

# Weed Control in Sugarbeet Fargo

**Tom Peters**

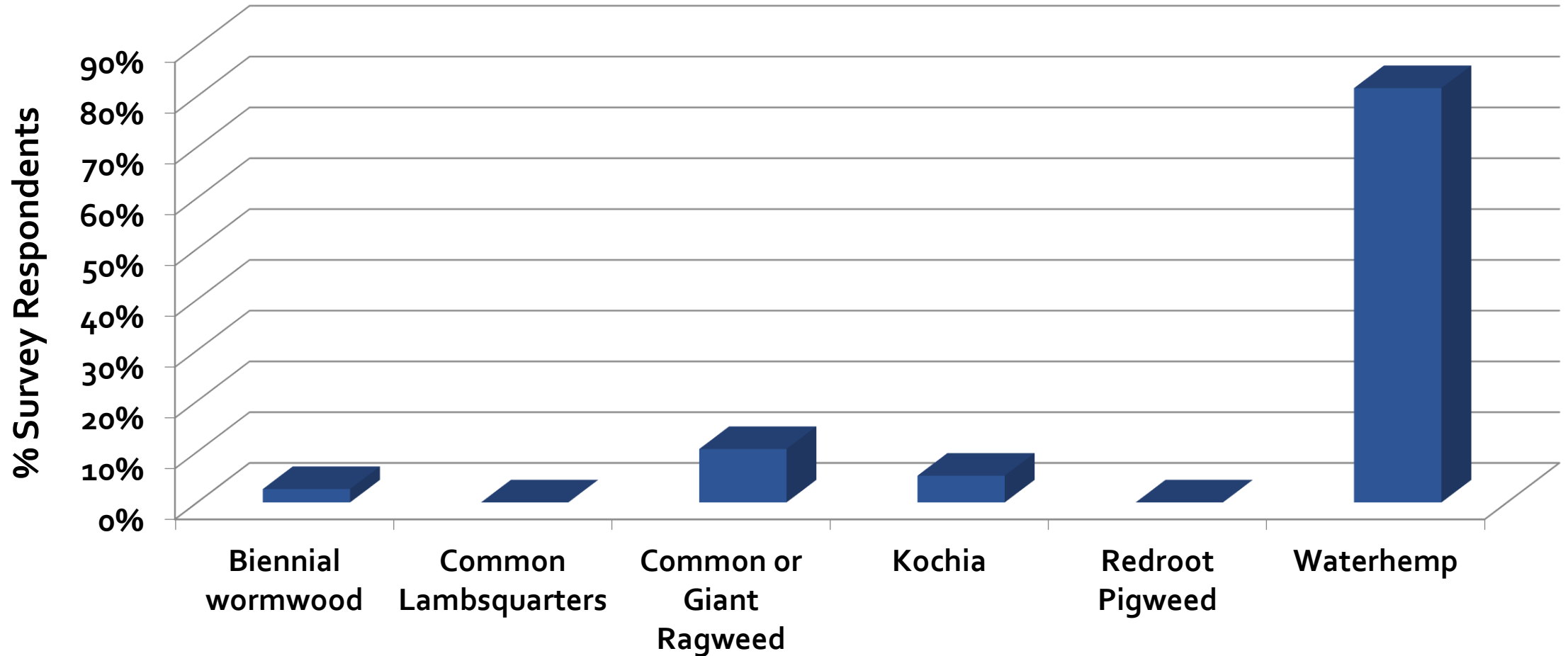
**Extension Sugarbeet Agronomist and  
Weed Control Specialist**

**NDSU**

EXTENSION

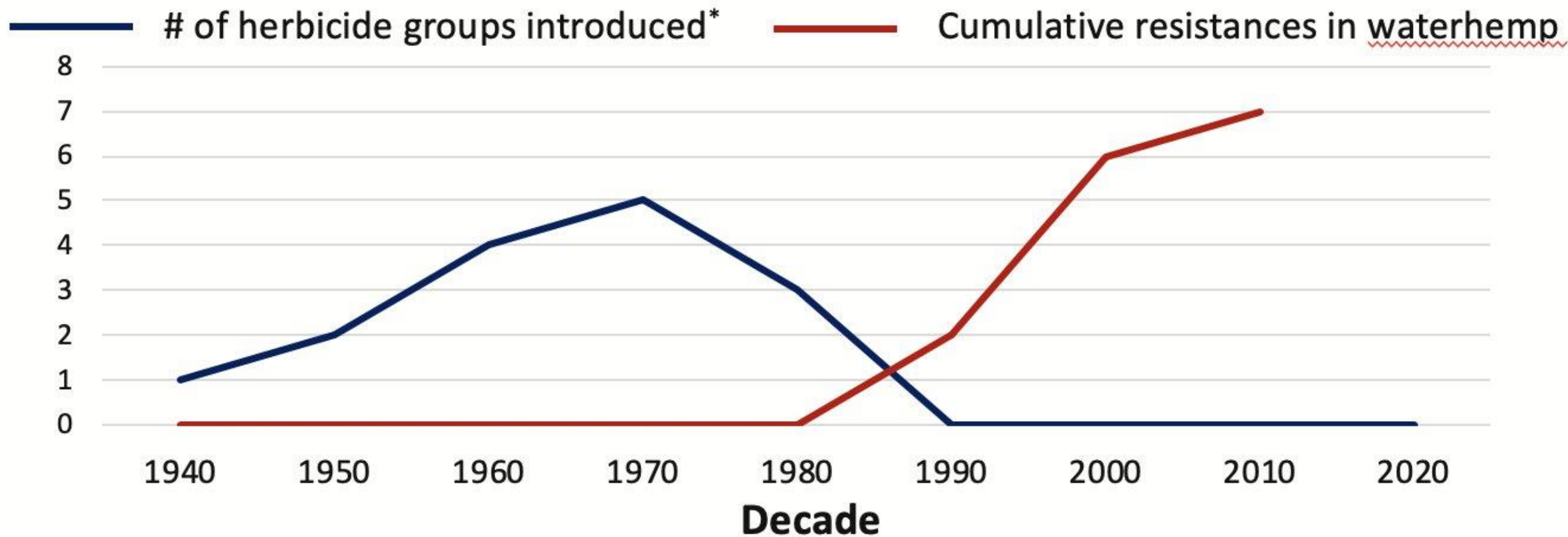
UNIVERSITY OF MINNESOTA  
**EXTENSION**

# What was your worst weed problem in 2018?<sup>a</sup>



<sup>a</sup>Turning Point Survey of Growers; conducted at the 2019 Sugarbeet Growers Seminar, Fargo;  
survey results at [www.sbreb.org](http://www.sbreb.org)

# Chemical era of weed management: Nice while it lasted



# Resistant weeds in ND/MN\*

Herbicide Group	Weed
Group 1	Wild oat, Green foxtail
Group 2	<b>Kochia</b> , Green foxtail, <b>Common ragweed</b> , redroot pigweed, <b>Waterhemp</b> , Wild oat
Group 3	Green foxtail
Group 4	<b>Kochia</b>
Group 5 (atrazine)	<b>Kochia</b>
Group 9	<b>Kochia</b> , Horseweed, <b>Common ragweed</b> , <b>Waterhemp</b>
Group 14	<b>Common ragweed</b> and <b>Waterhemp</b> (suspected)

\*Not a complete list

# Why is waterhemp so difficult to manage?

## Waterhemp is well-suited for modern agriculture

- Difficulty in weed identification
- Extended germination timing
- Rapid growth
- Well adapted for conserve tillage
- Has benefited from transition to POST herbicides
- Great seed production
- Seed longevity
- Genetic diversity and resistance







No hair on stem  
Waterhemp



Hair on stem  
Redroot pigweed



# Waterhemp cotyledons are wider and shorter (row boats) than redroot pigweed (canoes)



Waterhemp, credit, M. Horak, Kansas State Univ.

Redroot pigweed, credit, Bruce Ackley, The Ohio State Univ., Bugwood.org

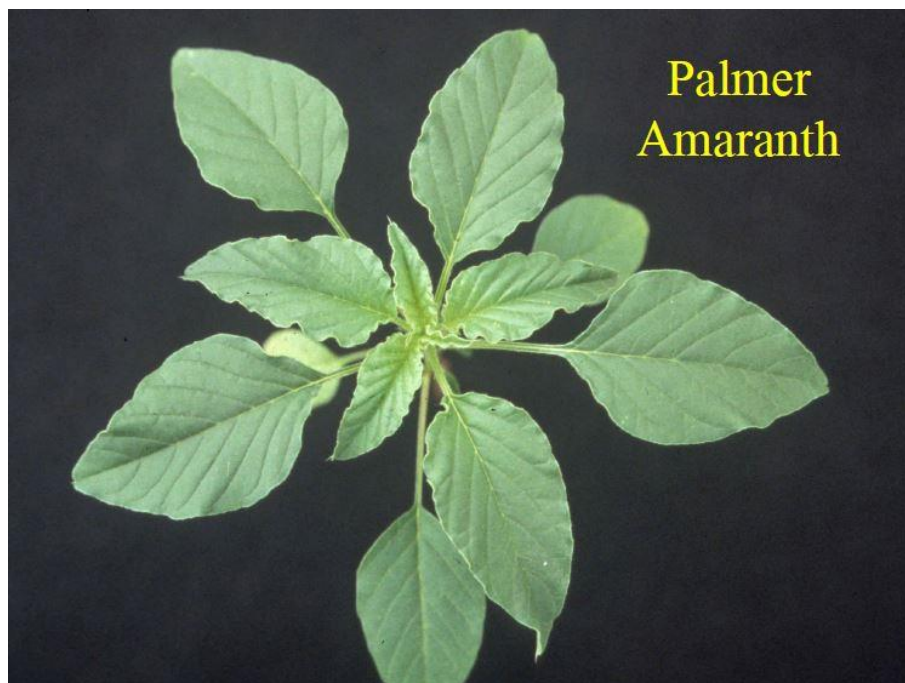
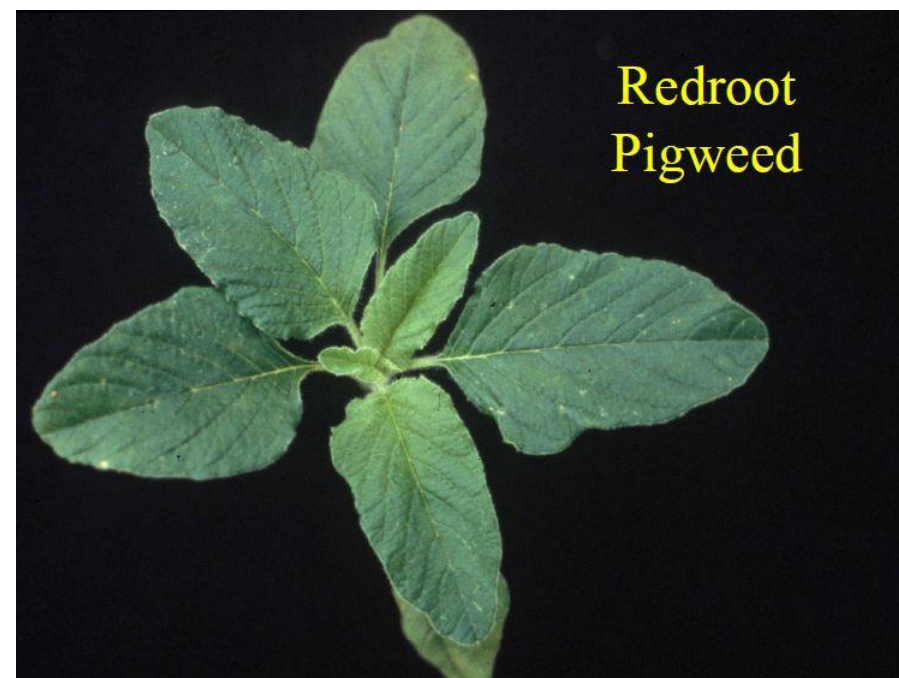


Waterhemp



Waterhemp









Powell amaranth



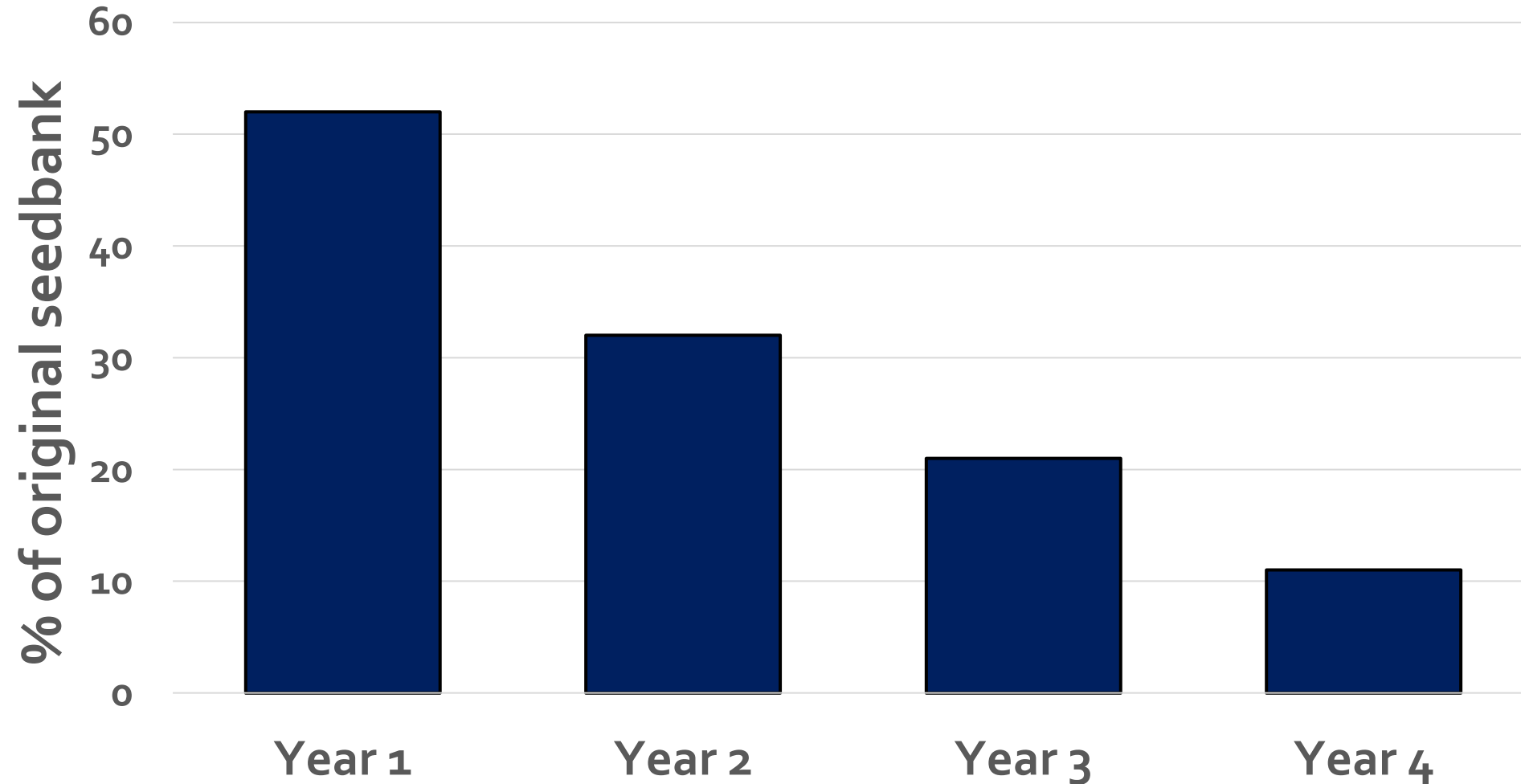
Waterhemp



Redroot pigweed



# Percent of waterhemp seed viable four years following burial



Source: Buhler and Hartzler, 2001. Weed Science: 49:230-235

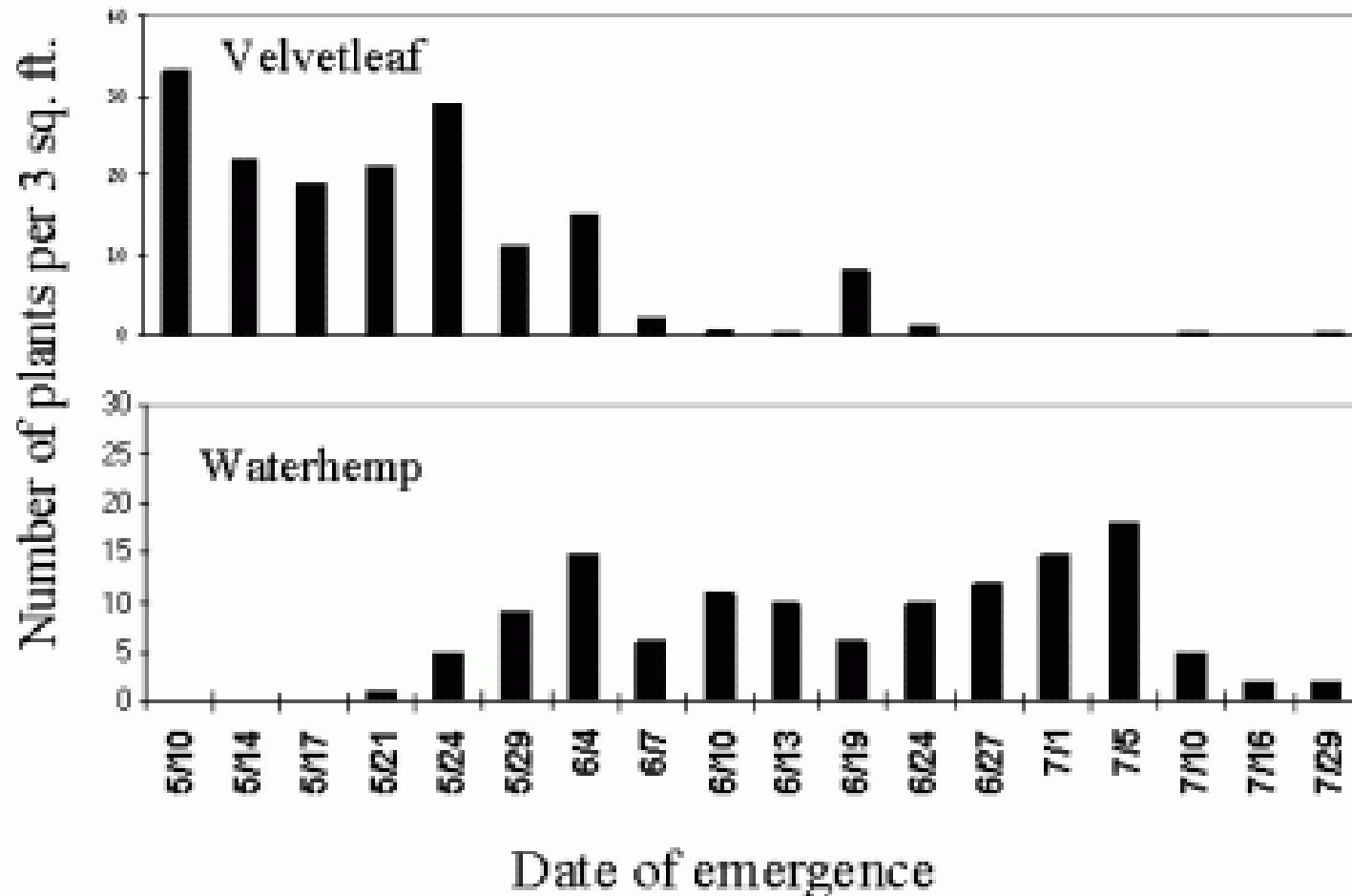




Waterhemp emerged, image, May 22



# Delayed and prolonged emergence of waterhemp creates weed management challenges



# Etho might be our most versatile herbicide

Rate (pt/A)	Response
0.25	With PowerMax POST
0.38	With PowerMax POST
0.75	With PowerMax POST
1	With S-metolachlor
2	With S-metolachlor
3	With S-metolachlor
4	Kochia control PRE
5	Kochia control PRE
6	PRE for waterhemp control
7	PRE for waterhemp control

**Nortron<sup>®</sup> SC**  
HERBICIDE



**ETHOTRON<sup>®</sup>**  
HERBICIDE



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Treatment	Rate	Sgbt inj		W. hemp cntrl	
		12 DAT	20 DAT	Mid	Harvest
	fl oz /A	%	%	%	%
PM / PM / PM	28/28/22	1	0	63 de	48 e
PM+Etho / PM + Etho / PM Etho	28+4 / 28+4 / 22+4	2	1	76 c	67 cd
P-value		NS	NS	<.0001	<.0001

- Add AMS at 1% weight or 2.5% v/v liquid (8.5 lb/100 G water)
- HSMOC (tank-mixes)
- Ethofumesate 4SC = 45 day PHI



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## 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

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**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 <sup>2</sup>	%
Dual Magnum	8	PRE	25 b	97
PowerMax	28	EPOST	192 c	74
Control			727 a	

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

# Etho might be our most versatile herbicide

**Nortron<sup>®</sup> SC**  
HERBICIDE

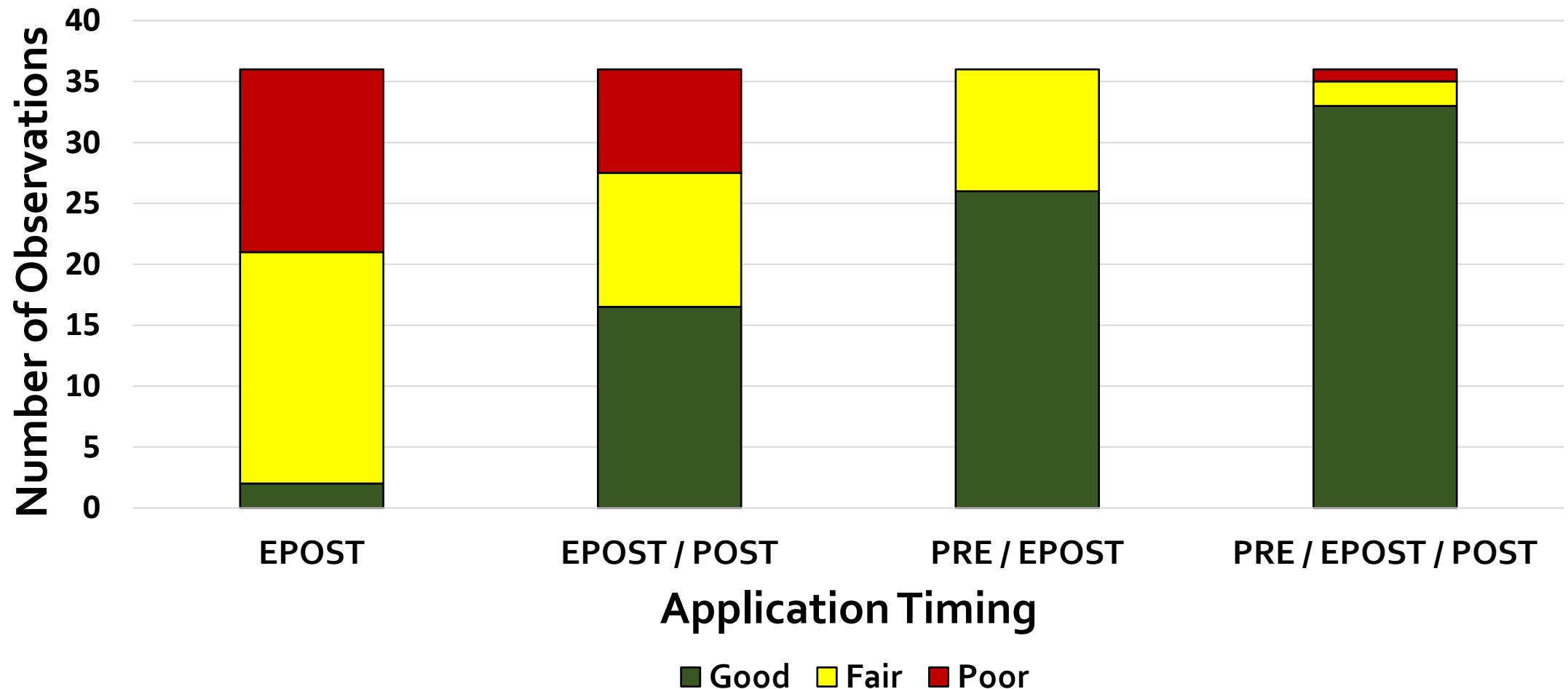


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Treatment	Rate	Herman 2014	Moorhead 2015	Herman 2014	Herman 2015	Moorhead 2015	Lake Lillian
	pt/A	% sgbt injury		-----% waterhemp control-----			
Ethofumesate PPI	7	8	11	74	74	79	98
Ethofumesate PRE	7	3	4	70	79	86	96
S-metolachlor PRE	0.5	6	5	89	63	61	90
S-metolachlor PRE	0.75	9	13	94	61	74	91
Control		-	14	33	48	60	48
LSD (0.05)		8	10	9	12	10	11

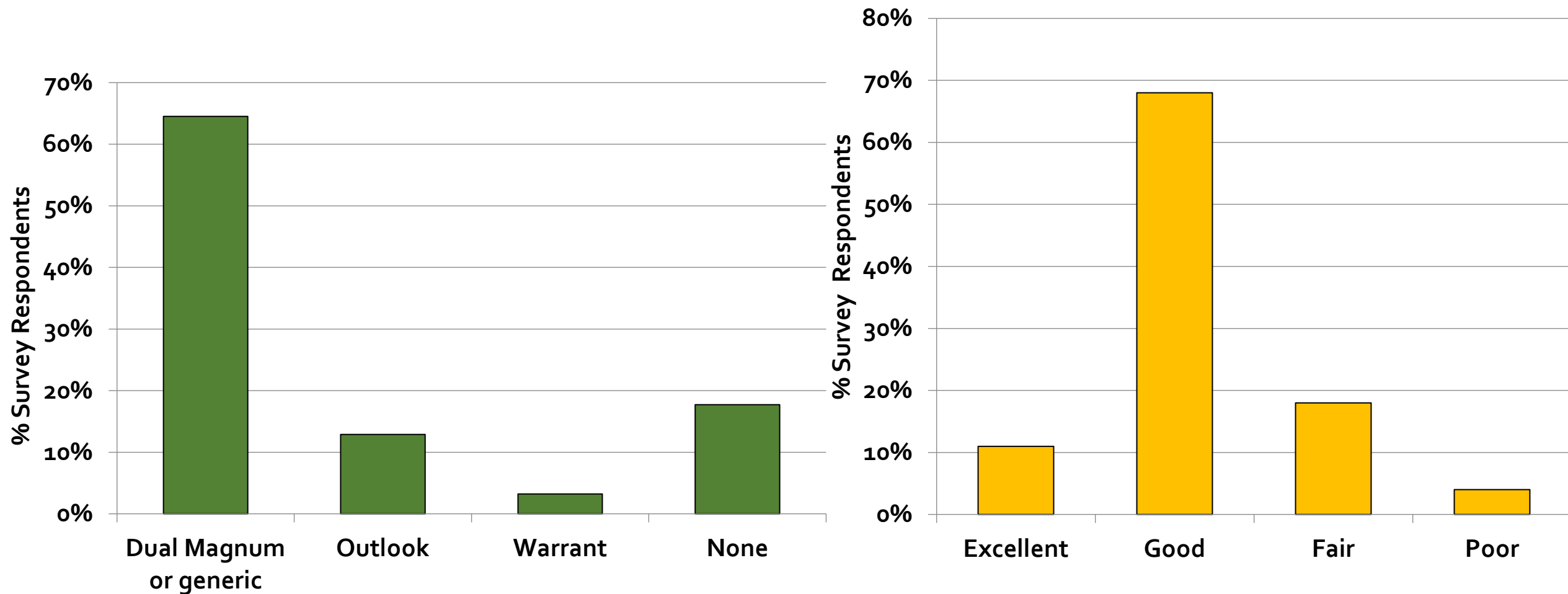


# Waterhemp control in response to application timing averaged across herbicide, herbicide rate, evaluation, location, and year.



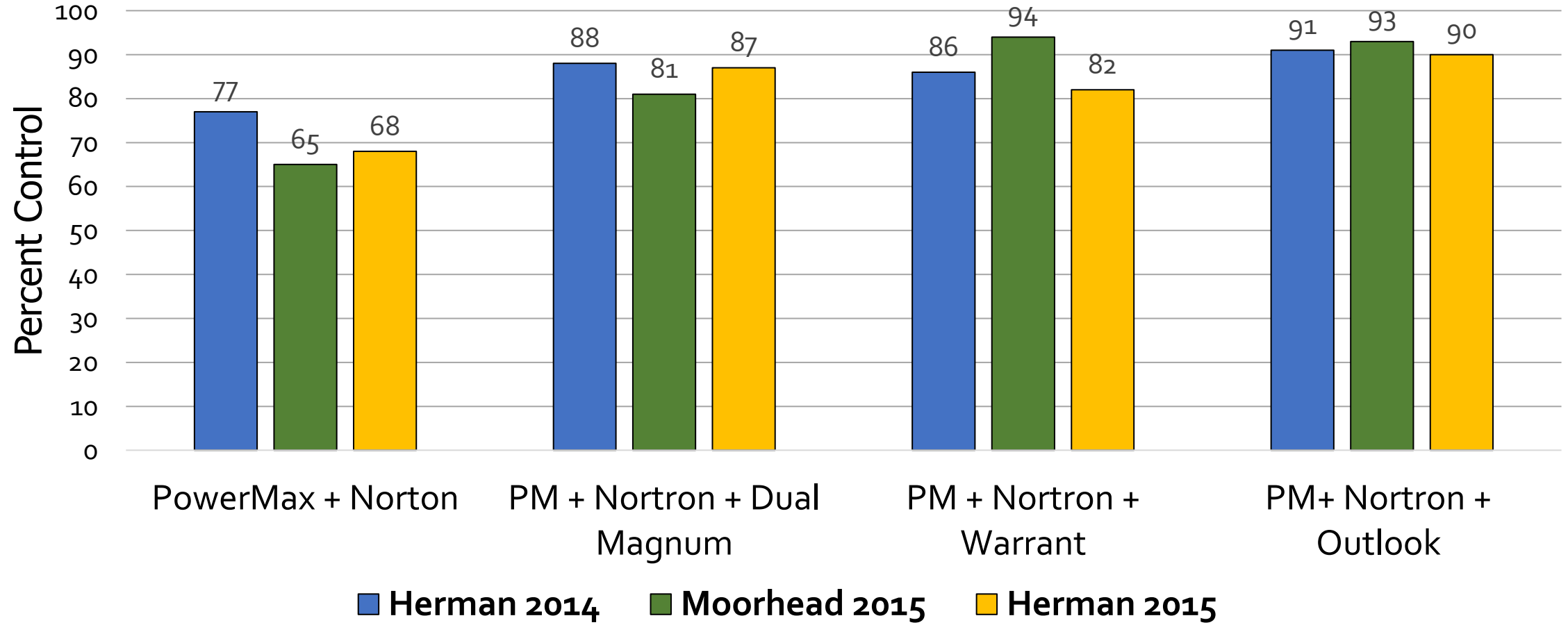
# Which soil-applied herbicide (lay-by) did you use in 2018?

## How effective were your soil-applied herbicide applications?<sup>a</sup>



<sup>a</sup>Turning Point Survey of Growers; conducted at the 2019 Sugarbeet Growers Seminar, Fargo

# Waterhemp control from postemergence herbicides, across locations and years





# 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



# Ethofumesate is an effective pigweed herbicide, SMBSC, 2019



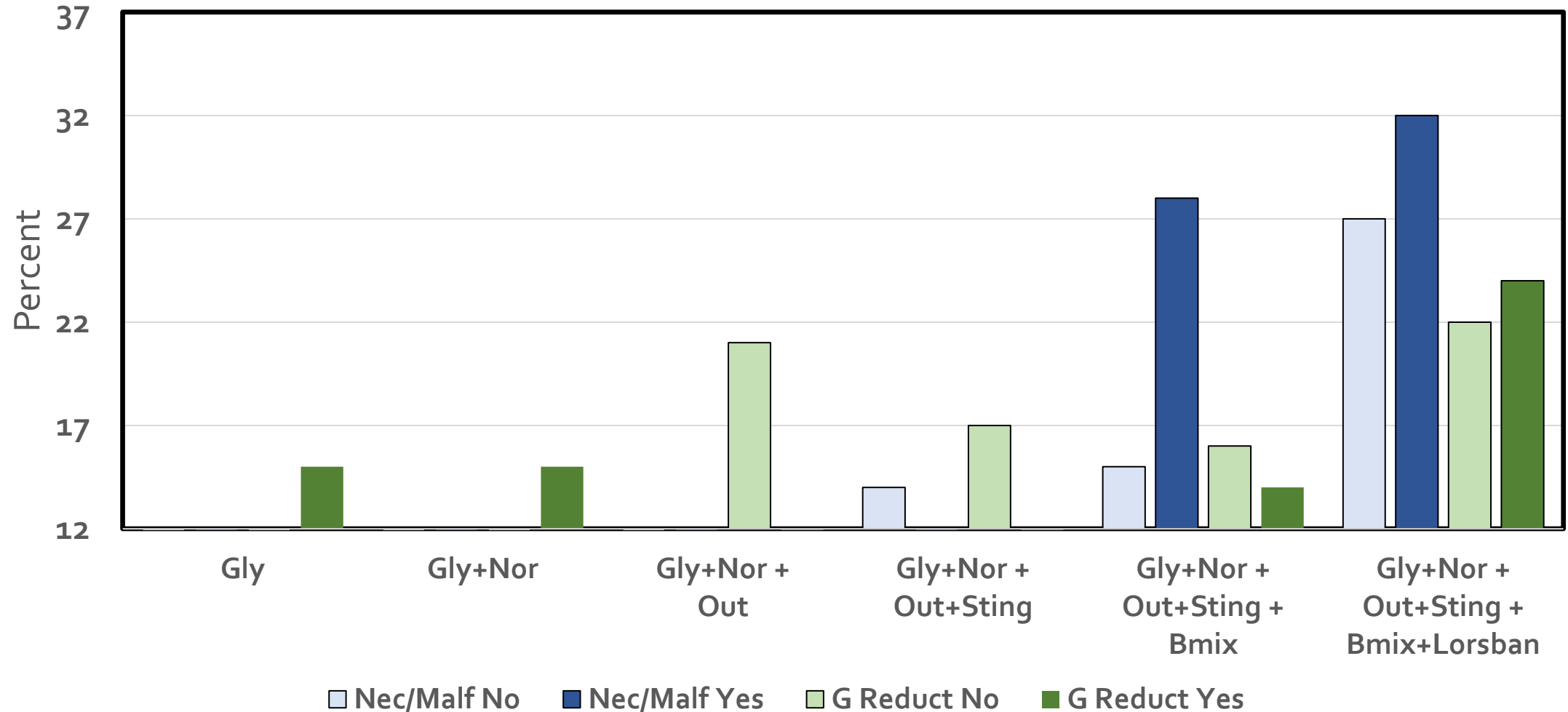
Ethofumesate  
fb Outlook +  
Power Max at  
14 + 32 fl oz/A

Outlook +  
Power Max at  
14 + 32 fl oz/A

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

- Stinger and Betamix?
- What about Asana or Lorsban (cutworm?)

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





# **We have greenhouse work left this winter**

- We need to repeat our greenhouse experiments
- We need to evaluate sugarbeet safety from complex mixtures following ethofumesate PRE

# Kochia

[CBS-TumbleweedClip.mp4](#)



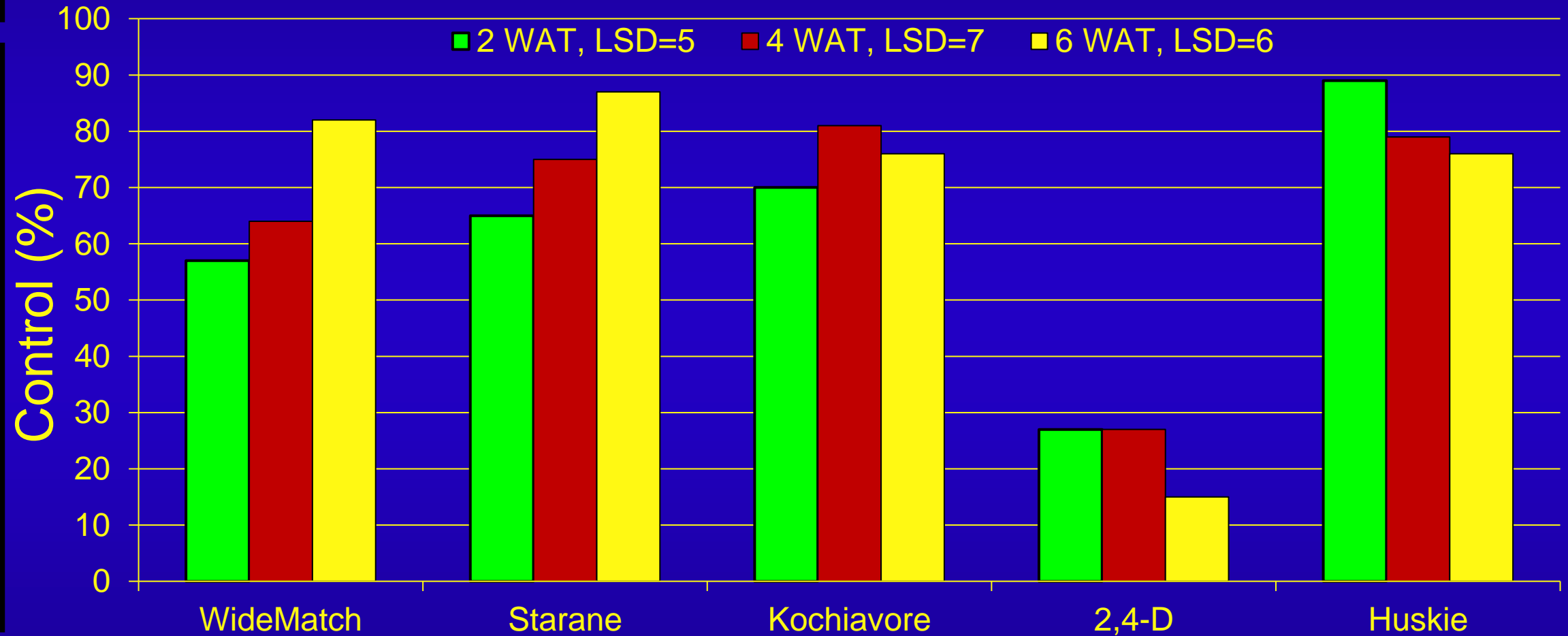
- Life cycle, summer annual
  - One of the first weeds to emerge in spring
- Seed production, 15,000 seeds per plant
- Biology, very deep rooted, tolerates saline soils
- Biology, extremely competitive; a few plants will reduce yield
- Seed viability, 1 to 2 years

# Small grains are tremendous crop(s) to implement a kochia control protocol

- Narrow rows provide canopy closure
- Herbicides and herbicide families are complimentary
  - Growth Regulators (SOA<sub>4</sub>)
    - Fluroxypyr, Starane, or Starane Ultra
    - Dicamba
    - Widematch (clopyralid+fluroxypyr)
  - PSII Inhibitors (SOA<sub>6</sub>)
    - Bromoxynil
  - PPO Inhibitors (SOA<sub>14</sub>)
    - Aim
  - HPPD Inhibitors (SOA<sub>27</sub>)



# Kochia Control





# Starane

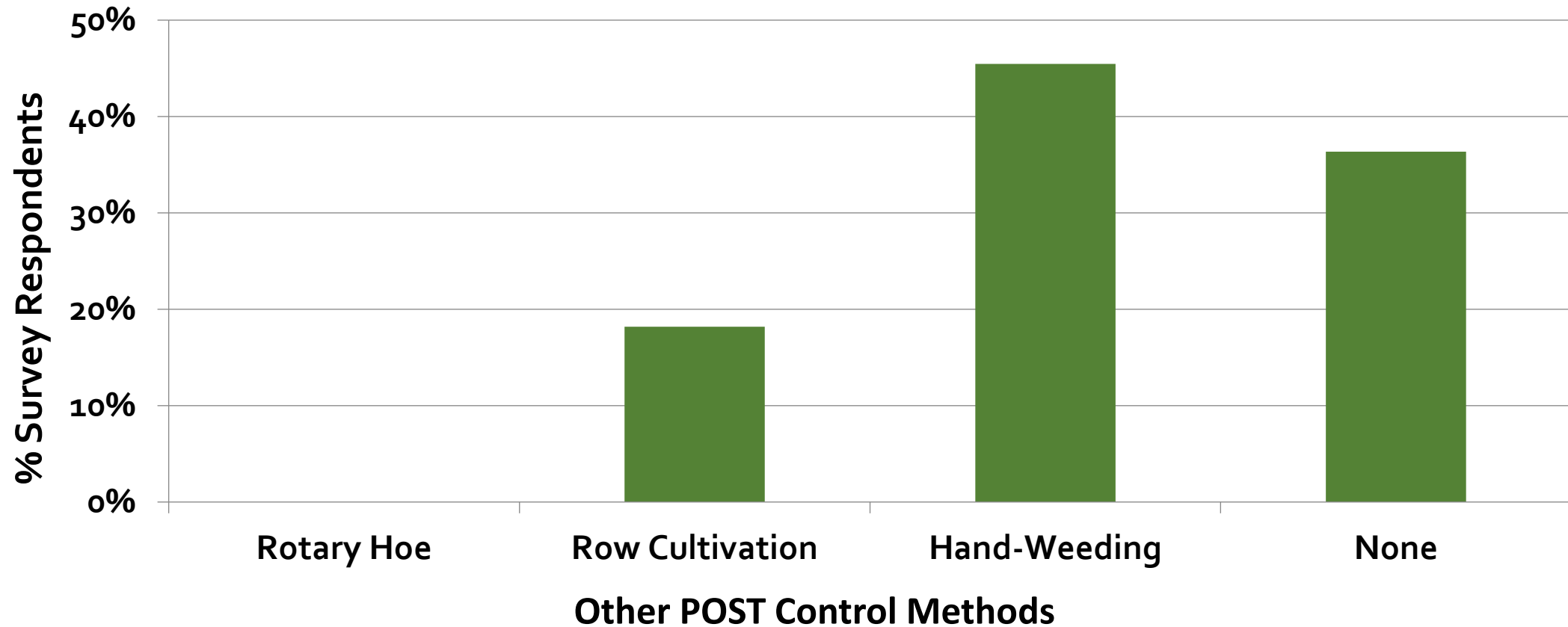


# Products containing bromoxynil



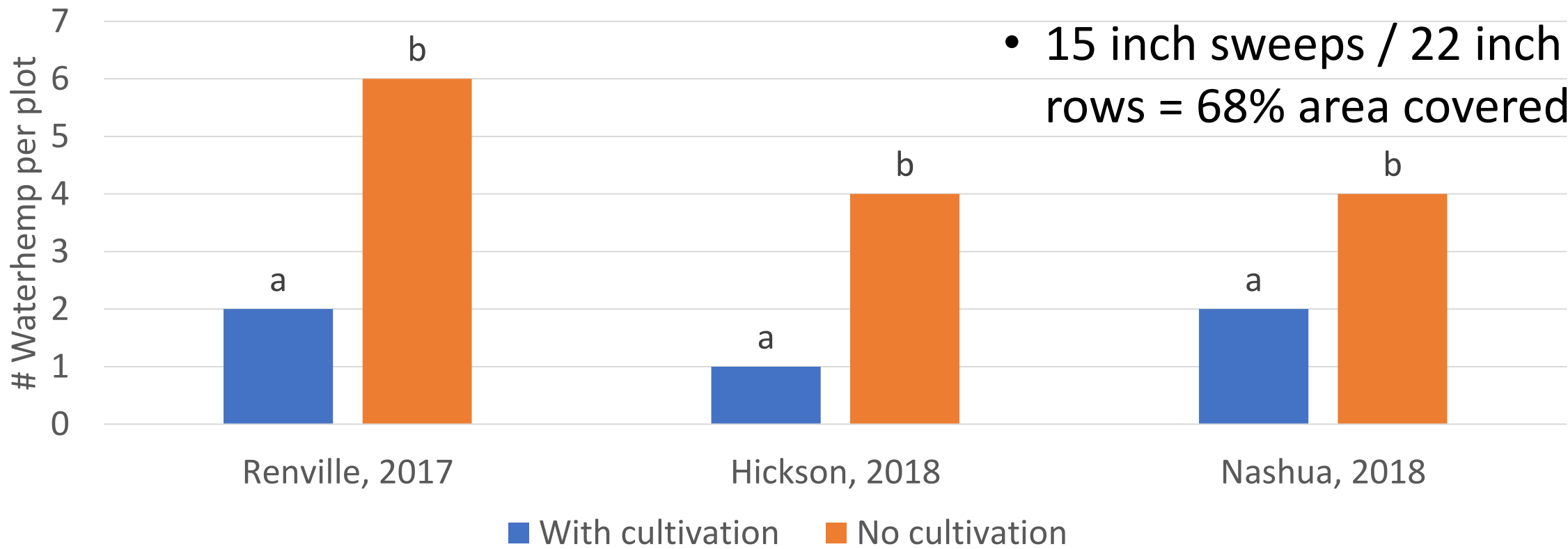


# What other POST weed control methods did you use in 2018?<sup>a</sup>



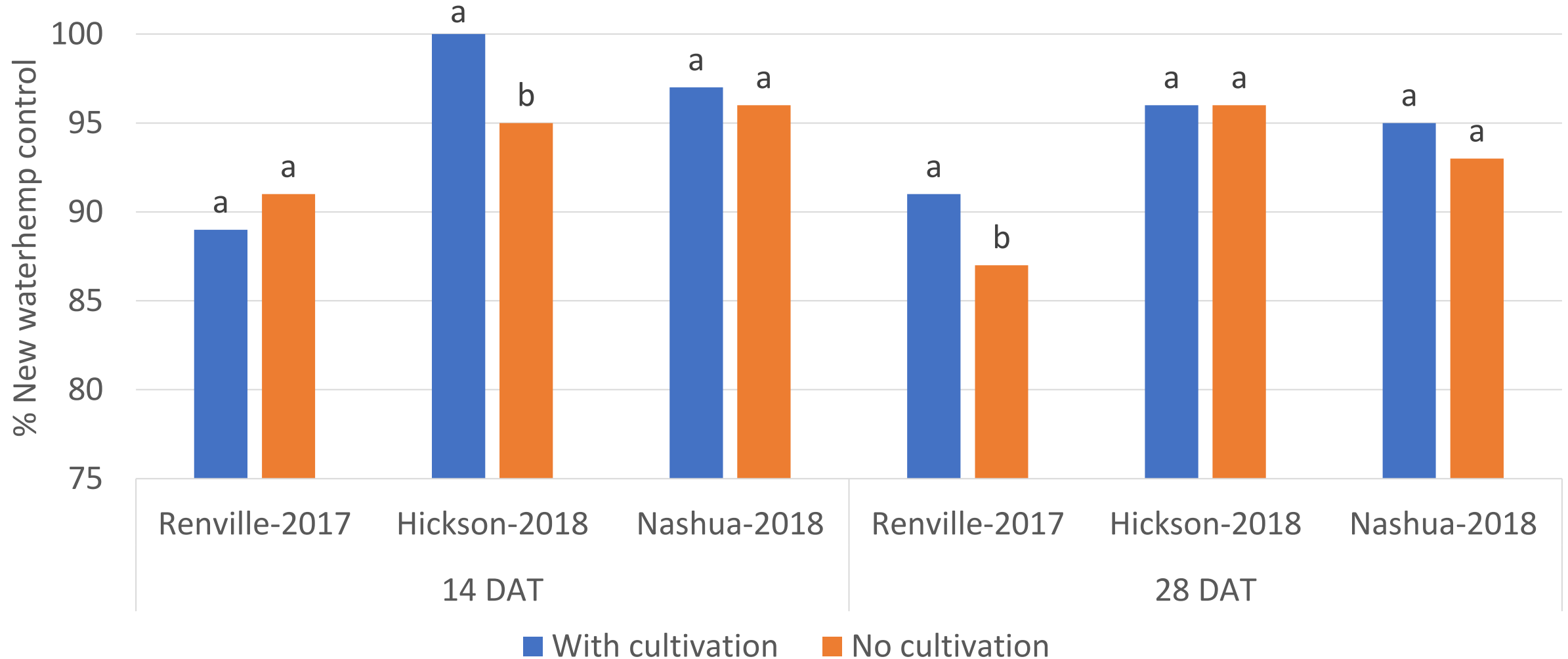
<sup>1</sup>Turning Point Survey of Growers; conducted at the 2019 Sugarbeet Growers Seminar, Fargo

# 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



# 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.

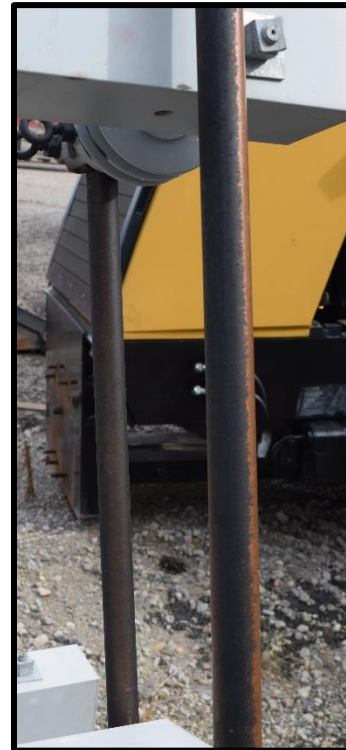
- Lasco Lightning Weeder
- Developed in 1979
- Grand Forks County, ND
- 50,000 watts
- 125 HP tractor
- PTO driven
- [EDS](#)





# 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 a	66.7 b
<i>P-value</i>		<0.0001	<0.0001



# Acknowledgements

- Sugarbeet Research and Education Board for supporting our ideas
- Our cooperators: Glenn and Danny Brandt (Ada), Dallas Loff (Galchutt), Mike Moen (Galchutt), Tim and Michael Backman (Herman), Vince Ulstad (Hickson), Brian and Chris Schlegal (Lake Lillian), Pinta Brothers (Minto), American Crystal Sugar (Moorhead), Troy Koltes (Nashua), James Bergman and Ransel Anderson (Oslo) , Matt Ness (Wolverton)
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- North Dakota State University Experiment Station and Crookston Research and Outreach Center

# Thank you for your Support

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