

# **Weed Control in Sugarbeet Grafton Growers seminar**

**Thomas Peters**

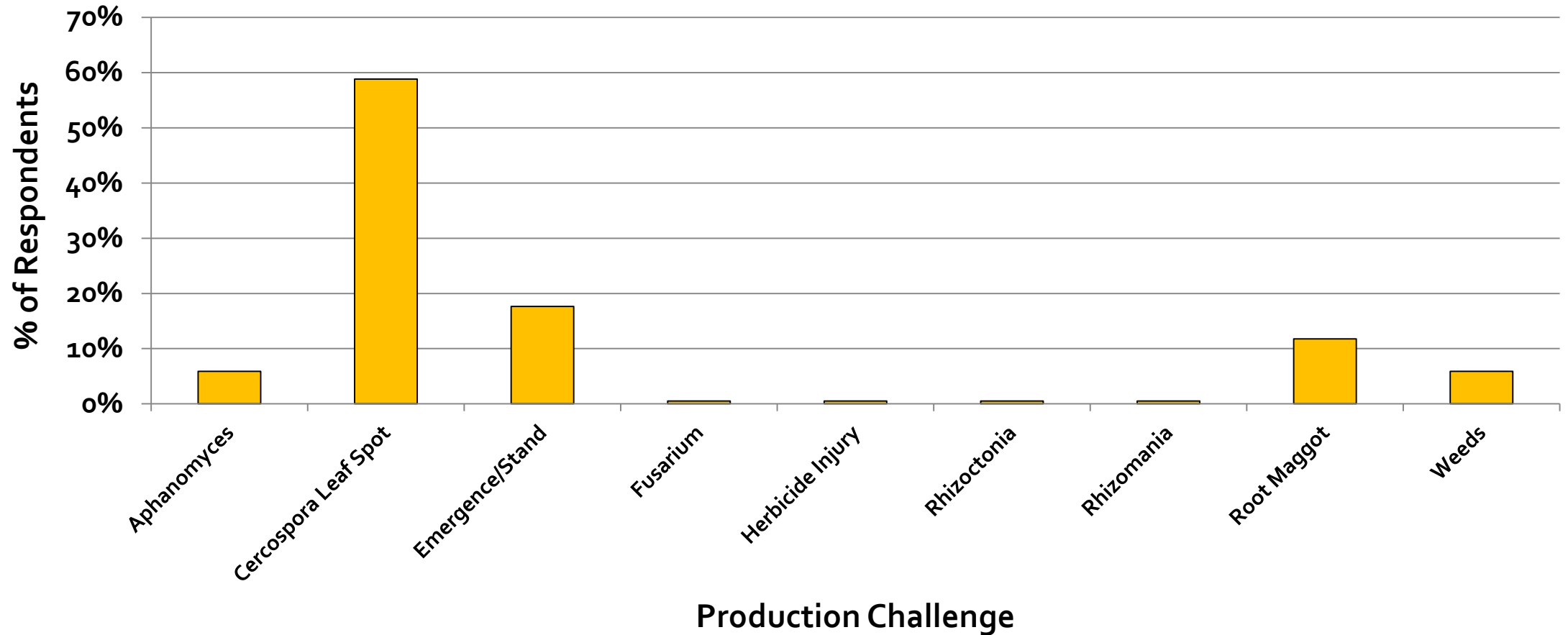
**North Dakota State University and  
University of Minnesota**

**NDSU**

EXTENSION

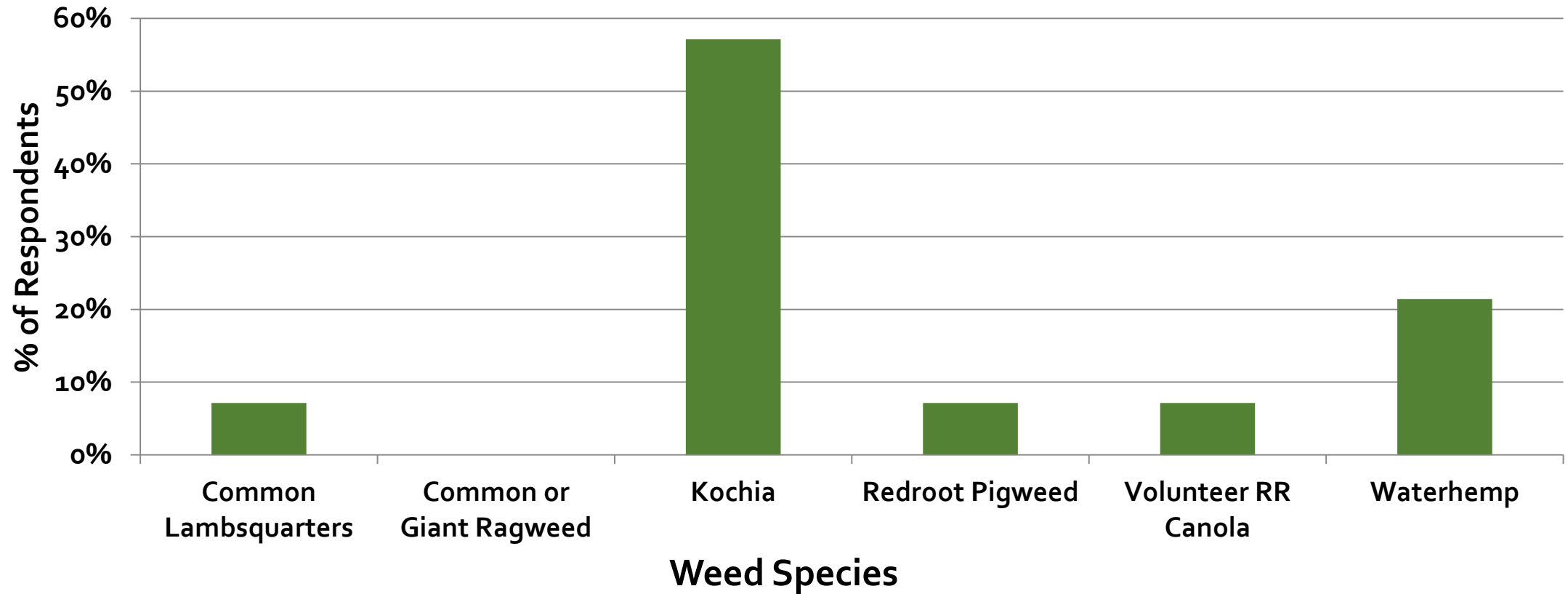
UNIVERSITY OF MINNESOTA  
**EXTENSION**

# What was your most serious production problem in 2021?<sup>a</sup>



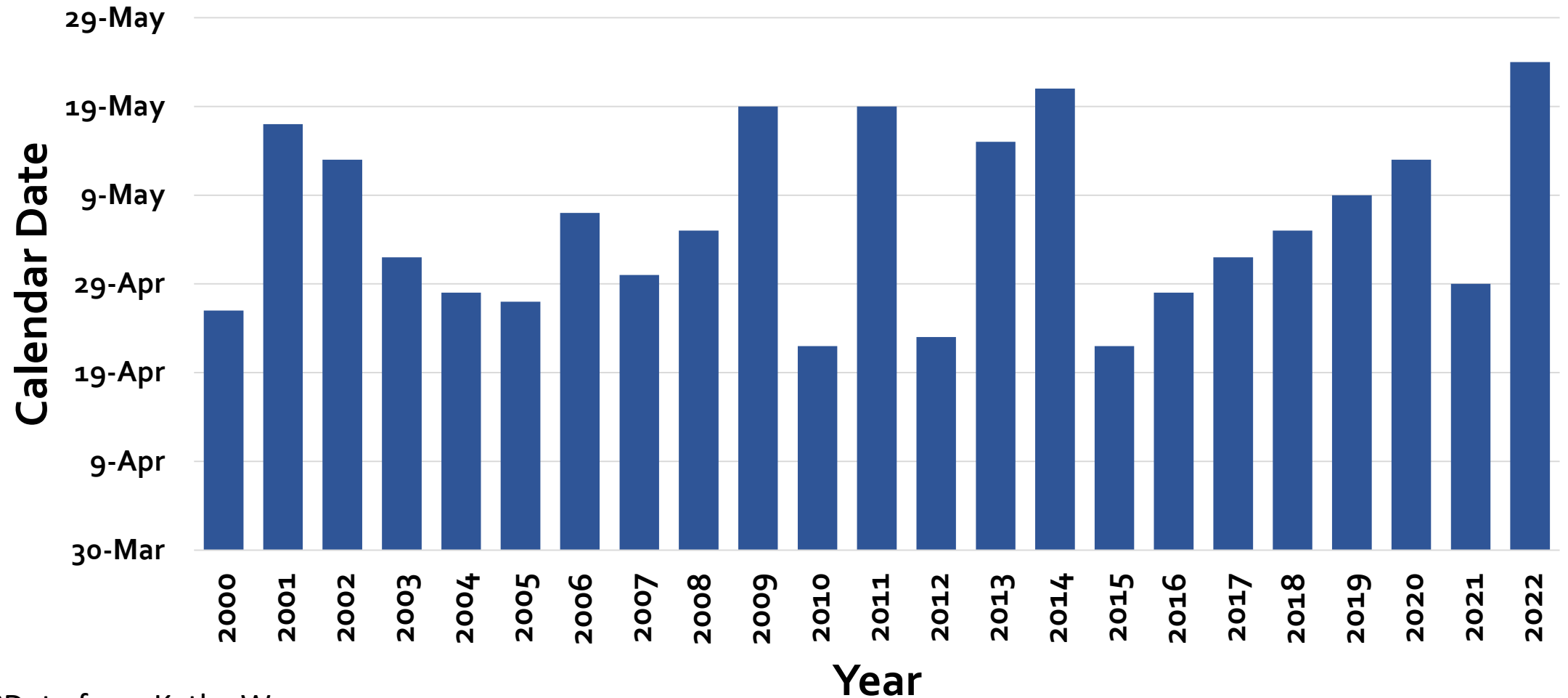
<sup>a</sup>Grafton Grower Seminar, February 17, 2022

# What was your troublesome weed problem in 2021?<sup>a</sup>



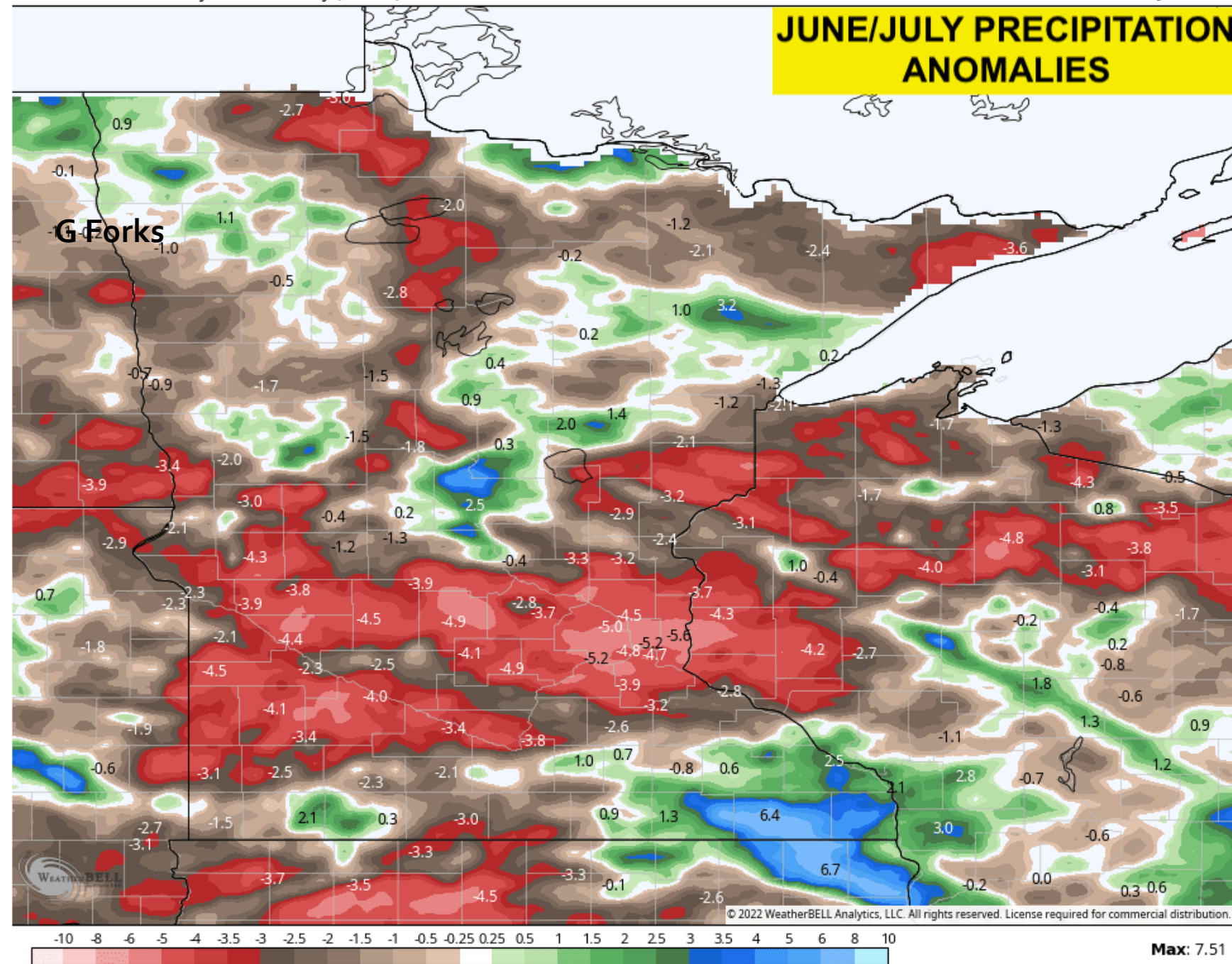
<sup>a</sup>Grafton Grower Seminar, February 17, 2022

# Average sugarbeet plant date, American Crystal Sugar Coop, 2000 to 2022.<sup>a</sup>



<sup>a</sup>Data from Kathy Wang



**JUNE/JULY PRECIPITATION  
ANOMALIES**



**DRY SOIL AND HIGH WINDS CAUSING FARMING PROBLEMS**

10:05  
50°  
  
VALLEY NEWS LIVE

**Valley News**  
Live

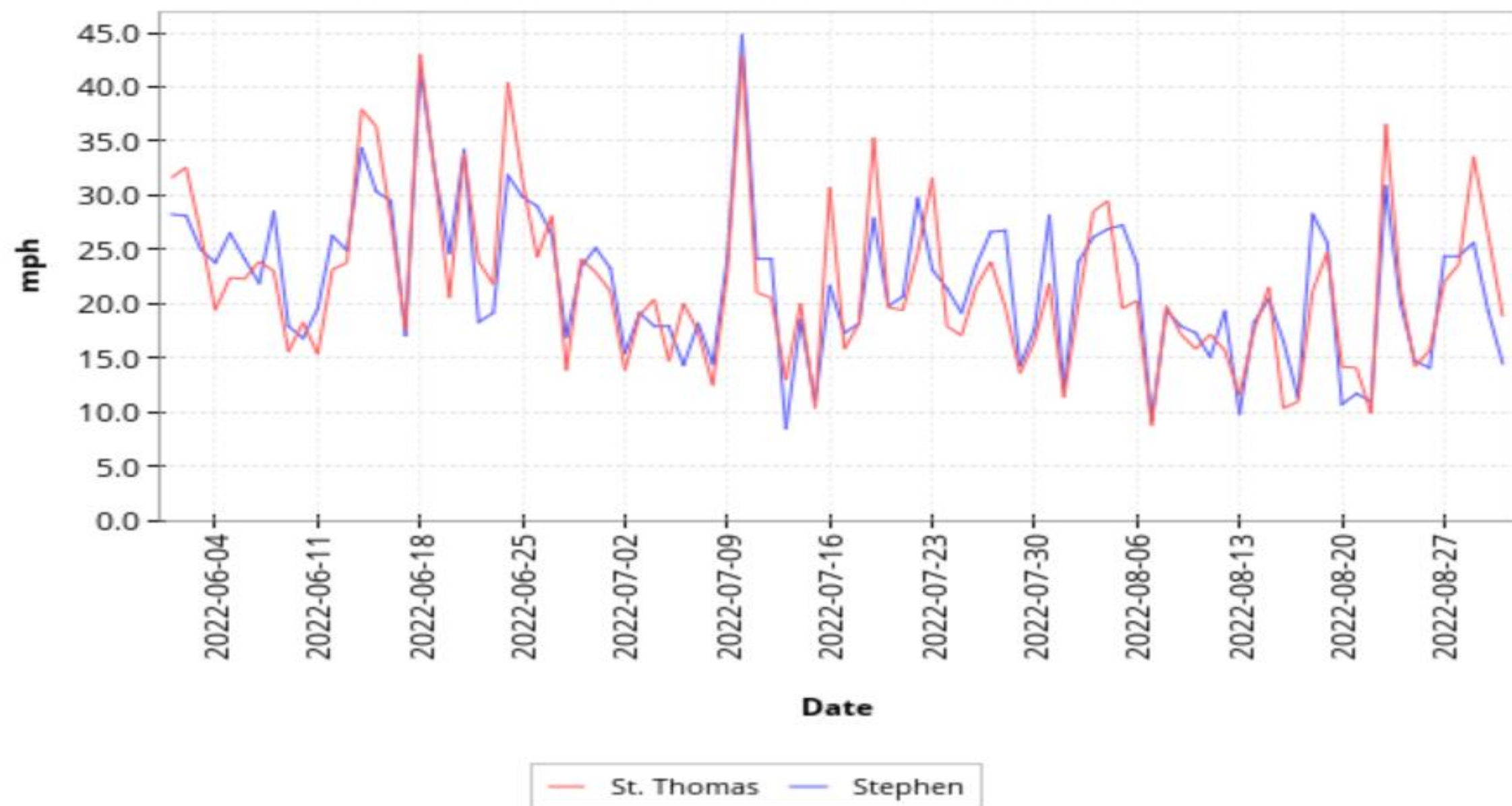
deaths.

**VNL Alert** | North Dakota: 69 new cases, 2 deaths with a 2.67% daily pos

# Daily Maximum Wind Speed

(2022-06-01 - 2022-08-31)

North Dakota Agricultural Weather Network (NDAWN)



# Presentation outline

- Nurse and cover crops to protect sugarbeet from wind and blowing soil
- Are PRE herbicides compatible with cover crops
- Kochia control
  - Sugarbeet
  - Small grains
  - Soybean
- Waterhemp control



# Spring-seeded wheat, Wilkin County, MN, 2015





# Seeding rate is over the board

## Catalogues vs. practical experience

Timing	Species	Purpose	Seeding rate
			lb acre
Spring	Barley	Wind/soil protect	15 (1/3 bu)
Spring	Oat	Wind/soil protect	16 (1/2 bu)
Spring	Wheat	Wind/soil protect	20 (1/3 bu)
Fall broadcast	Rye	Wind/soil protect	10-15
Fall seed in rows	Rye	Wind/soil protect	3-5

- Nurse crops are broadcast seeded, often with P and K fertilizer and incorporated
- Sugarbeet is often seeded immediately after tillage
- Nurse crops terminated at V<sub>2</sub>-V<sub>4</sub> stage







**We recommend terminating nurse crops when sugar beet reach 4-lvs, Peters et al., 2015, SBREB 46:34-40**

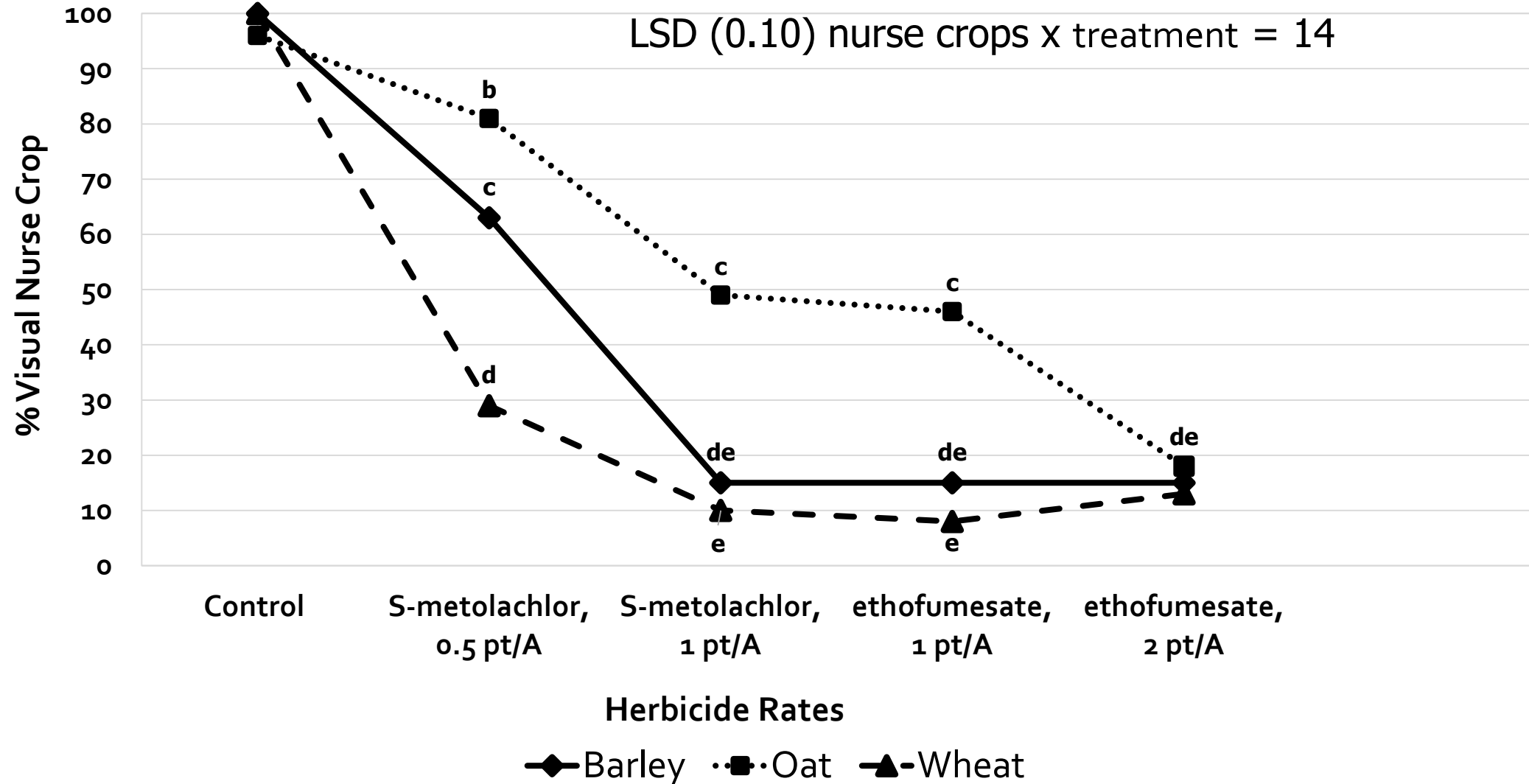
Sugarbeet stage at wheat termination (# of leaves)	Wheat height at termination (inch)	Root Yield (Ton/A)	Recoverable Sucrose (lb/A)
No cover crop	n/a	35.3 ab	11,051 ab
2	2	36.0 a	11,253 a
3	4	36.6 a	11,173 ab
4	6	35.5 ab	10,929 abc
5	8	33.8 b	10,373 c
6	10-12	34.0 b	10,644 bc
LSD (0.10)		1.6	542



# Waterhemp Control Program in Sugarbeet

Planting Date	Recommendation
<b>Sugarbeet plant in April or May</b>	PRE. Dual Magnum at 0.5 to 0.75 pt/A, ethofumesate at 2 to 6 pt/A or Dual Magnum at 0.5 pt/A plus ethofumesate at 2 pt/A
	Split lay-by application (early postemergence / postemergence). Chloroacetamide herbicides applied at 2-lf sugarbeet fb 6- to 8-lf sugarbeet
<b>June</b>	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
<b>July</b>	Electric Discharge Systems (WeedZapper™)
<b>August / September</b>	Hand remove waterhemp

# Barley, oat, and wheat ground cover in response to soil residual herbicides, 35 days after planting, Foxhome, MN, 2015



# Wheat and barley in response to herbicides, Crookston and Foxhome, 2014



Dual Magnum, 0.5 pt/A



ethofumesate, 2 pt/A



# Nurse crops or soil residual herbicides?

- Ethofumesate and/or Dual Magnum are our two most common soil residual herbicides applied PRE
  - Dual Magnum is taken up through the shoots of grasses
  - Ethofumesate is taken up through roots and shoots
  - Give nurse crops a head start by delaying PRE application
  - PREs need to rainfall incorporated for them to be activated
- 
- Its hard for nurse crops to co-exist for those of you using ethofumesate at 6 pt/A for kochia control





## Fall Seeded Cover Crops

- Seeding in strips configuration to protect against wind exposure and to reduce potential planter 'bounce' during sugarbeet planting
- Managing cover crop seeding rate has mitigated seeding depth issues





## Seeding sugarbeet between fall-seeded winter rye

- Tillage and fall applied fertilizer
- Planter is used to seed winter rye at approximately 5 lb/A
- Potentially can cultivate cover crops in rows longer before termination
- Stubble reduces potential for blowing soil



## Best Management Practices

- Cover crops need to be actively managed in the spring depending on conditions, especially if broadcast
- Some producers used Gramoxone to slow down growth of winter rye in 2022
- No concerns about using ethofumesate at 5 to 7 pt/A over fall seeded cover crops
- Need to learn more about tillage to incorporate etho / manage cover crop residue







## Terminating Cover Crops:

- Use glyphosate at full rates before broadcast cover crops reach 8-inch height (6-inch might be even better).
- Might be able to wait longer if cover crops are planted in rows.
- Environmental conditions will determine best timing for termination.



**Kochia**

# Kochia

**The Empire Strikes  
Back!**

Slide courtesy of Dr. Kirk Howatt



# Program objectives for kochia control

- Make GR kochia control a program priority.
- Redefine a program approach for GR kochia control in sugarbeet including kochia control in the crop sequence, especially soybean and wheat.
- Identify new herbicides, herbicide mixtures, or integrated weed management approaches for GR kochia control in sugarbeet.
- Determine if herbicides coupled with fall seeded cover crops improve kochia control.



# 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 and dicamba (SOA 4)
  - Triazines (5)
  - Glyphosate (SOA 9)
  - Multiple resistance in ND, 2+4, 2+9, 2+4+9



# Sugarbeet injury and kochia control from herbicide treatments, Barney, ND, 2015

		Sgbt injury		Kochia control		
Treatment <sup>1</sup>	Rate	12 DAC	20 DAC	12 DAC	41 DAC	69 DAC
	pt or fl oz/A	------(%)-----		------(%)-----		
PMax <sup>2</sup> / PMax / PMax	28 / 28 / 22	9	0	65 cd	78 bcd	75 bc
PMax+Etho / PMax+Etho / PMax+Etho	28+4 / 28+4 / 22+4	3	10	58 d	75 cd	70 c
Etho / PMax+Etho / PMax+Etho / PMax+Etho	7 pt/28+4 / 28+4 / 22+4	9	5	85 ab	73 cd	70 c
Etho / Etho+Bmix+UpB / PMax/ PMax / PMax	7 pt/12+10+1 / 28 / 28 / 22	11	10	91 a	88 ab	85 ab
	LSD (0.10)	NS	NS	9	11	10

<sup>1</sup>Roundup PowerMax only treatments contained Prefer 90 NIS at 0.25% v/v plus N-Pak AMS at 2.5% v/v. All other treatments contained Destiny HC at 1.5 pt/A plus N-Pak AMS at 2.5% v/v.

<sup>2</sup>PMax = Roundup PowerMax, etho = ethofumesate, Bmix = Betamix, and UpB = UpBeet

# Kochia control herbicide from potential candidates in sugarbeet

- Ultra Blazer
- Phenmedipham (Spin-Aid, Betanal, 'Blue Can')
- Rinskor
- Glufosinate and dicamba applied over Truvera™ sugarbeet

# Kochia control from Ultra Blazer, 42 DAP and 18 DAAC, greenhouse, 2022

Treatment	Rate	1-inch	2-inch	4-inch
	fl oz/A	%	%	%
Ultra Blazer	16	73 b	59 cd	28 e
Ultra Blazer + NIS	16 + 0.25%	92 a	89 a	30 e
PowerMax + NIS +AMS	28 + 0.25% + 2.5%	99 a	99 a	68 bc
Ultra Blazer + PowerMax + NIS +AMS	16 + 28 + 0.25% + 2.5%	99 a	99 a	53 d
	LSD (0.10)	-----13-----		





2-inch kochia

UB+PM+NIS+AMS

control

Ultra Blazer

UB + NIS

PM+NIS+AMS



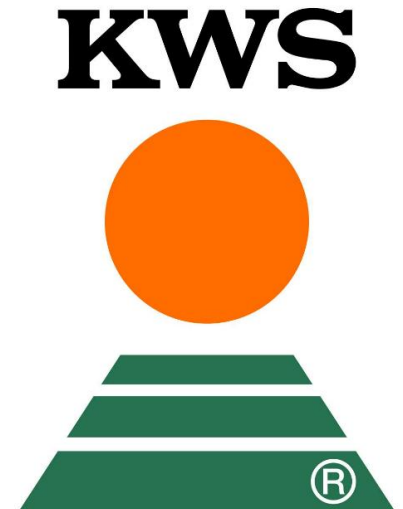
4-inch kochia





# Dicamba and glufosinate compliment sugarbeet herbicides

- Ethofumesate PRE requires significant rainfall to activate
  - Our producers are incorporating etho to improve early season waterhemp control
  - Sometimes they incorporate etho too deep
  - We certainly don't need the extra tillage
  - Cover and nurse crops potentially are in conflict with PRE herbicides
- Glufosinate provides consistent waterhemp control
  - Spray weeds less than 3-inch tall
  - Spray when sunny, humid, and two hours after sunrise
  - Concerns over 30 fl oz/A Liberty rate use rate





Images: July 20, 2021  
Manvel, ND

STD

Nortron 6 pt/A / PM / PM



STD

PowerMax / PowerMax



8

ExtendiMax / Liberty

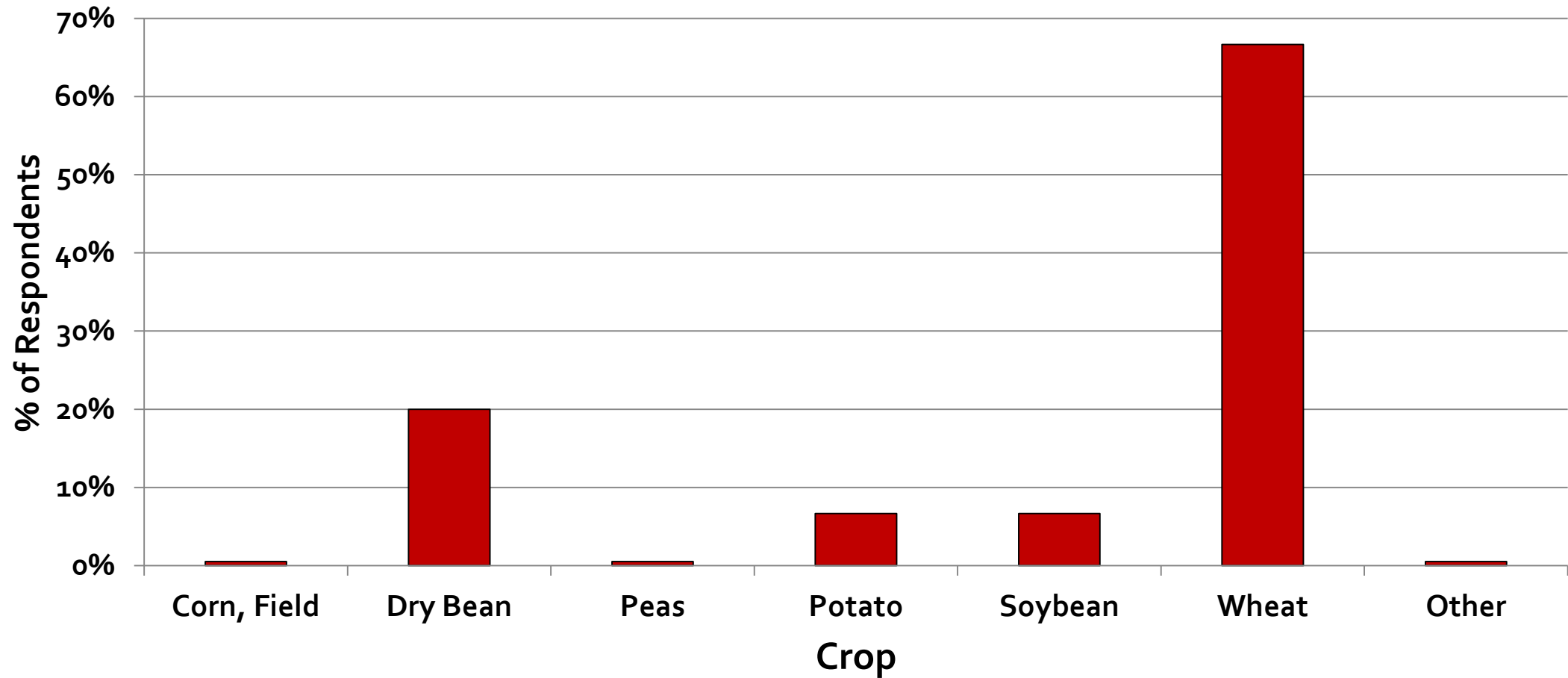


6

EM + PM / EM + PM



# What crop preceded most of your sugarbeet acres in 2021?<sup>a</sup>



<sup>a</sup>Grafton Grower Seminar, February 17, 2022

# Kochia control in the cropping sequence

## corn/wheat>soybean/dry bean>wheat>sugarbeet rotation

### **Soybean**

- Flumioxazin/metribuzin combination, e.g. Valor/Panther + metribuzin, Fierce MTZ, etc.
- POST application of Liberty, dicamba, or Flexstar (1 or 2 apps as needed/appropriate) depending on the soybean trait.
- Dicamba PRE.

### **Soybean Postharvest**

- Flumioxazin 3 oz late fall prior to freeze-up. Advise not to till after Valor application.
- Seed wheat direct in the spring.

### **Wheat**

- 2 oz ai fluroxypyr where possible. 1.5 oz ai is cut rate, less than 4" kochia.
- Kochiavore or Cleansweep D (products with at least 2 modes of action).
- Check the 2023 ND Weed Control Guide for additional products.

### **Postharvest wheat**

- Tillage or Gramoxone to control kochia escapes.

## Sample F



UNT

Glyph  
1X

Glyph  
2X

Starane  
1X

Starane  
2X

Dicamba  
1X

Dicamba  
2X

Slide courtesy of Dr. Brian Jenks

## How do we proceed?

- Not every kochia plant/population is resistant.
- Need to be vigilant in scouting after application.
- Scout fields 5-7 DAT. Should have dead plants at 7 DAT.
- Continue to use residual herbicides.
- Use metribuzin where possible.
- Use multiple effective modes of action where possible.
- One recommendation/recipe does not fit every grower or field

# Kochia control in herbicide tolerant soybean, Carrington and Minot, 2020.<sup>a</sup>

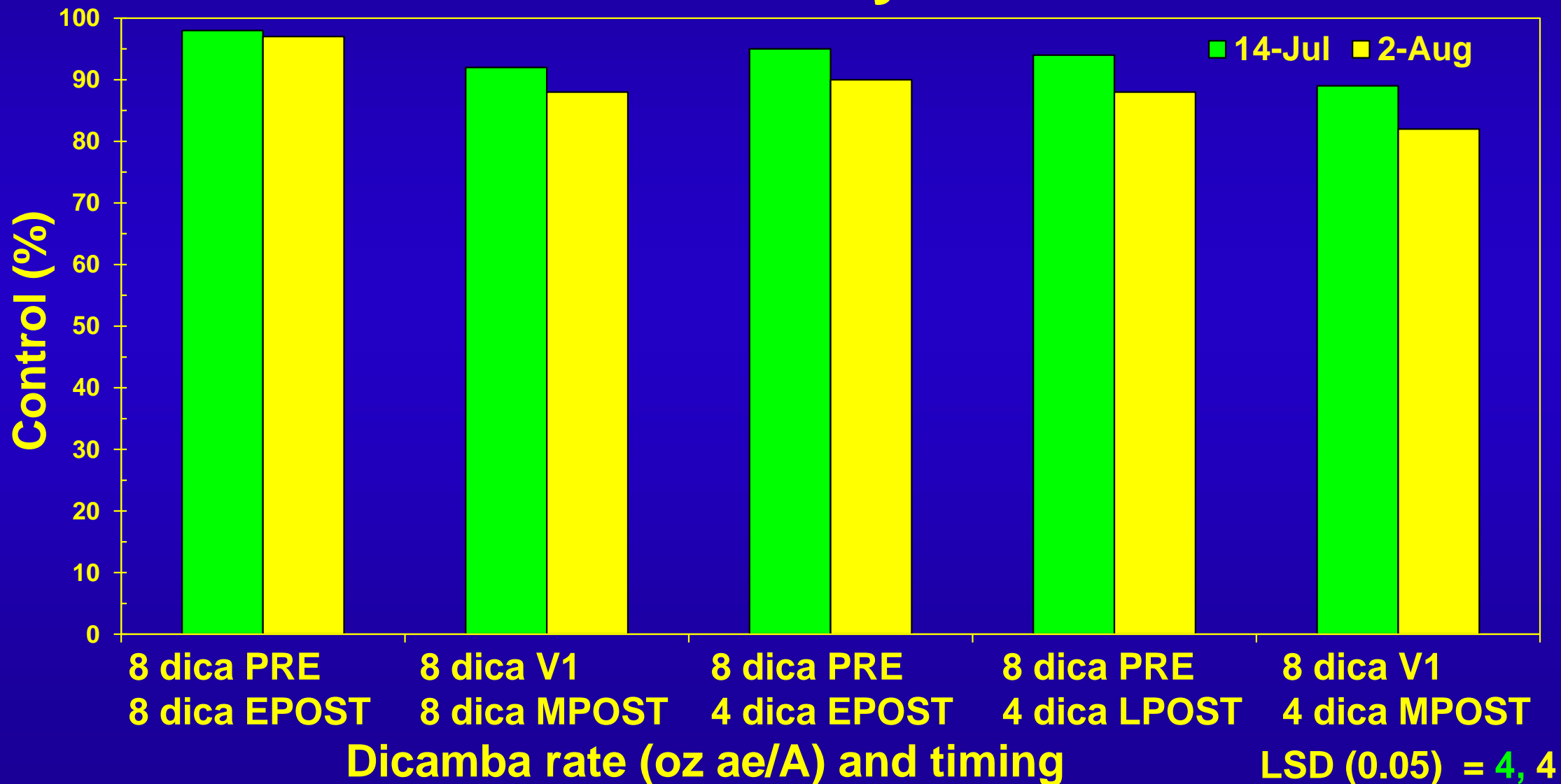
Treatment	Rate	7 DAT	7 DAT	14 DAT	28 DAT
	oz/A	< 2-inch	> 2-inch	all	all
Liberty	32	<b>97</b>	<b>98</b>	<b>90</b>	85
Roundup PM	28	79	78	74	60
Liberty + Roundup PM	32 + 28	<b>97</b>	<b>99</b>	<b>92</b>	89
Liberty + Enlist Duo	32 + 4.75 pt	<b>96</b>	<b>99</b>	<b>91</b>	88
Liberty + Enlist One	32 + 2 pt	<b>91</b>	<b>99</b>	85	78
Enlist Duo	4.75 pt	70	60	68	61
Enlist One	2 pt	16	3	0	0
LSD (0.05)		6	4	6	10

<sup>a</sup>all treatments contain AMS at 3 lb/A

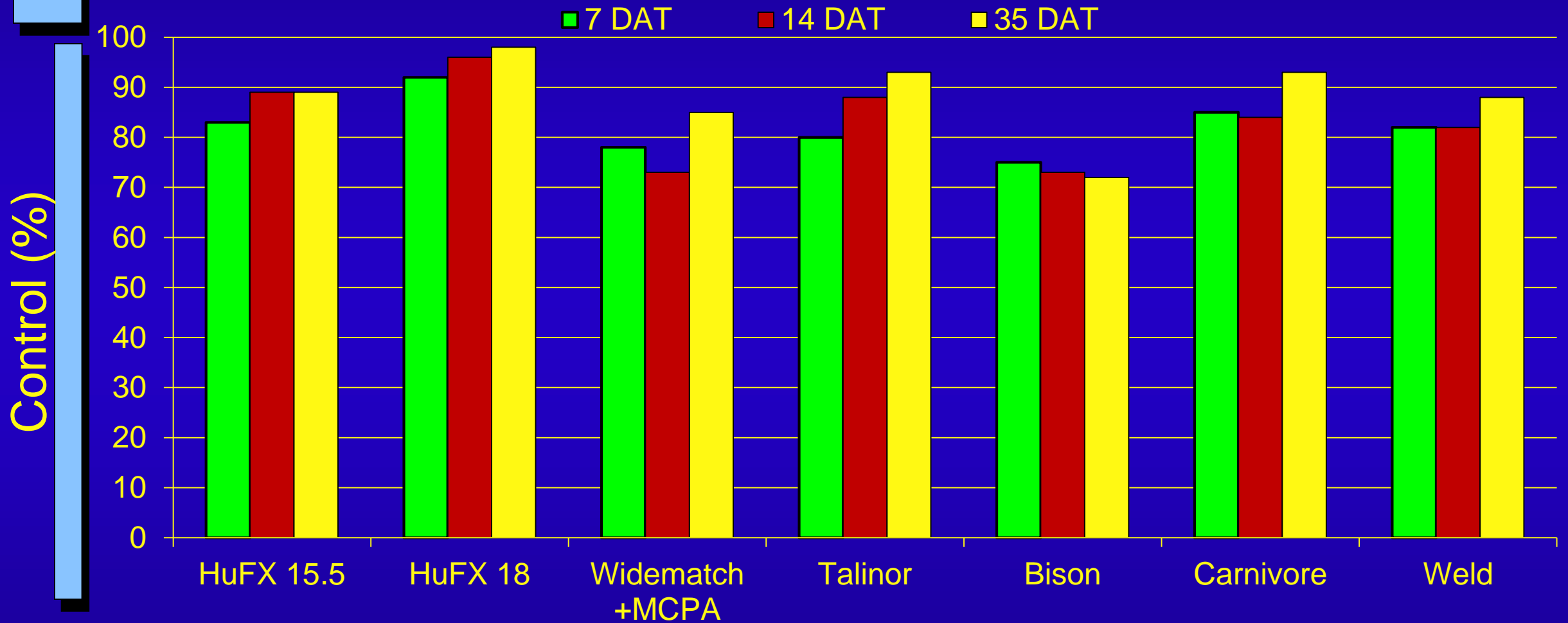
Slide courtesy of Dr. Mike Oslie

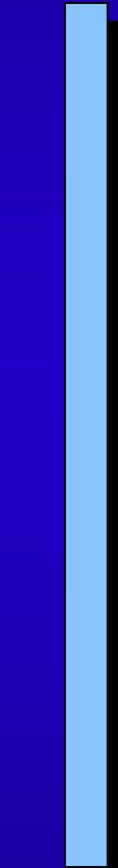


# Timing is important for dicamba control of kochia in no-till Xtend soybean

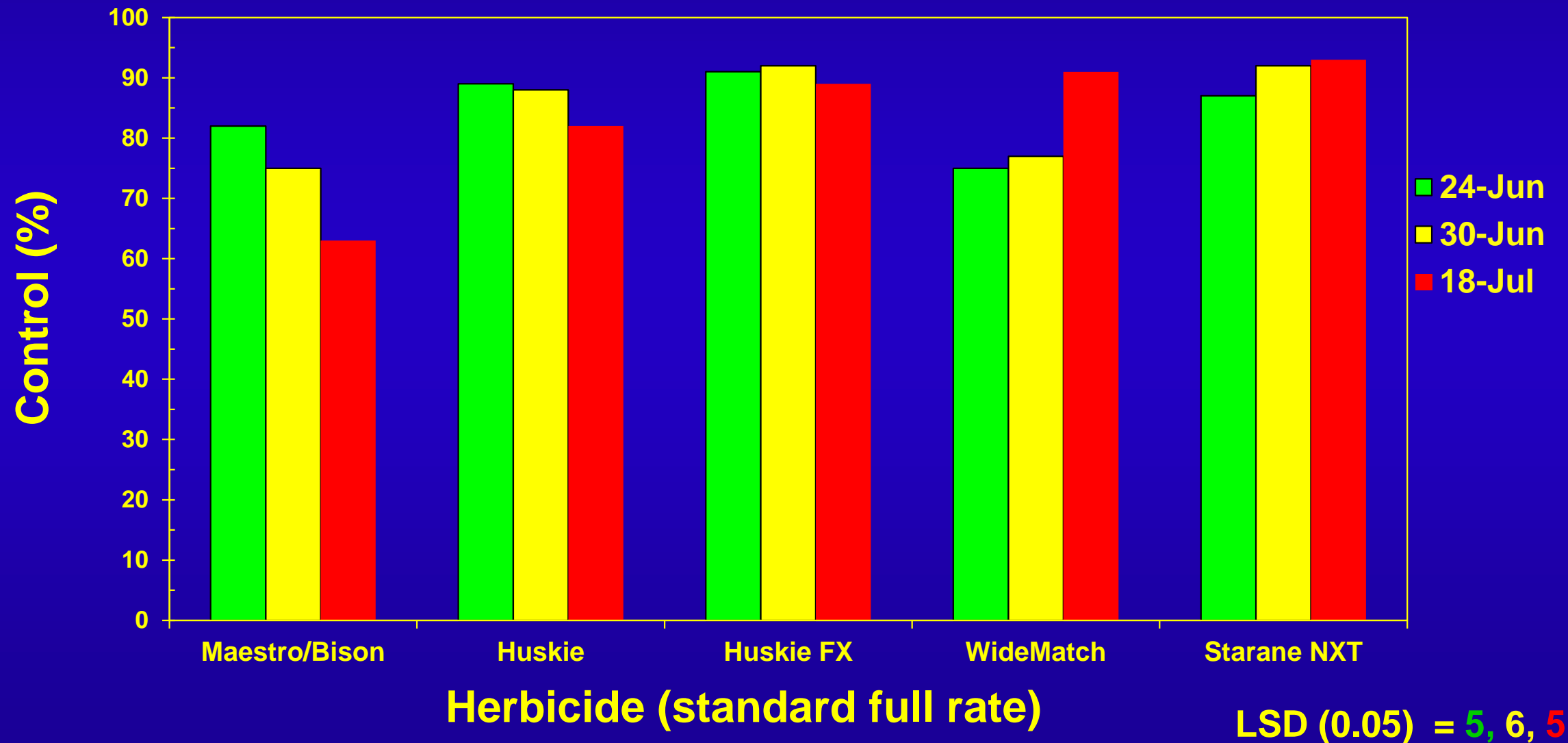


# Kochia Control (from 2021)

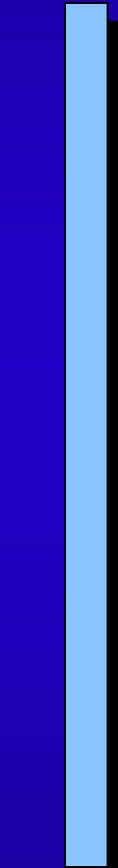




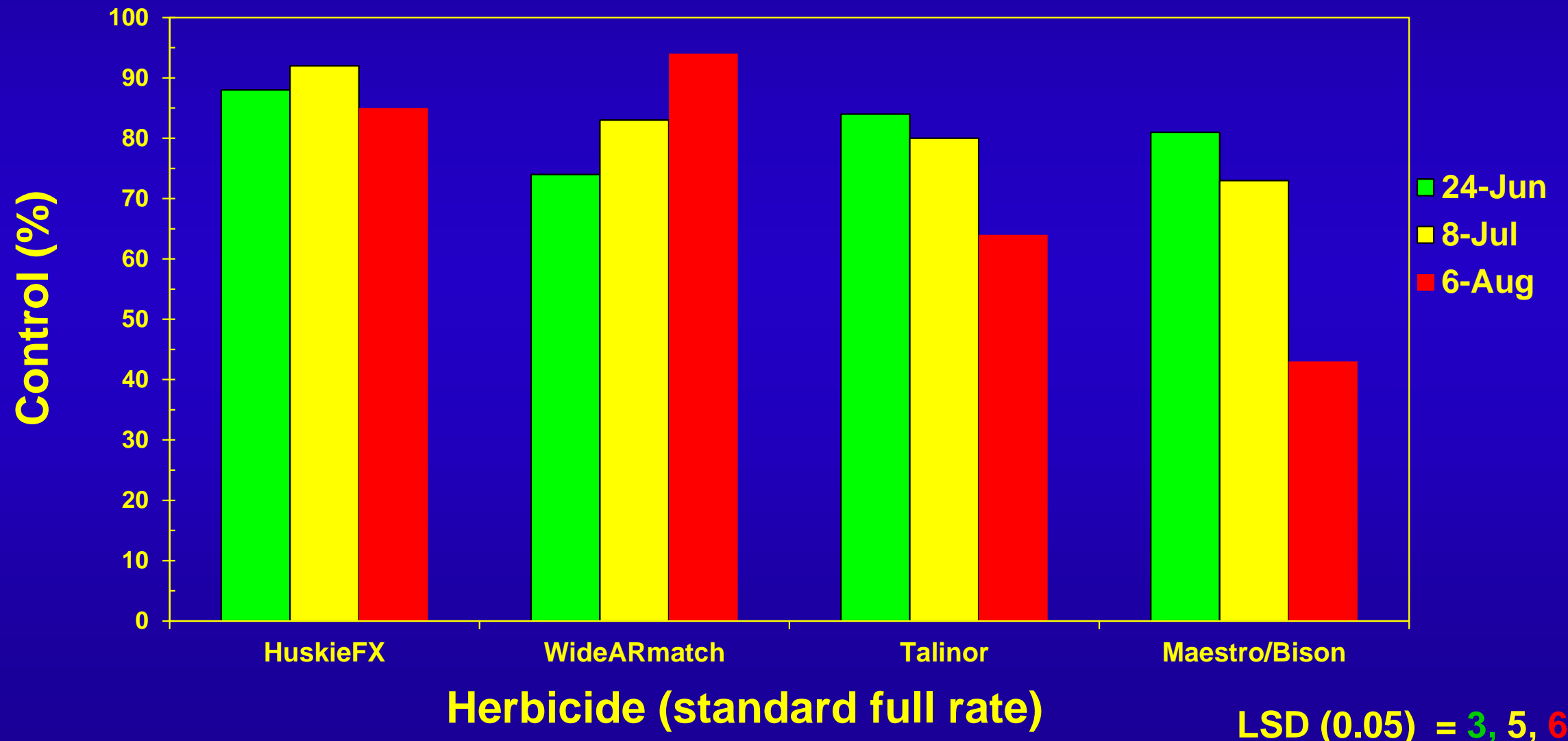
# Kochia Control for Wheat



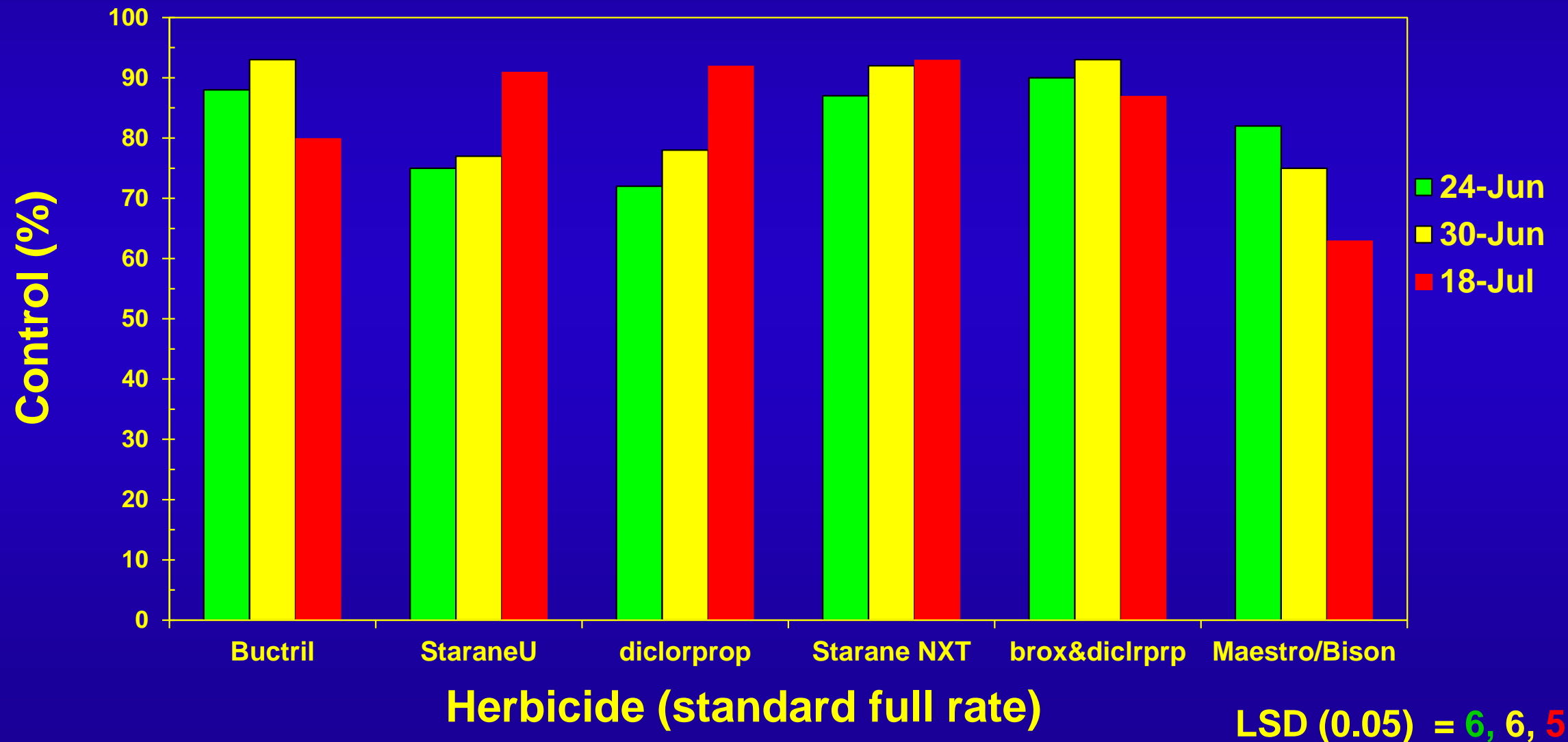




# Kochia Control for Wheat



# Kochia Control for Wheat in Development





# Huskie FX

15.5 fl oz/A



18 fl oz/A





# WideMatch/Weld

Slide courtesy of Dr. Kirk Howatt



# Bison



# Talinor





# Group 14 resistant kochia biotypes collected from multiple western ND locations

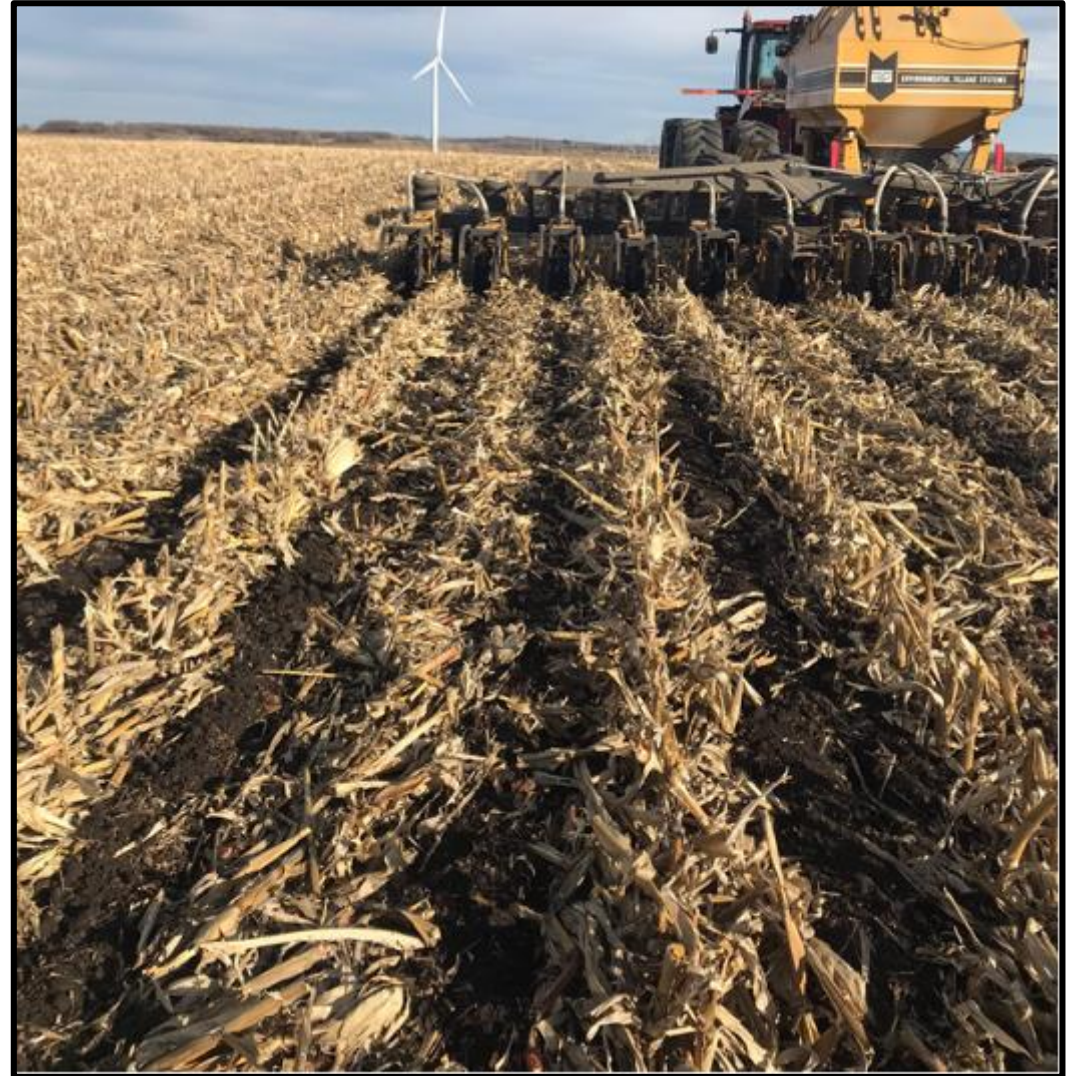
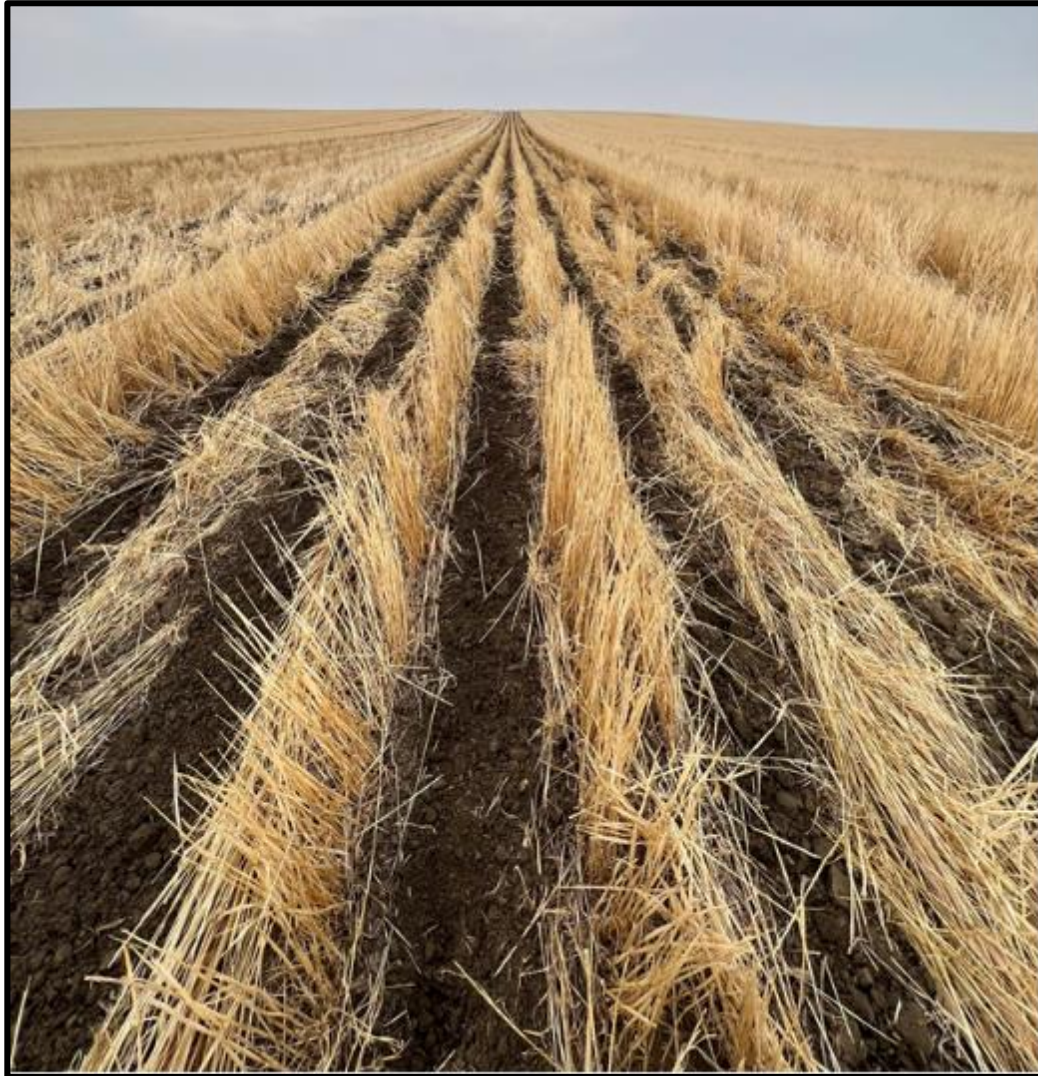
- Sharpen at 1 and 2 fl oz/A with AMS and MSO
- 13 DAT
- Kochia at 2 to 2.5-inch

Slide and research from  
Brian Jenks, Minot





# Some growers have purchased strip-tillers





# Strip-Tillage may create weed shifts

- Strips are made in the fall and freshened in the spring before plant.
- Weather conditions will dictate if one plants before or after tillage to 'freshen' strips.
- We observed winter annual and early emerging summer annual weed escapes in 2022.
- Weeds (kochia) were not controlled by tillage and got too big before glyphosate application.
- Strongly recommend Gramoxone after planting and before sugarbeet emergence to control early-emerging weeds.

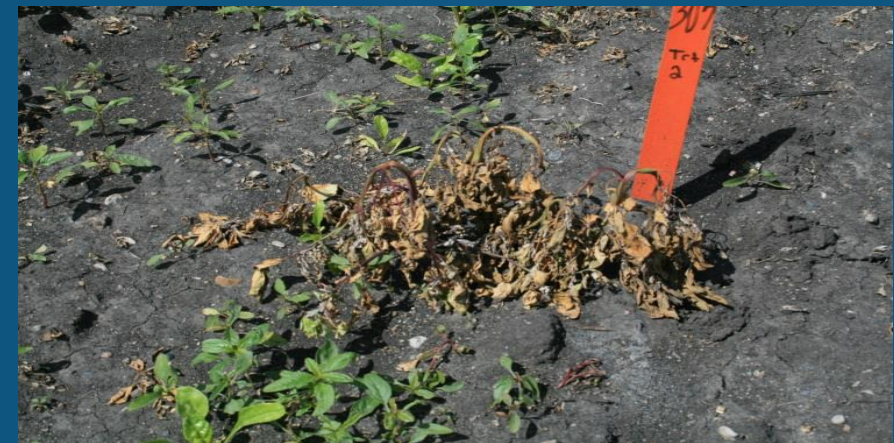
Courtesy of Aaron Hoppe



**Waterhemp**



# Repeat Roundup PM + NIS + AMS applications, Herman MN, 2014





# Does PowerMax control waterhemp in Grant and Kandiyohi Counties, MN?

Treatment	Rate	Herman, 2014	Lake Lillian, 2017	Lake Lillian, 2017
	fl oz/A	-----Count/m2-----		
Roundup PowerMax	28	101	192	116
Control	0	432	727	792



Control plot, Jun 6



PowerMax at 1.10 kg/ha

Number of waterhemp per meter square, June 6, 2017, Lake Lillian, MN

YES. 77% control at Herman and 76% control at Lake Lillian

Increasing the rate or repeat applications does not improve control



# Repeat Roundup PM + NIS + AMS applications, Herman MN, 2014





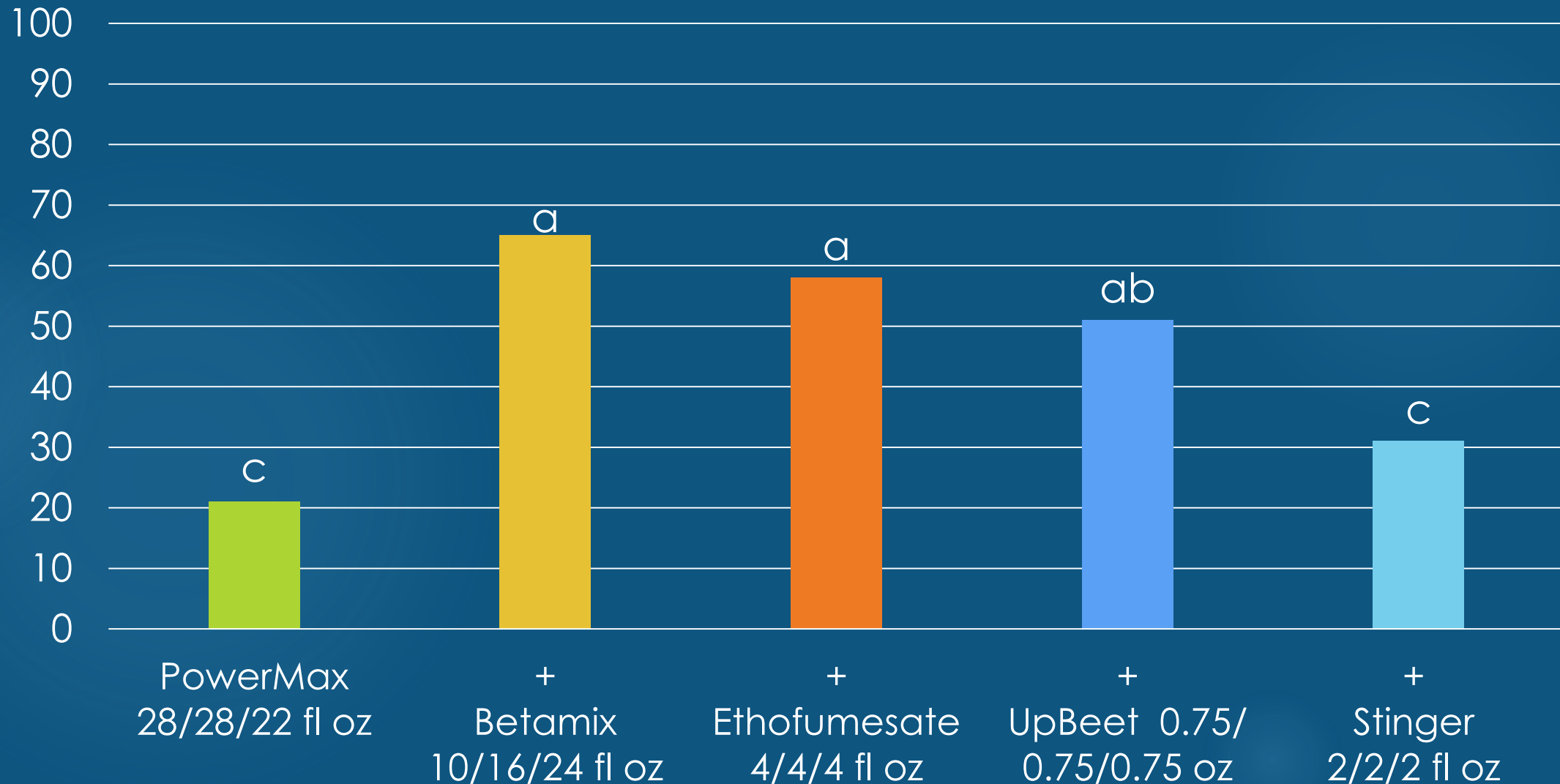
# Repeat Roundup PM + NIS + AMS applications, Herman MN, 2014





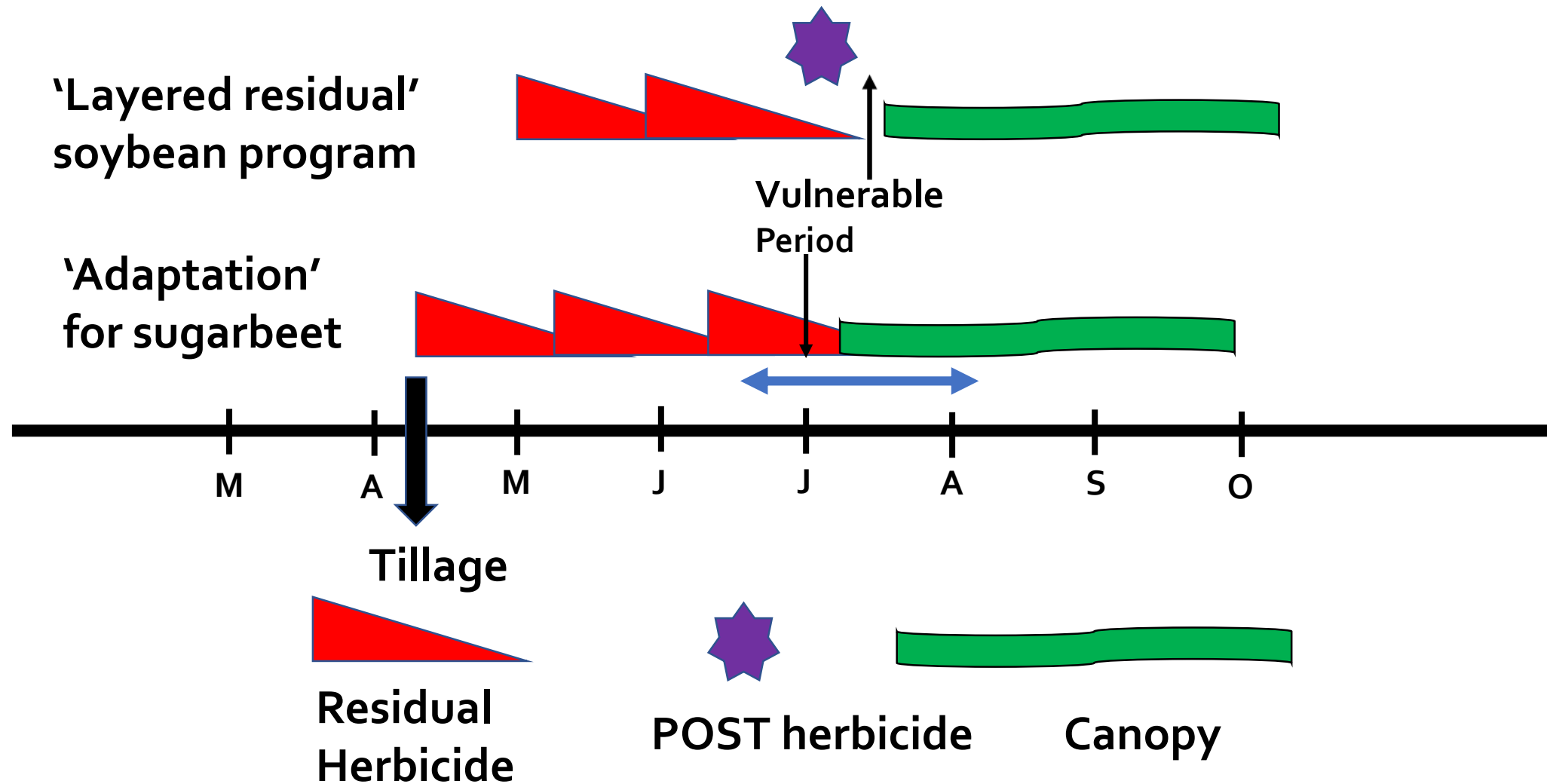
# RESULTS - Postemergence

Waterhemp Control – Aug. 27, 2014



# Layered Residual Herbicides

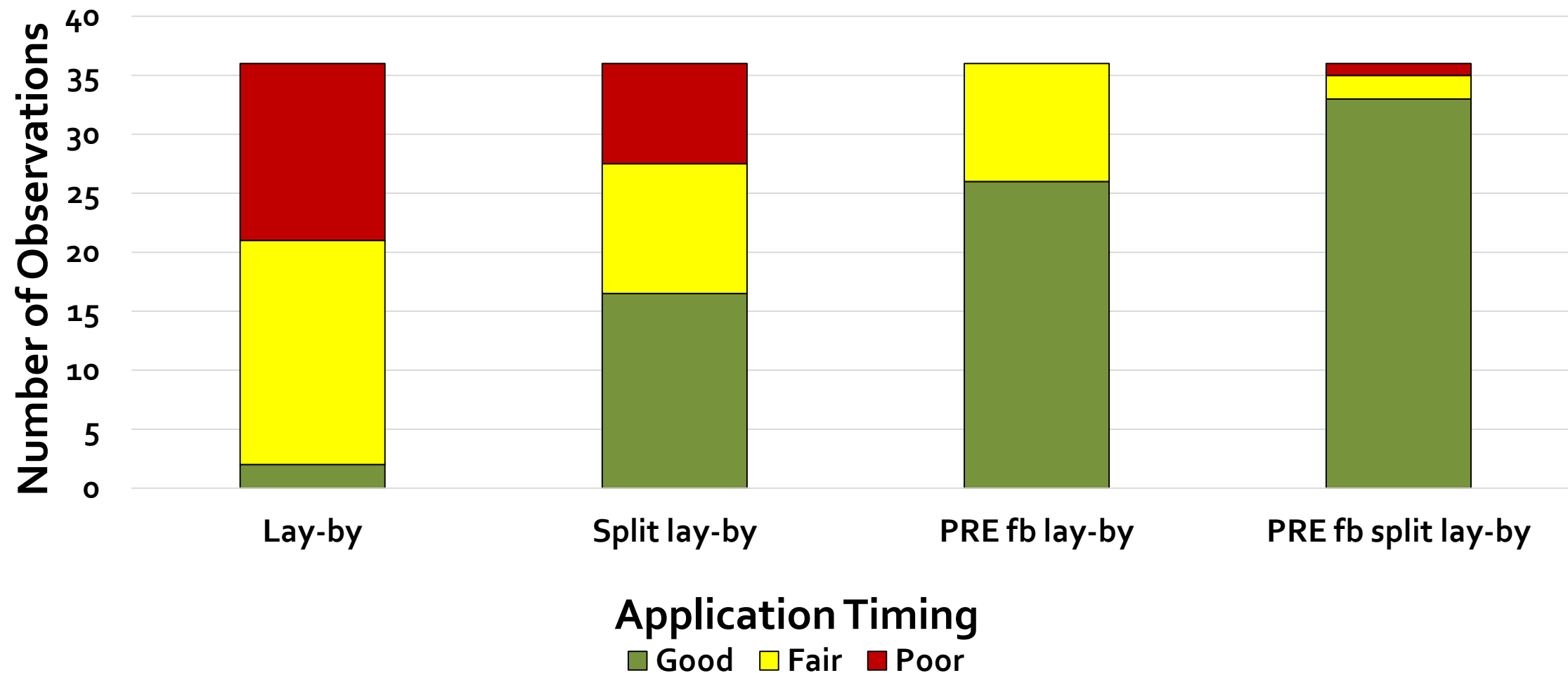
Objective: Prolong PRE activity until canopy fills



Adapted from a slide created by B Hartzler, ISU

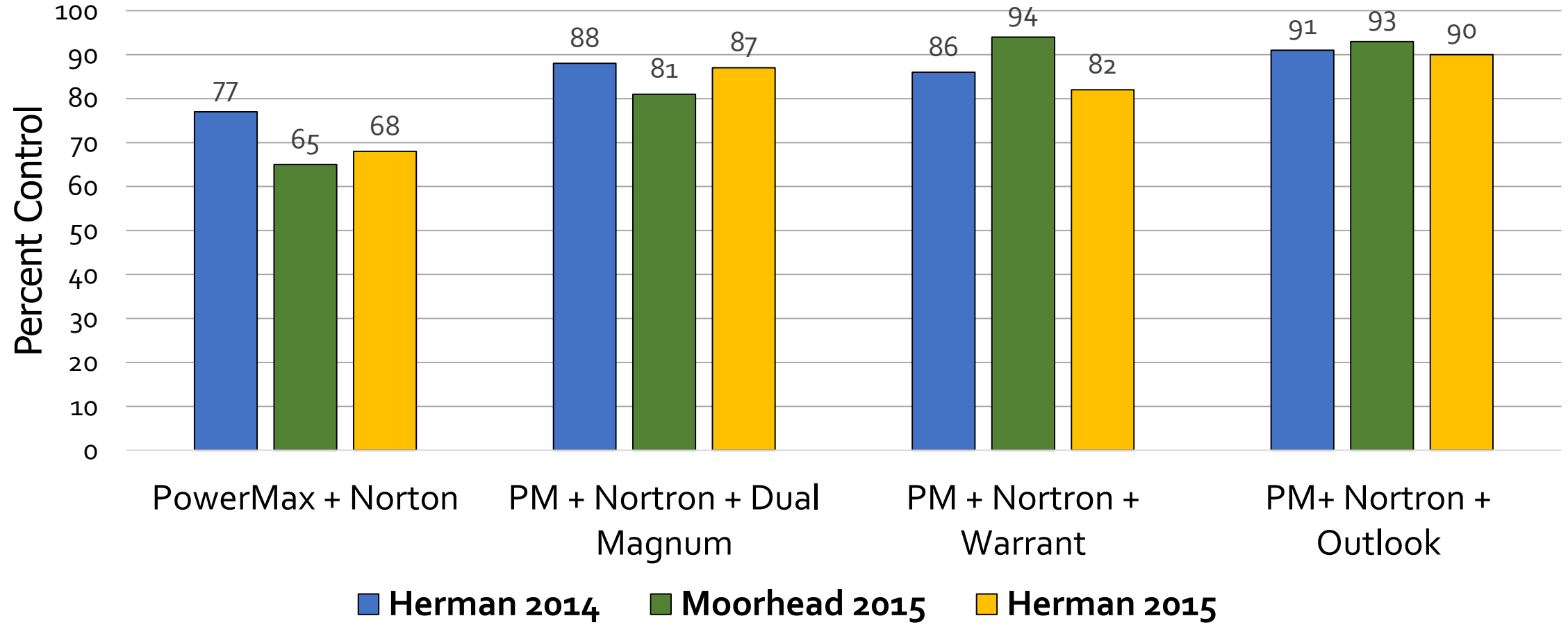


# Waterhemp control across application timing, summed across herbicides, locations and years<sup>a</sup>



<sup>a</sup>2014, 2015 and 2016 field experiments in MN and ND

# 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

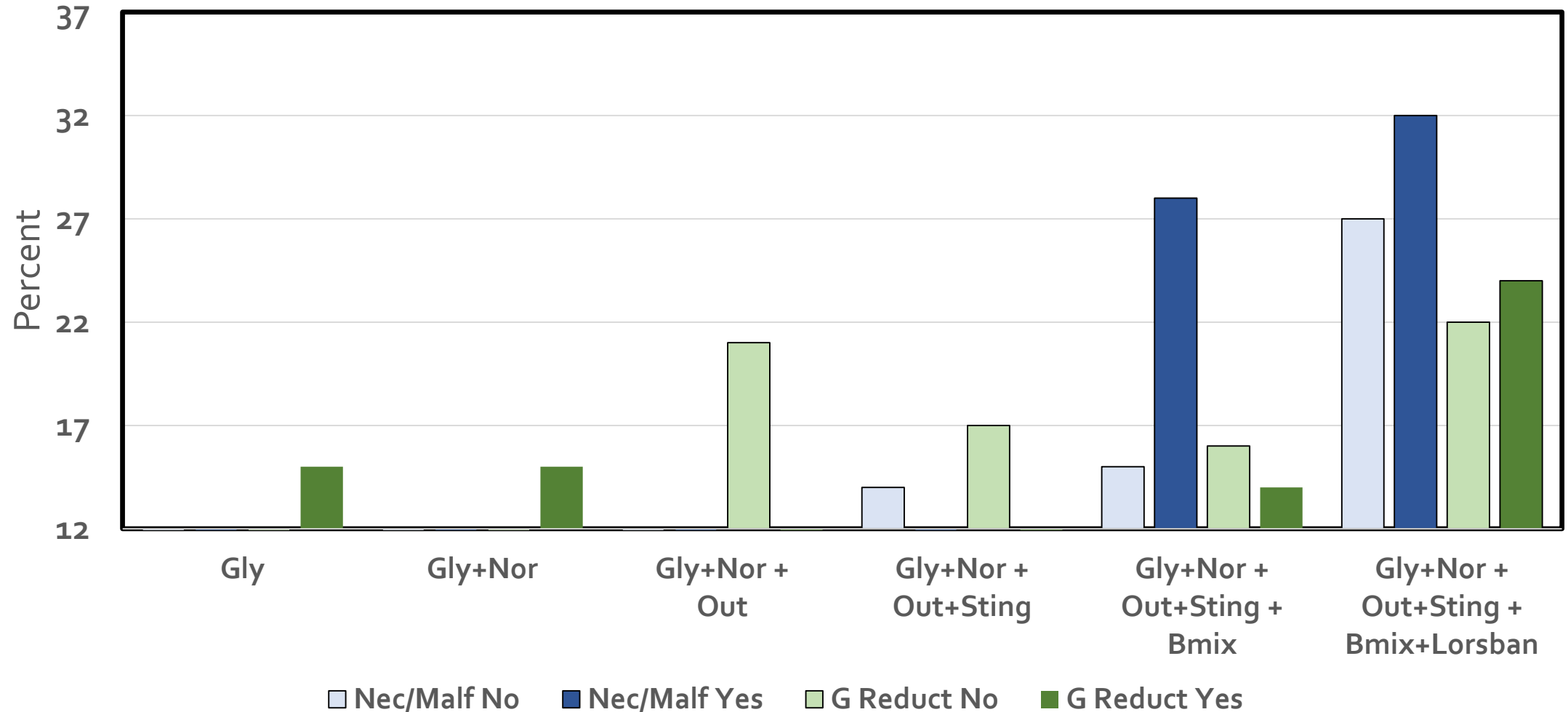


# Question. Can I tank-mix glyphosate + etho and lay-by with.....

- Stinger and Betamix?
- What about Asana or Mustang Max (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



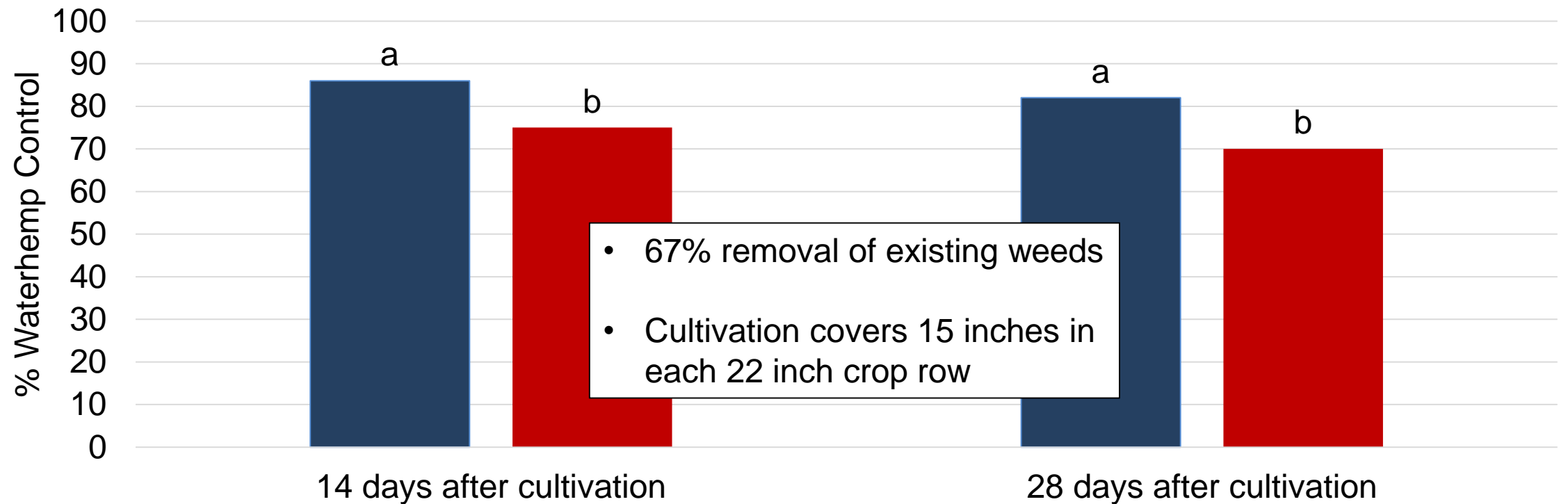




Schmoll Farms  
Lake Lillian, MN



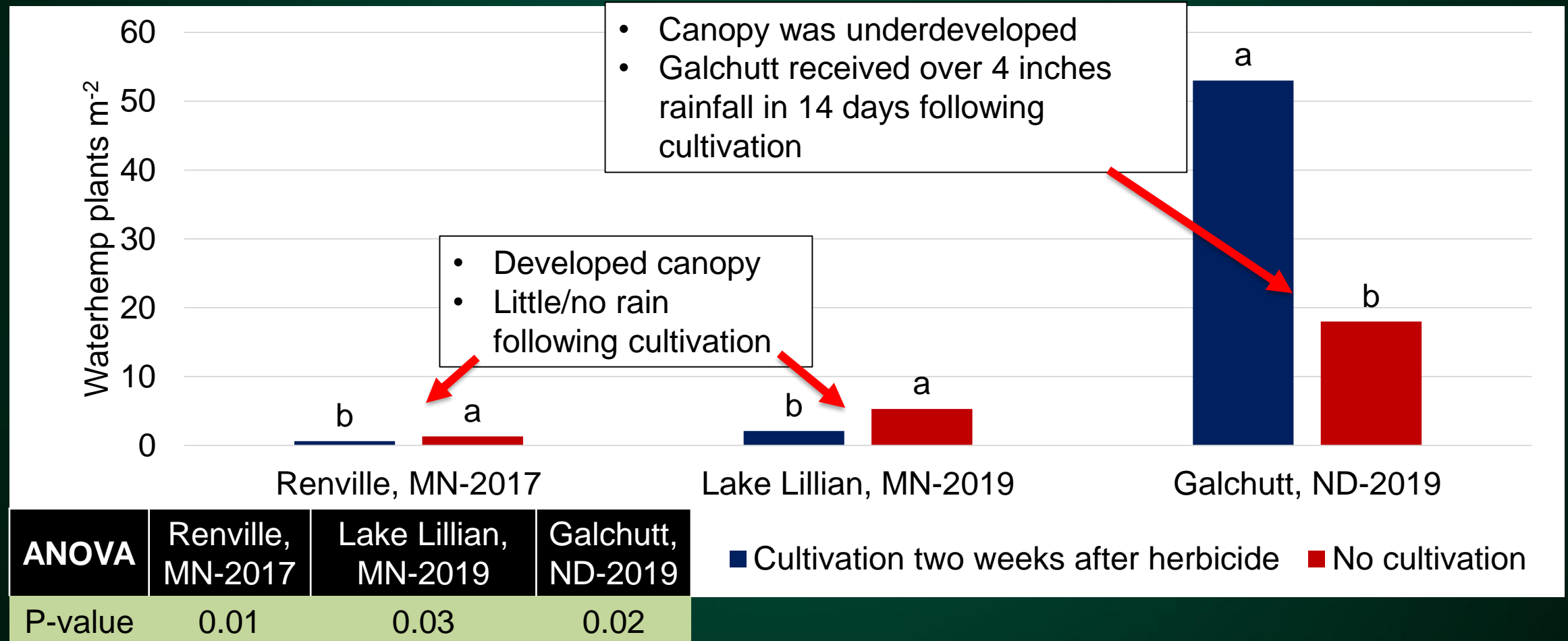
# Cultivation two weeks after POST spray improved waterhemp control 11-12% across four environments



ANOVA	14 DAT	28 DAT
P-value	0.038	0.030

■ Cultivation two weeks after herbicide ■ No cultivation


# Delayed cultivation significantly increased waterhemp density 28 DAT in Galchutt, ND-2019





# Thank you for your attention and your continued support

Tom Peters

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