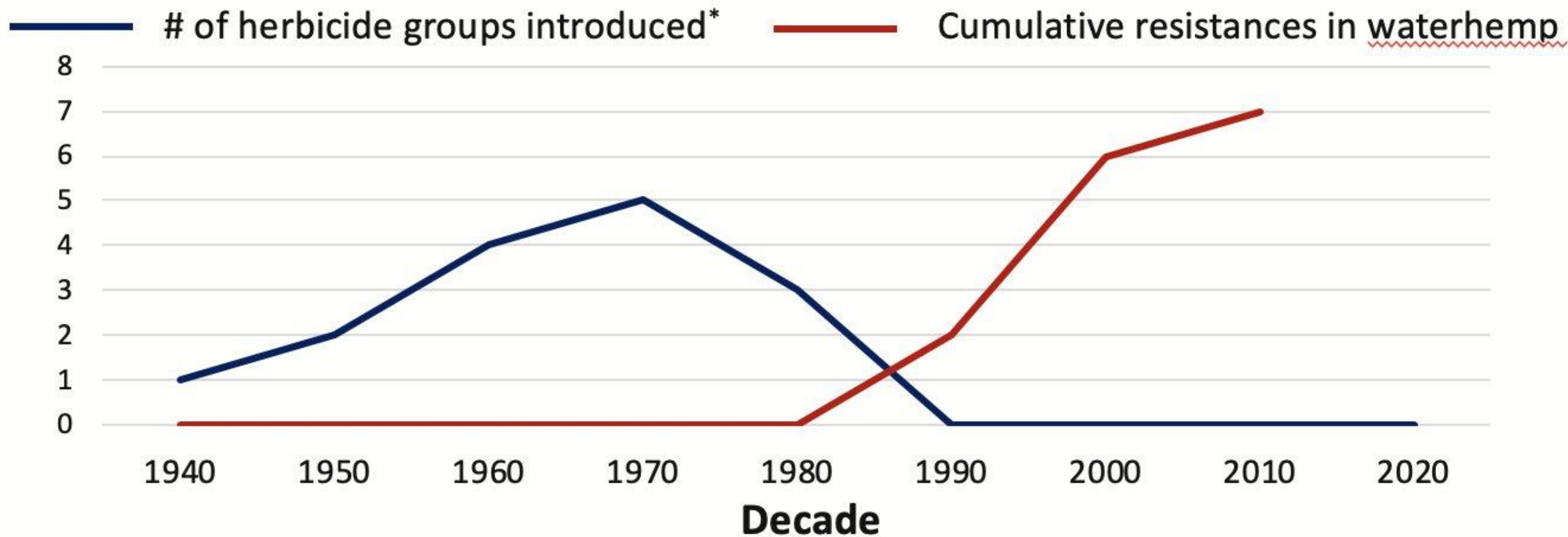
¹Turning Point Survey of Growers; conducted at the 2019 Sugarbeet Growers Seminar, Willmar

How effective were your soil-applied herbicide applications (lay-by) at weed control in 2018? Which soil-applied herbicide (PPI or PRE) did you use?¹



¹Turning Point Survey of Growers; conducted at the 2019 Sugarbeet Growers Seminar, Willmar

Chemical era of weed management: Nice while it lasted



Waterhemp Control Recommendations

Planting Date	Recommendation
Sugarbeet plant in April	Split lay-by application (early postemergence / postemergence) of chloroacetamide herbicides applied at 2-lf sugarbeet fb 4 to 6-lf sugarbeet
	PRE (Dual Magnum and/or ethofumesate) followed by a split lay-by application at 2 to 4-lf stage fb 4 to 6-lf stage
	Single lay-by application when sugarbeet is at the 2-lf stage or greater
Sugarbeet plant in May	Dual Magnum and/or ethofumesate PRE followed by a split lay-by
Either	Continue to scout fields for late germinating waterhemp in late June and July
Either	Be prepared for postemergence options

Residual Herbicides applied EPOST and POST

What herbicides and rates?

- Warrant, Outlook, S-metolachlor (Dual Magnum, Cinch, Brawl, Charger Basic, EverpreX, Moccasin)

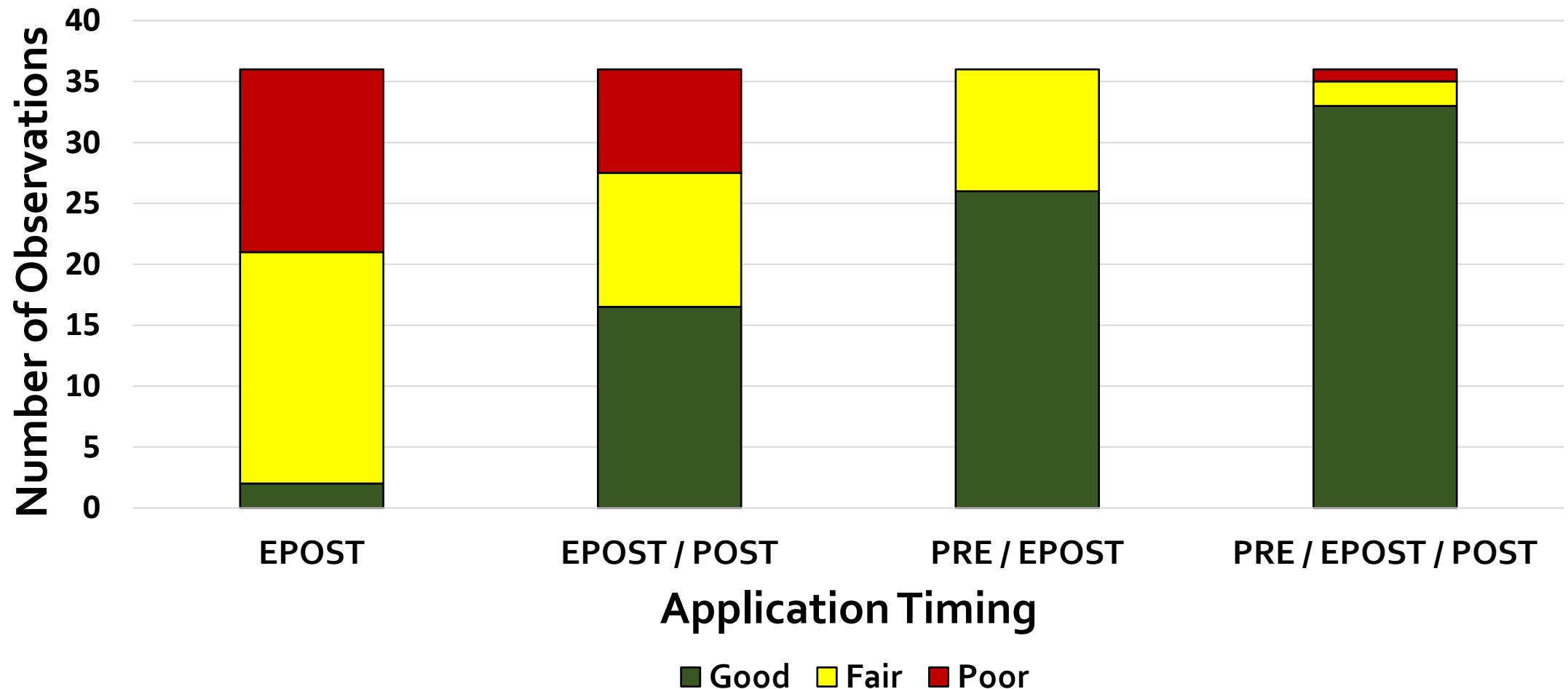
How should I use them; what rates?

- Split lay-by - Outlook at 12 fl oz fb 12 fl oz/A; metolachlor at 1 pt fb 1 pt and Warrant at 2.25 pt fb 2.25 pt/A
- Lay-by - Outlook, 18 fl oz/A; metolachlor, 1.25 pt/A; Warrant, 3.25 pt/A
- Pre fb split lay-by – Dual Magnum at 0.5-0.75 pt/A and/or ethofumesate at 2 pt/A fb Outlook at 12/12 fl oz/A, metolachlor at 1/1 pt/A, or Warrant at 2.25/2.25 pt/A



Waterhemp emerged, image, May 22

Waterhemp control in response to application timing averaged across herbicide, herbicide rate, evaluation, location, and year.



Soil applied options in sugarbeet

Herbicide treatment	Rate	Comment
Ro-Neet SB	4 to 5.3 pt/A	Must be incorporated. 5.3 pt/A rate better than 4.5 pt/A
Ro-Neet SB + Eptam	2.7 + 2.3 pt/A	Must be incorporated. Combination gives better grass and pigweed control than Ro-Neet alone
Ethofumesate	5 to 7.5 pt/A	Will not allow use of barley, oat or wheat as nurse crop. Quicker activation and less chance for weed escapes with PPI application
Dual Magnum	0.5 to 1.0 pint/A	Rate based on soil OM. Use PRE
Ethofumesate + Dual Magnum	0.5 pt + 2 pt/A	Use split lay-by program when sugarbeet are at 2 true leaves

PRE/POST vs. POST

Advantages

- Product layer buffers against delayed POST; activation of POST
- Our most efficacious program
- Reduces the likelihood of waterhemp POST escapes
- Allows you to buy time before first layby application

Disadvantages

- Takes time and manpower; grower needs to plant and spray
- There is injury under certain environments
- Concerns with nurse crop

How do I decide between ethofumesate or Dual Magnum PRE?

Ethofumesate (Nortron, Ethotron, Ethofumesate 4SC

- Needs 0.75 in precipitation to activate
- History of safe use on sugarbeet PRE and POST
- \$25 per acre?

Dual Magnum

- Needs 0.5 inch precipitation to active
- Apply at 0.5 pt to 1.0 pt/A; safety greatest OM>3.5% or medium and fine texture
- Indemnified label
- \$7.50/acre

Waterhemp (count per meter square) or as a percent of control , June 6, 2017, Lake Lillian, MN

Herbicide	Rate	Application	Count	Visual Control
	fl oz/A		Num/m ²	%
Dual Magnum	8	PRE	25b	97
PowerMax	28	EPOST	192c	74
Control			727a	

Herbicide	Rate	Application	Count	Visual Control
	pt/A		Num/m ²	%
Ethofumesate	2	PRE	53bc	93
Ethofumesate	3	PRE	20cd	97
Ethofumesate	4	PRE	07d	99
PowerMax	1.75	EPOST	116b	85
Control			792a	

Etho in a weed management system for waterhemp control



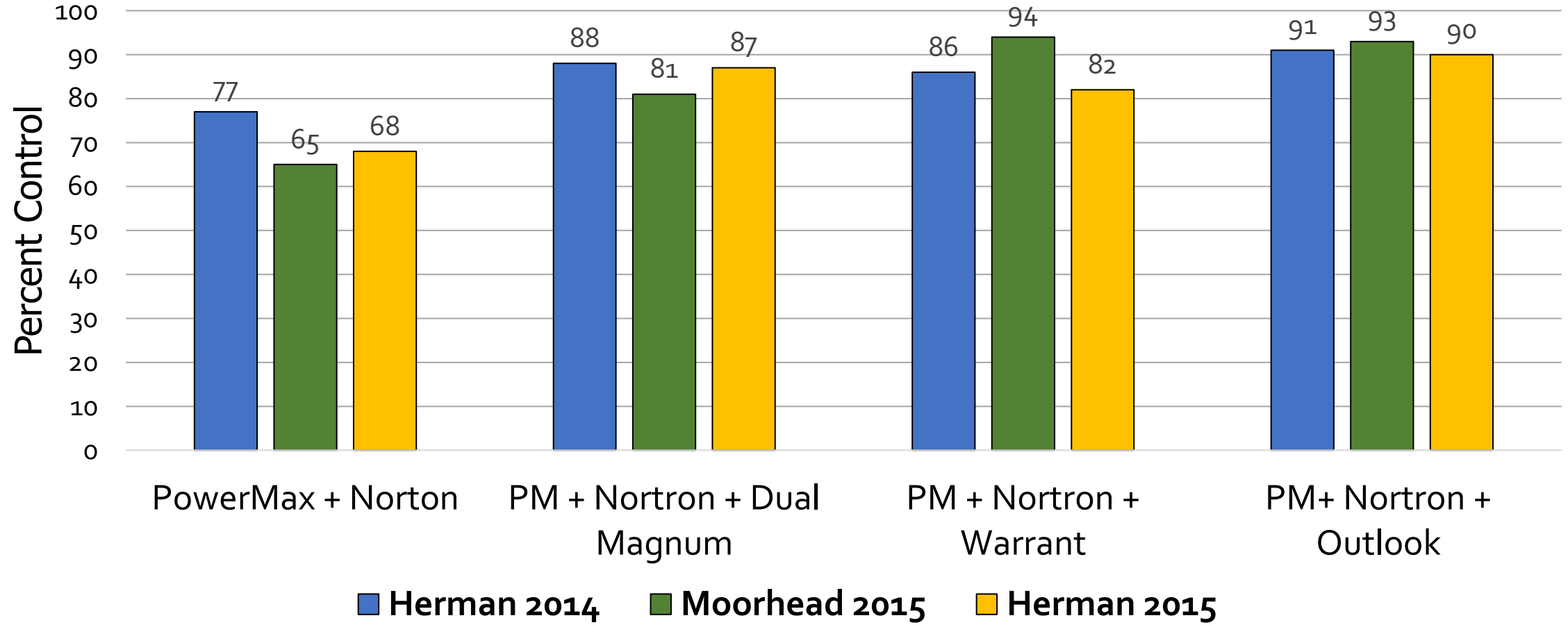
How do you decide what product to use lay-by?

Risk management

- Replanting, select Dual Magnum
- Activation early, select Outlook
- Sugarbeet safety, Dual Magnum or Warrant
- Length of control, Warrant
- Spectrum, Warrant
- Relationship with industry?
- Don't forget about the generic versions



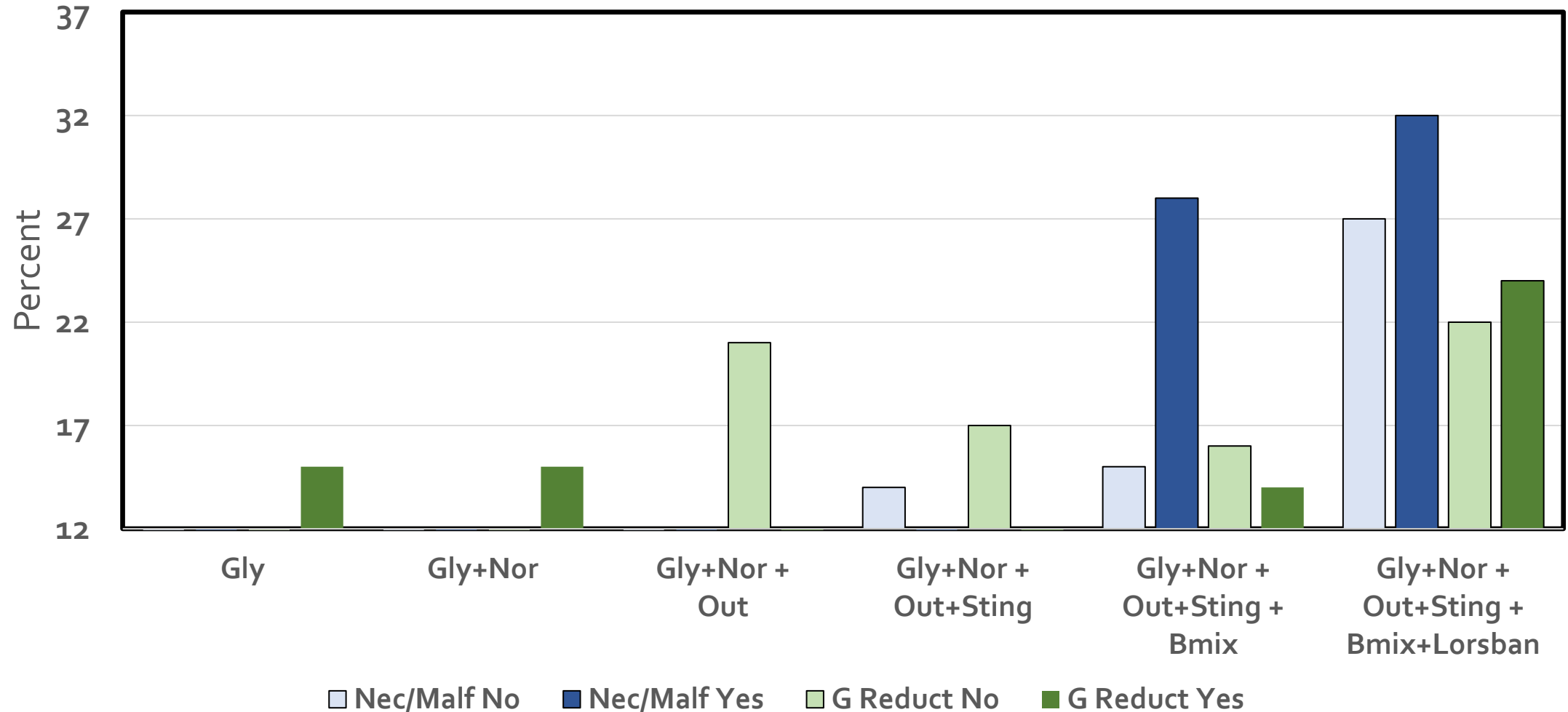
Waterhemp control from postemergence herbicides, across locations and years



Question. Can I tank-mix glyphosate + etho and lay-by with.....

- Stinger and Betamix?
- What about Asana or Lorsban (cutworm?)
- Ethofumesate PRE
- Ethofumesate PRE reduced epicuticular wax (Rubin et al. 1986) and altered structure of cuticular waxes (Leavitt et al. 1979)
- Ethofumesate may increase absorption / efficacy of POST herbicides (Kniss and Odera 2013)

Necrosis/Malformation and G Reduction in response to herbicides, with and without HSMOC, greenhouse 2019/2020



HT2 Sugarbeet

- A biotech trait featuring glyphosate, glufosinate and dicamba in the same vector.
- Commercialize in sugarbeet in the middle of the next decade
- We need to ensure the herbicide traits are useful when they are introduced.
- **Reinforce strategies to preserve future herbicide tolerant trait products in sugarbeet by creating educational / outreach modules emphasizing weed management across the crop sequence.**



Waterhemp control POST in sugarbeet

- Desmedipham + phenmedipham applied to small waterhemp (SMBSC Agriculturalists)
- Acifluorfen alone and in mixtures (E. Burt and Peters)
- Cultivation to supplement residual herbicides (N. Haugrud and Peters)
- Electrical discharge systems (Peters)
- Hooded sprayers (Peters)
- Ethofumesate POST to sugarbeet at rates greater than 12 fl oz/A (Lystad and Peters)



Acifluorfen

- Developed by Rohm & Haas and commercialized in 1980.
- Acquired by BASF to compliment the Basagran in soybean.
- UPL acquired acifluorfen from BASF in 2003.
- Control of pigweed, smartweed, and nightshade, and jimsonweed in soybean.
- The application rate is 16 to 24 fl oz/A depending upon weed species and weed height.
- Apply with adjuvant.

Research Only



Acifluorfen postemergence in sugarbeet

Objectives

Investigate sugarbeet injury and waterhemp control:

- in response to acifluorfen rate and growth stage
- in response to adjuvant with acifluorfen
- in response to tank-mixture with acifluorfen

Sugarbeet injury in response to treatment across four locations, 2019

			Necrosis	Stature Reduction	
Treatment	Rate	Timing	Early	Early	Late
	---fl oz/acre---	---lf-stage---	-----% visible injury-----		
Glyphosate / glyphosate ^a	28 / 28	2 / 4-6	0 a	0 a	0
Acifluorfen	16	2	29 bcd	55 c	8
Acifluorfen	16	4-6	36 cd	40 b	18
Acifluorfen	16	10-12	22 bc	0 a	7
P-Value			0.007	<0.0001	NS

^a Glyphosate was PowerMax, Monsanto Company, St. Louis, MO

^bAcifluorfen was Ultra Blazer, UPL, King of Prussia, PA.

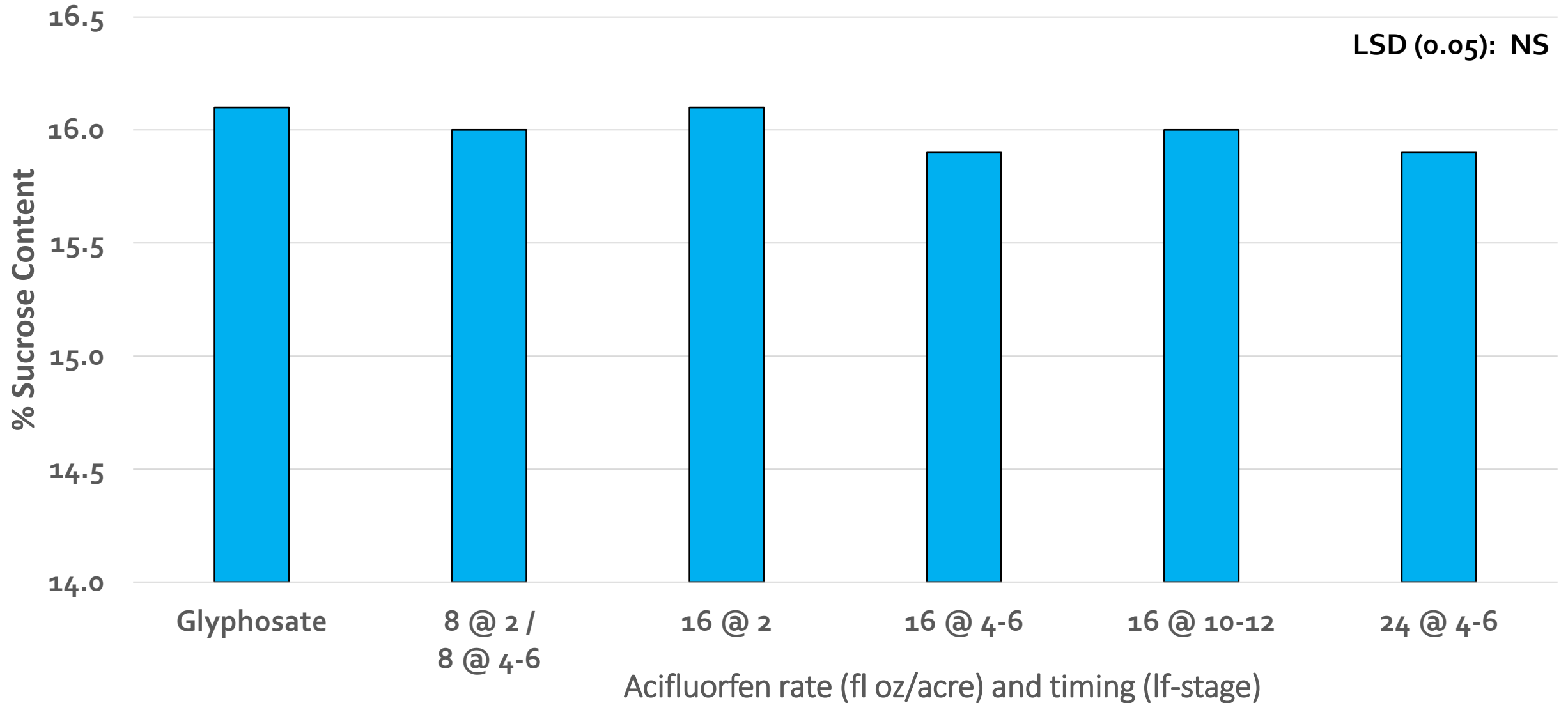
Acifluorfen at 16 fl oz/acre, applied June 10 (4-6 leaf), image 3 DAT



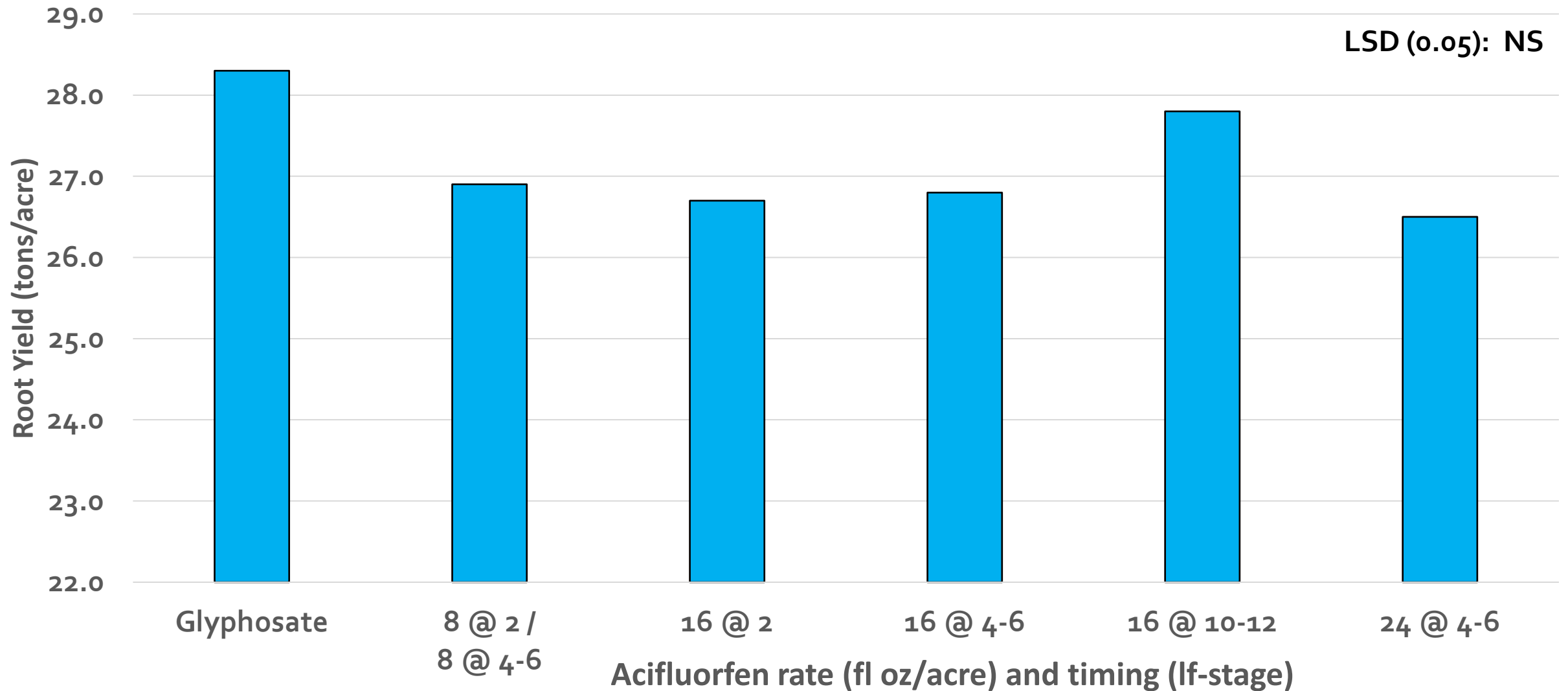
Acifluorfen at 16 fl oz/acre, applied June 25 (10-12 leaf), image 7 DAT



Sucrose content in response to acifluorfen across four locations, 2019



Root yield in response to acifluorfen across four locations, 2019



Sugarbeet injury and waterhemp control in response to treatment across three locations, 2019

		10 + Days after Treatment	
Treatment	Rate	Necrosis & GR	Waterhemp
	-----fl oz/acre-----	-----% visible injury-----	---% visible control---
Glyphosate + NIS / glyphosate + NIS ^a	28 / 28	1 a	37 d
Acifluorfen + NIS ^b	16	32 b	60 c
Acifluorfen + Glyphosate + NIS	16 + 28	60 c	87 a
Acifluorfen + Ethofumesate + NIS ^c	16 + 32	53 bc	85 ab
Acifluorfen + Glyphosate + Ethofumesate + NIS	16 + 28 + 32	63 c	94 a
P-Value		0.0027	<0.0001

^a Non-ionic surfactant at 0.25% v/v.

^b Non-ionic surfactant at 0.125% v/v.

^c Ethofumesate was Willowood Ethofumesate 4SC, Willowood USA, Roseburg, OR.

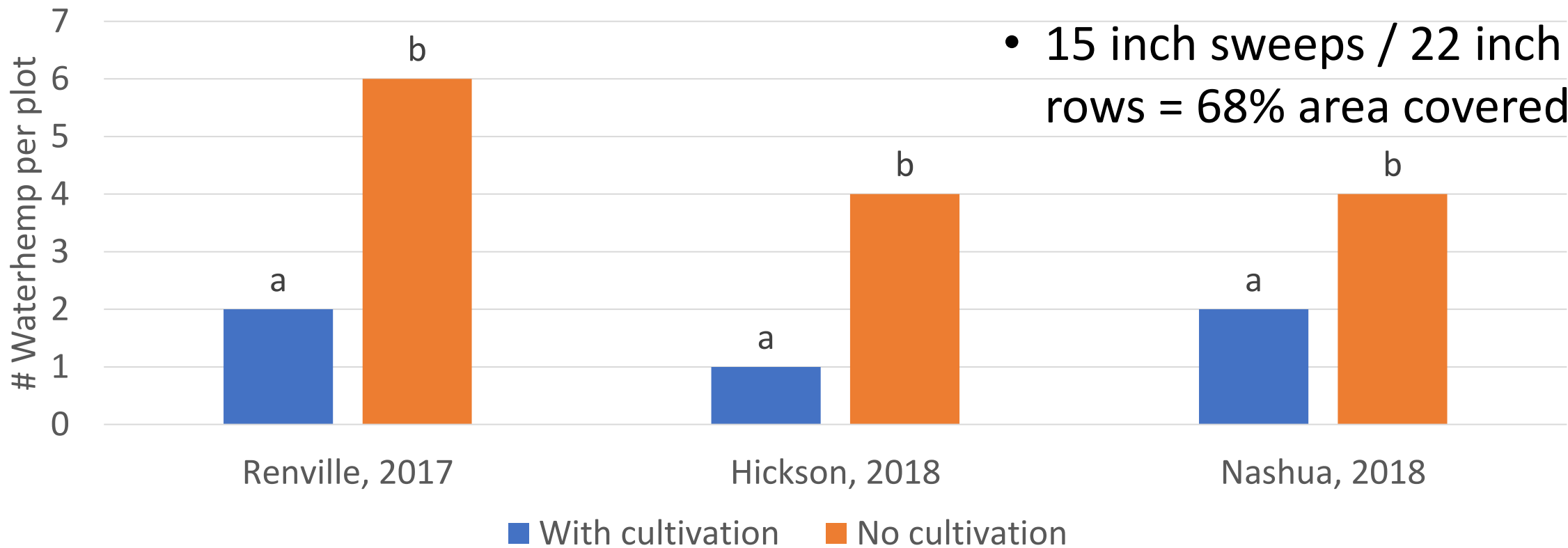
Glyphosate check, applied June 25, image 8 DAT



Acifluorfen at 16 fl oz/acre + Glyphosate + NIS, applied June 25, image 8 DAT

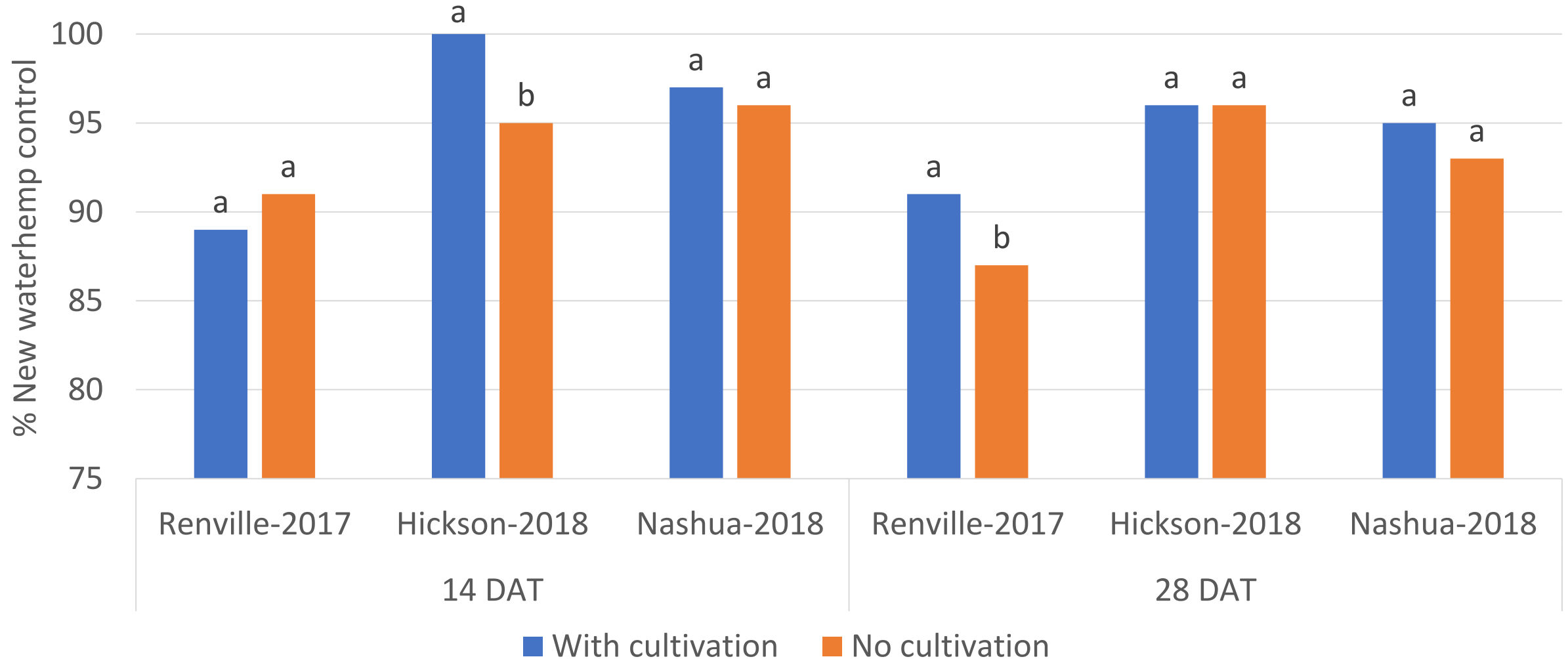


Cultivation immediately after herbicide resulted in 50-75% less waterhemp, 14 DAT

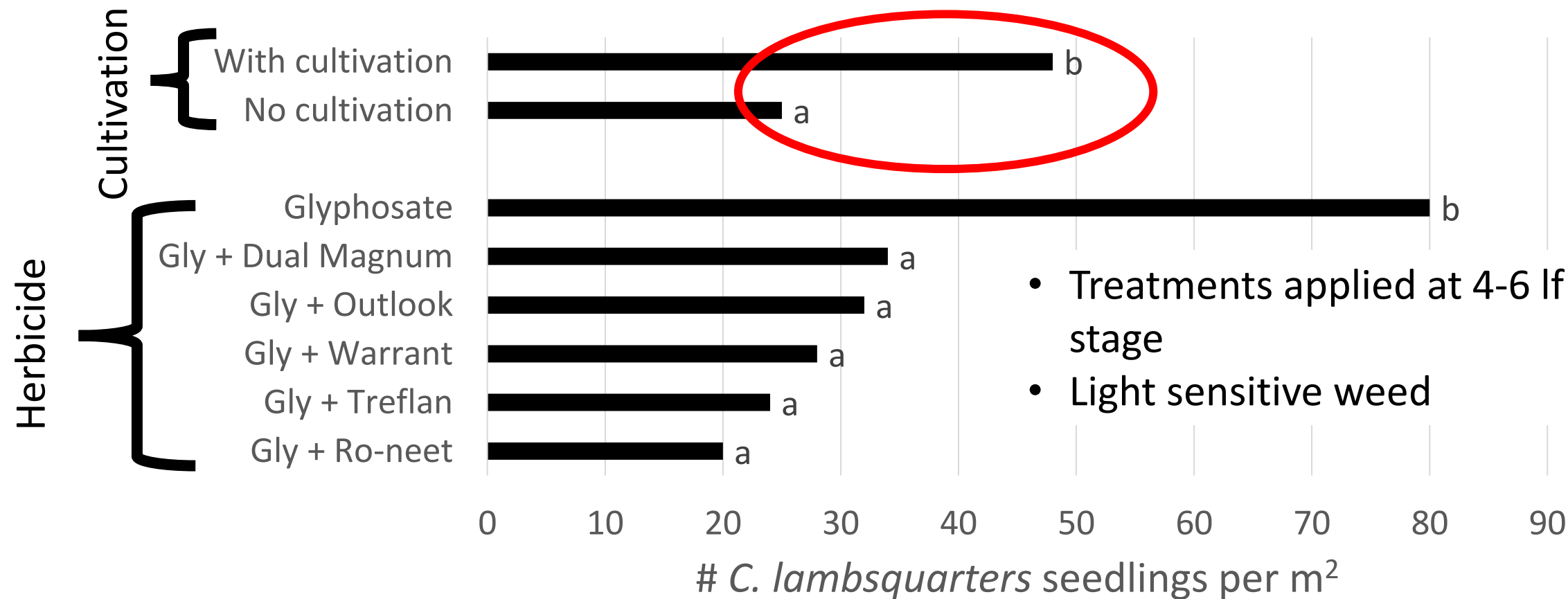


	Cultivation			Herbicide	C X H Interaction
ANOVA	Renville, 2017	Hickson, 2018	Nashua, 2018	All environments	
P-value	0.009	0.002	0.019	NS	NS

Early cultivation generally had no effect on new waterhemp emergence control



Early cultivation increased common lambsquarters emergence, Galchutt-2018, 28 DAT



ANOVA	Cultivation	Herbicide	C X H Interaction
P-value	0.018	< 0.001	NS

Electrical Discharge System (EDS)

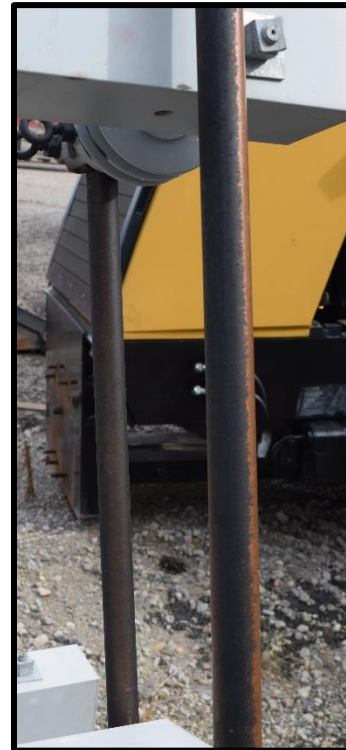
Electricity traveling in a copper bar contacts the stem of a plant, boiling the water in cells and bursting them. The more moisture in plants the more effective the result.

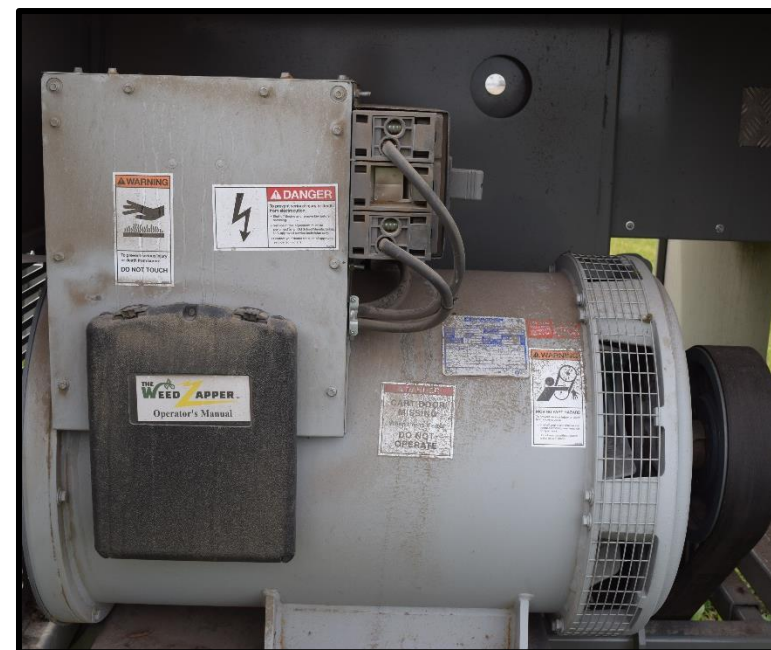
- Lasco Lightning Weeder
- Developed in 1979
- Grand Forks County, ND
- 50,000 watts
- 125 HP tractor
- PTO driven
- [EDS](#)



EDS, generation II, 2019

- Weed Zapper
- Developed in 2018
- Sedalia, MO
- 200,000 watts
- Boom front-end mounted
- PTO driven generator
- Requires a 275 PTO HP tractor
- Safety improvements
- [Morris, MN 2019.mov](#)







Experiment

- Collected waterhemp seed from brown and green flowering structure tissue from three fields.
- Planted 50 seeds per pot, 3 replications.
- Seeded and covered with plastic until emergence.
- Control was viable seed from a different source to evaluate technique.

Location	Stem color	Waterhemp	
		#	%
Glyndon, MN	brown	0 a	0 a
Perley, MN	brown	2.7 a	5.3 a
Perley, MN	green	2.3 a	4.7 a
Control		33.3 b	66.7 b
<i>P-value</i>		<0.0001	<0.0001

Herbicide post-directed through a hooded sprayer

- Common practice in cotton production
- Spray small weeds with a POST herbicide
- Contact herbicides / sugarbeet safety
- Equipment manufactured and sold by Redball



Liberty post-directed through a hooded sprayer

SMBSC and Peters are collaborating with BASF and MDA to develop a 24(c) special local needs label

- Liberty at rates from 32 to 43 fl oz/A
- Dry AMS at 3 lb/A
- Use at least 10 GPA water volume, Bayer says 15 GPA
- Weeds up to 3 inches tall
- Apply when environmental conditions are right
 - Hot, sunny, humid

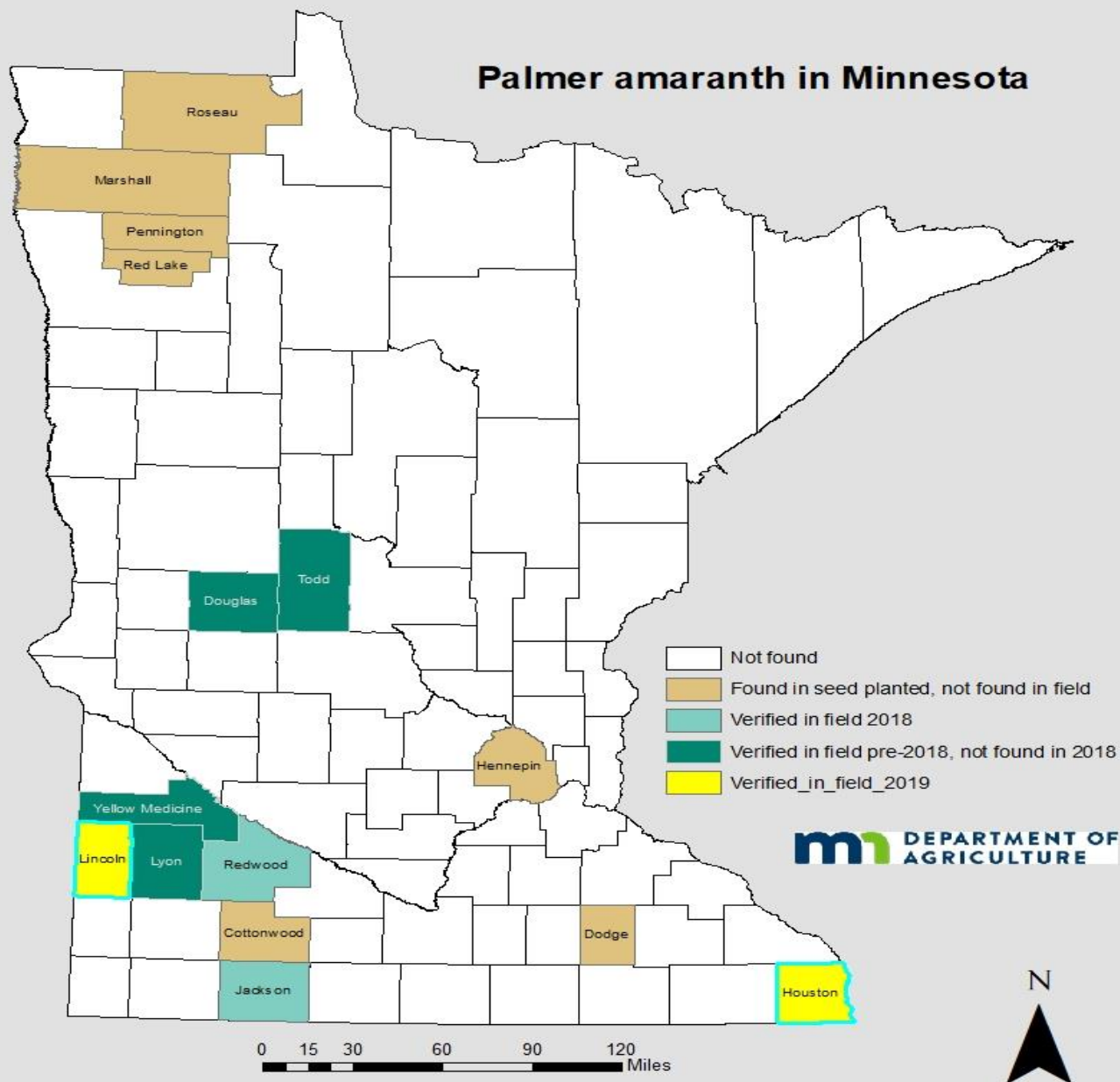


Status of Palmer amaranth in Minnesota

2019 New Counties

Lincoln County –
Millet

Houston County –
Two sites, no relation



In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651/201-6000. TTY users can call the Minnesota Relay Service at 711 or 1-800-627-3529. The MDA is an equal opportunity employer and provider.

Redwood County Palmer amaranth

- Fall of 2018 a grower in Redwood County and a grower in Jackson County found several Palmer amaranth plants in their fields.
 - First ever Palmer amaranth found in a row-crop in Minnesota.
 - MDA is looking into multiple possible pathways.
 - Sunflower screenings from North Dakota are a possibility, surveying manure piles from feedlots.



If you suspect Palmer amaranth on your property:

- Immediately call your local U of M Extension Educator or IPM Specialist, crop consultant, county agricultural inspector and or the MDA's Arrest the Pest at 888-545-6684 to report locations.
- Photos and a location

If a suspect plant is found:

- Save the plant until the species has been confirmed.
- Live plant material should be placed in a plastic bag and refrigerated.
- Dead and dry plant material should be placed in a paper bag and stored at room temperature.

What to do?



Thank you for your Support

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