

Weed Control in Sugarbeet Grand Forks

Tom Peters

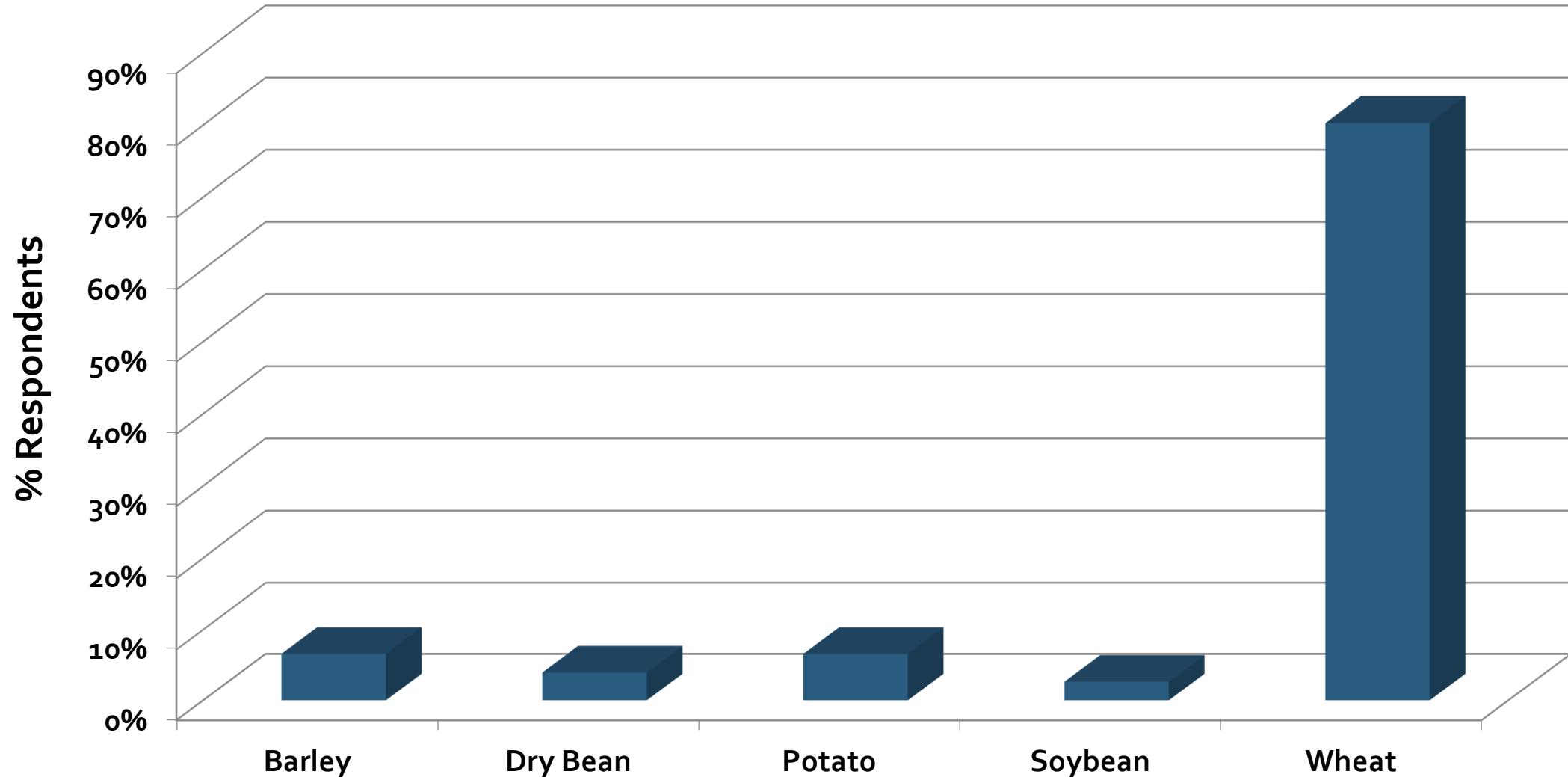
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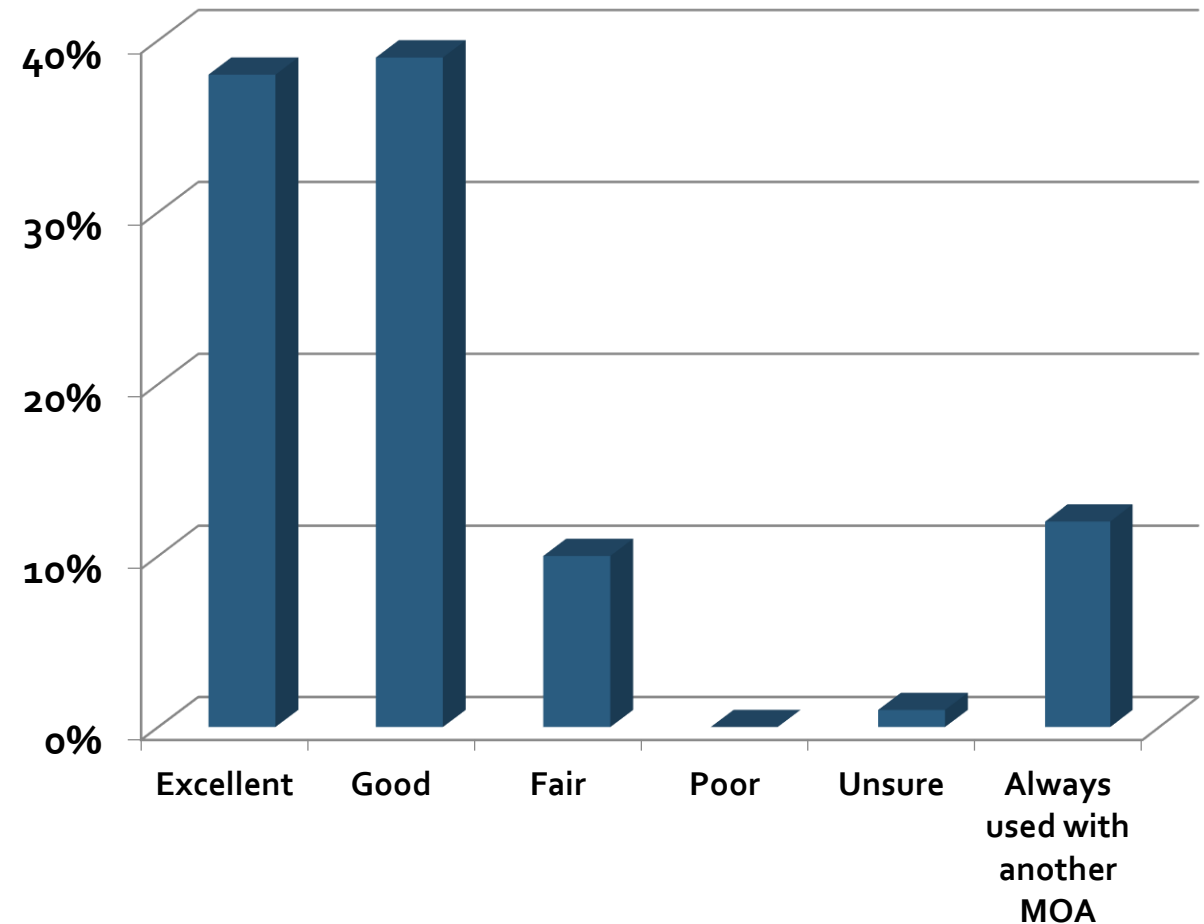
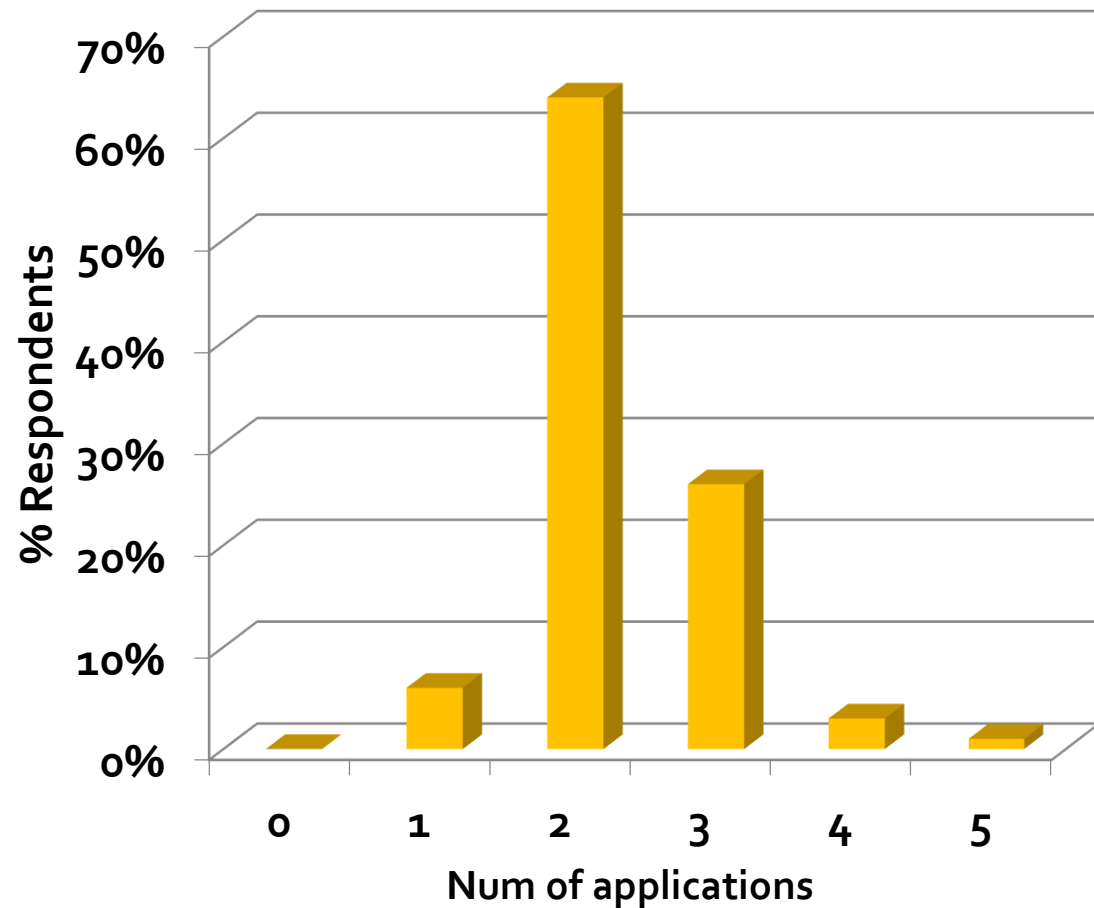
What crop preceded most of your sugarbeet acres¹?



¹Turning Point Survey of Growers; conducted at the 2018 Sugarbeet Growers Seminar, Grand Forks



How many glyphosate applications did you use in 2017? How did it work?



Glyphosate alone, glyphosate in tank-mixes¹

	Central Minnesota	RR Valley South	RR Valley Central	RR Valley North
	-----% of survey respondents-----			
Glyphosate	9	23	34	79
Glyphosate + soil residual herbicide applied POST	77	47	11	0
Glyphosate + POST broadleaf herbicide	9	23	53	17
Glyphosate + POST grass herbicide	5	7	2	4
Broadleaf Tank-mix	86	70	64	17

¹Turning Point Survey of Growers; conducted at the 2018 Sugarbeet Grower Seminars

Wild oat and green foxtail resistance testing

Table is number of resistant populations

Wild oat (27 samples)*

Puma: 23
Axial: 14
Assure II: 21
Select: 0

Everest: 26
GoldSky: 27
Varro: 27
Raptor: 12

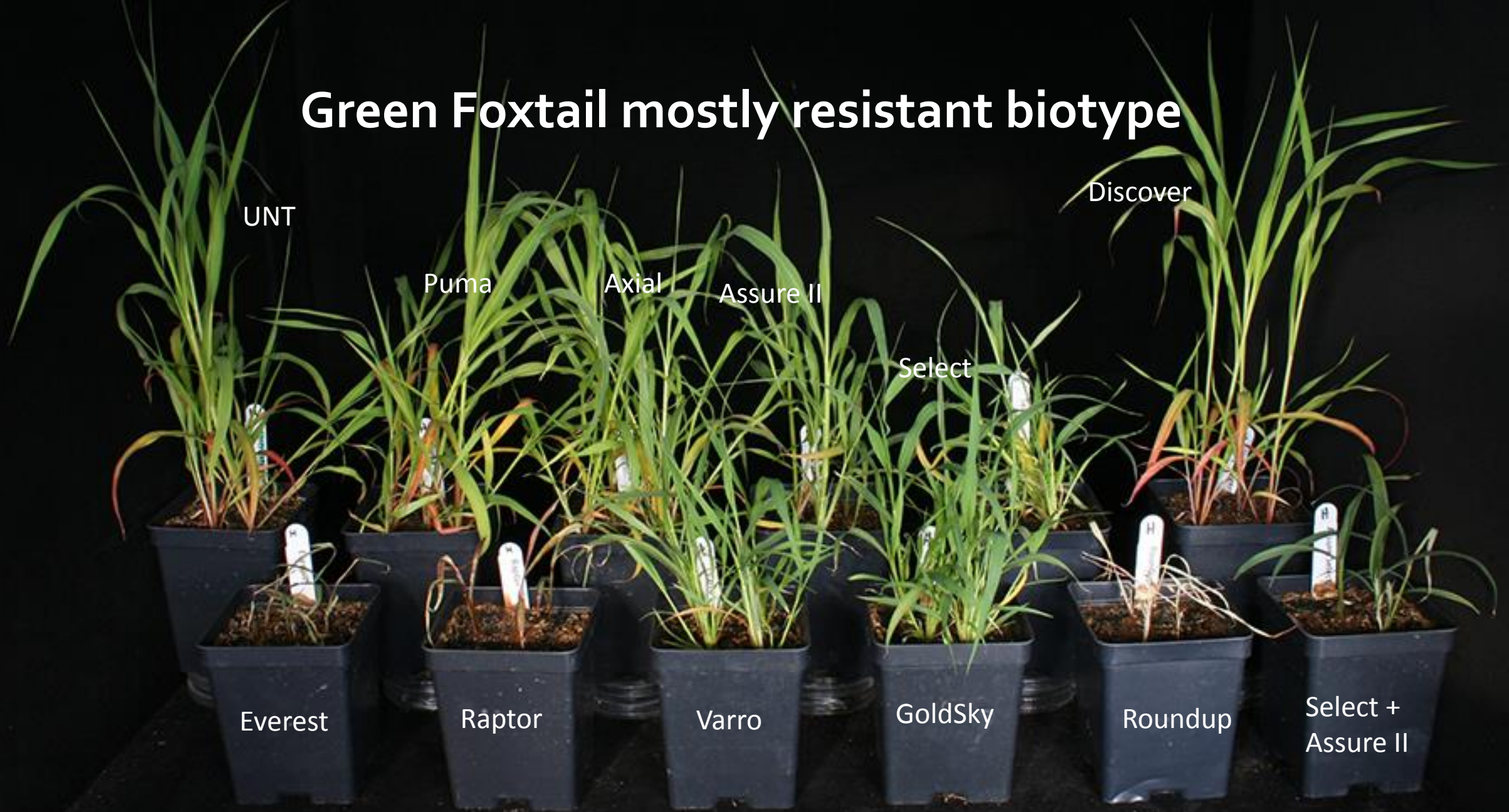
Green foxtail (16 samples)*

Puma: 14
Axial: 10
Assure II: 11
Select: 1

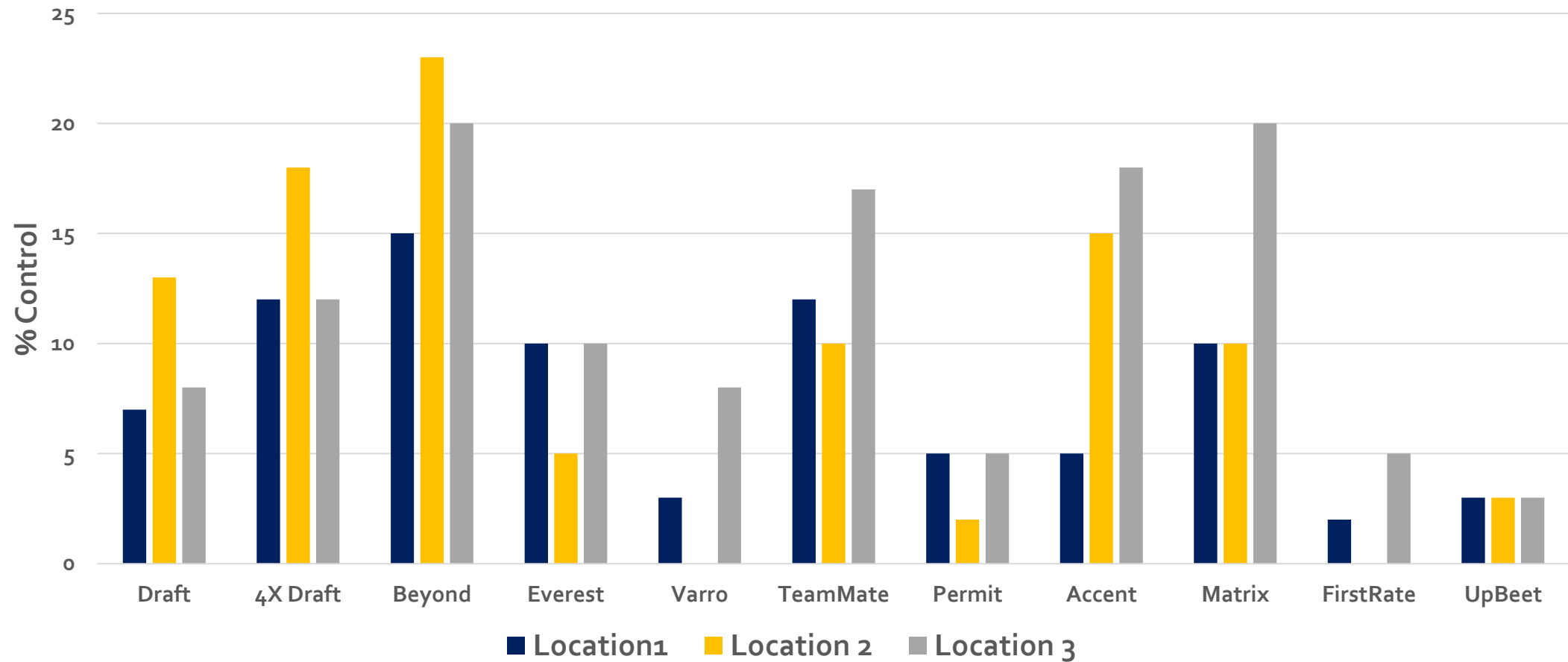
Everest: 2
GoldSky: 2
Varro: 2
Raptor: 0

*samples submitted and tested by Dr. Brian Jenks. Samples from NE North Dakota and NW Minnesota

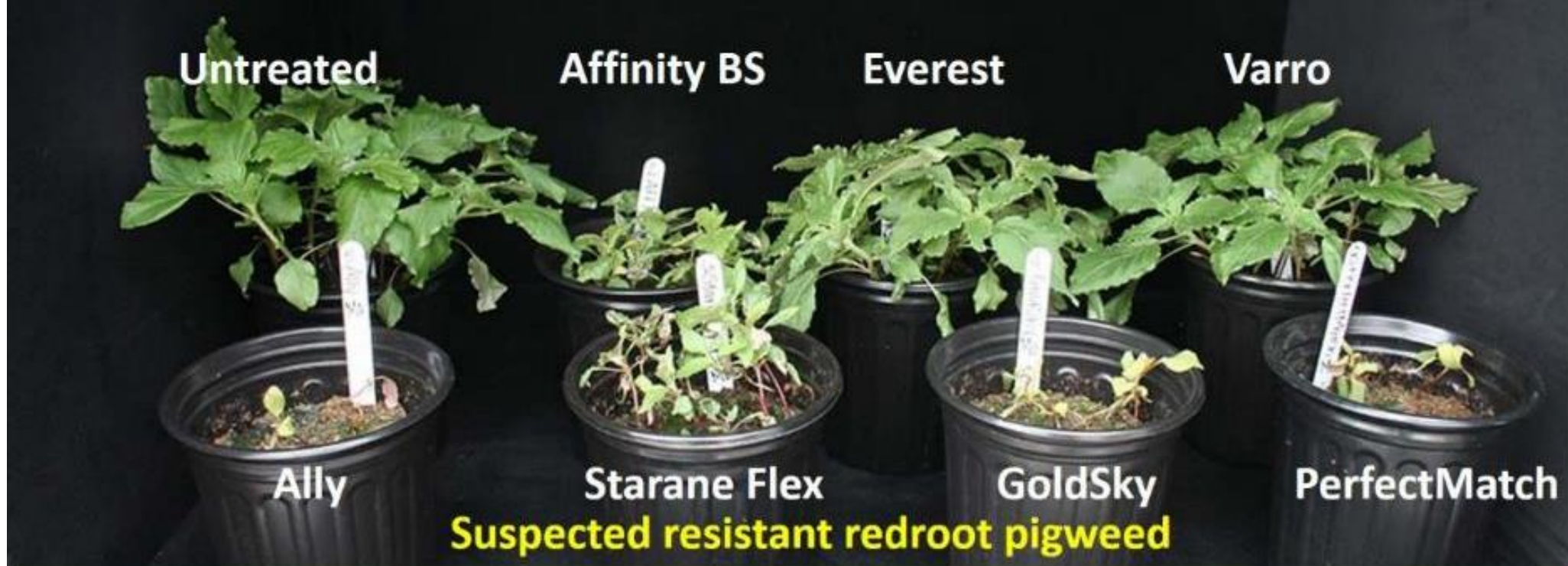
Green Foxtail mostly resistant biotype



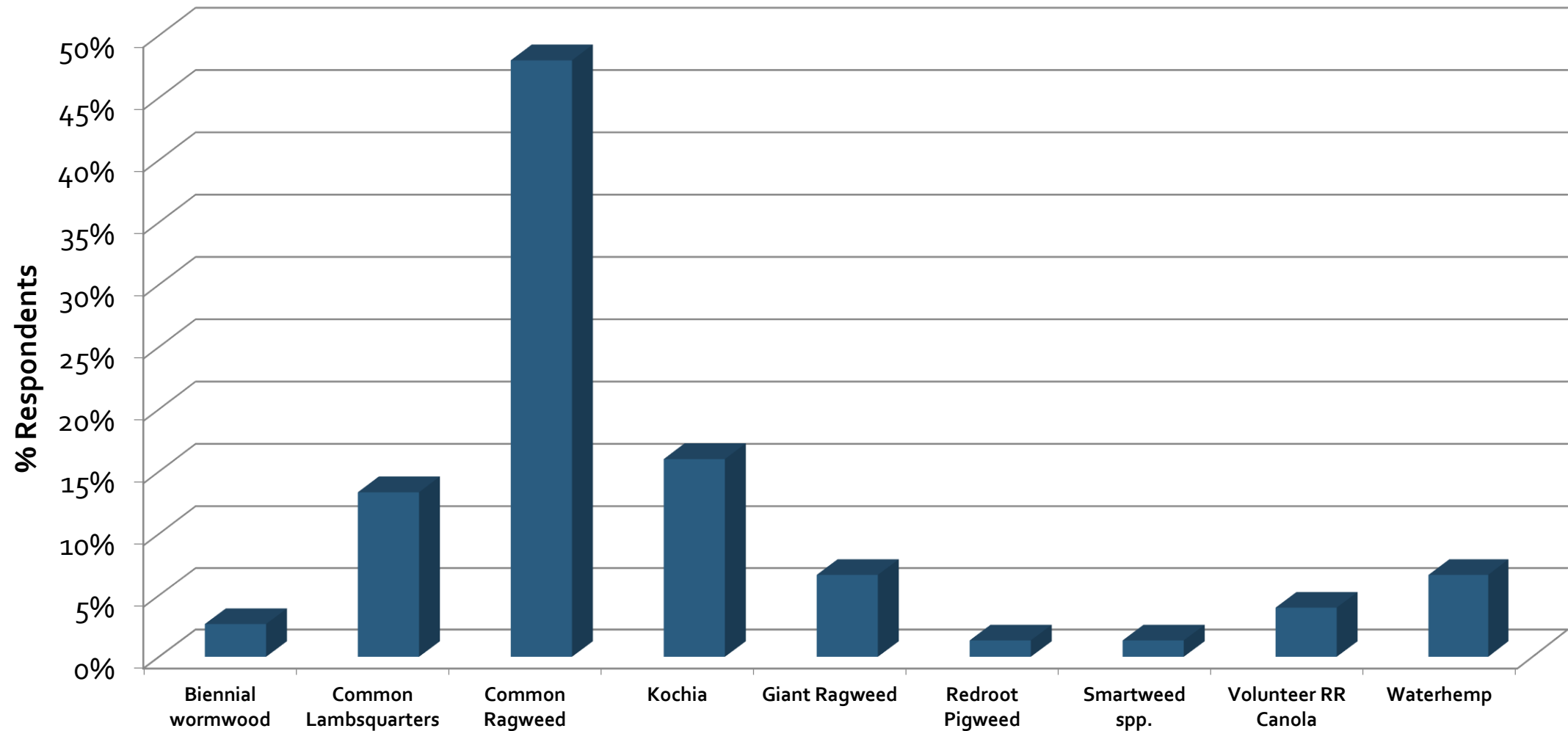
ALS-resistant redroot pigweed control* in northeastern North Dakota



*samples submitted and tested by Dr. Kirk Howatt. Samples from NE North Dakota



What was your worst weed problem in 2017¹?



¹Turning Point Survey of Growers; conducted at the 2018 Sugarbeet Growers Seminar, Grafton

Common lambsquarters control from glyphosate, Bathgate ND



The Times They Are A-Changin'

Bob Dylan, 1963



Common Ragweed



- Life cycle: summer annual broadleaf
- Growth habit: fibrous root system, grows 2 to 4 feet high
- Germination: soil temperature triggers germination
 - between 50 and 80 F
 - returns to dormancy when temperatures get hot in June and July
- Reproductive habit: male and female flowers are in separate flower heads on the same plant (monoecious)
- Seed production: 30,000 to 60,000 seeds per plant
- Longevity: 25 to 35 years??
- Resistant biotypes to multiple classes of herbicides
 - ALS (SOA 2)
 - PPO inhibitor (SOA 14)
 - Glyphosate (9)



Sugarbeet injury and control of common ragweed, Doran ND, 2018

Three inch common ragweed

Herbicide Treatment ¹	Rate	June 21 sgbt inj	June 28 cora cntl	July 11 cora cntl
	fl oz/A	------(%)-----		
PowerMax ²	28	8	55	58
PowerMax+ethofumesate	28+4	18	55	53
PowerMax+Stinger	28+2	5	85	73
PMax+Stinger	28+4	8	94	93
PowerMax+Stinger/ PowerMax+Stinger	28+2/ 28+2	10	98	99
PowerMax+Stinger/ PowerMax+Stinger	28+4/ 28+4	8	100	100
LSD (0.1)		14	5	8

¹PowerMax alone and PowerMax+Stinger treatments were applied with N-Pak AMS at 2.5% v/v and Prefer 90 NIS at 0.25% v/v.

²Application May 31 and June 13

Sugarbeet injury and control of common ragweed, Doran ND, 2018

Six inch common ragweed

Herbicide Treatment ¹	Rate	June 21 sgbt inj	June 28 cora cntl	July 11 cora cntl
	fl oz/A	------(%)-----		
PowerMax ²	28	5	78	66
PowerMax+ethofumesate	28+4	18	71	65
PowerMax+Stinger	28+2	13	76	72
PMax+Stinger	28+4	23	75	73
PowerMax+Stinger/ PowerMax+Stinger	28+2/ 28+2	15	81	82
PowerMax+Stinger/ PowerMax+Stinger	28+4/ 28+4	28	76	91
LSD (0.1)		8	13	16

¹PowerMax alone and PowerMax+Stinger treatments were applied with N-Pak AMS at 2.5% v/v and Prefer 90 NIS at 0.25% v/v.

²Application May 31 and June 13

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

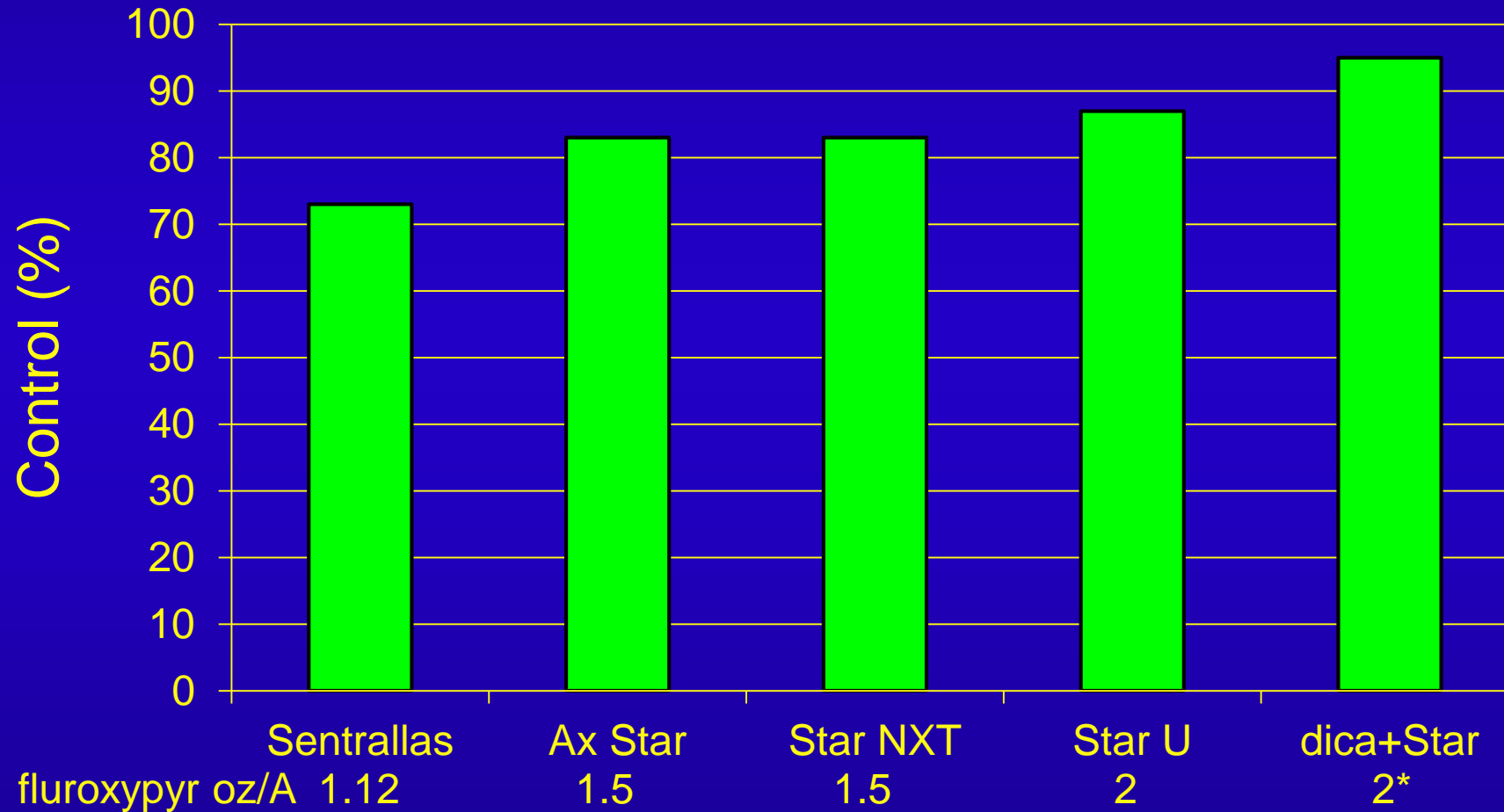


Small grains are tremendous crop(s) to implement a kochia control protocol

- Narrow rows provide canopy closure
- Herbicides and herbicide families are complimentary
 - Growth Regulators (SOA₄)
 - Fluroxypyr, Starane, or Starane Ultra
 - Dicamba
 - Widematch (clopyralid+fluroxypyr)
 - PSII Inhibitors (SOA₆)
 - Bromoxynil
 - PPO Inhibitors (SOA₁₄)
 - Aim
 - HPPD Inhibitors (SOA₂₇)



Kochia Control



LSD (0.05) = 5

Slide from K Howatt, NDSU

Volunteer canola control from UpBeet plus PowerMax; early or late planting, cotyledon or 2-leaf at application, Prosper, ND, 2015

		Early, April planting			Late, May planting	
Herbicide ¹	Rate	29 Jun	2 Aug		2 Aug	24 Aug
	(oz/A)	------(%)-----			------(%)-----	
UpBeet / UpB / UpB	0.25	72 c	59 b		-	-
UpBeet / UpB / UpB	0.5	87 b	70 a		79 b	63 b
UpBeet / UpB / UpB	0.75	92 a	70 a		83 b	65 ab
UpBeet / UpB / UpB	1.0				92 a	71 a

		Early, April planting			Late, May planting	
Canola stage		29 Jun	2 Aug		2 Aug	24 Aug
		------(%)-----			------(%)-----	
Cotyledon		80 b	63 b		86	64 b
2-leaf stage		88 a	70 a		83	69 a

¹UpBeet plus Roundup PowerMax with Destiny HC at 1.5 pt/A plus N-Pak AMS at 2.5% v/v



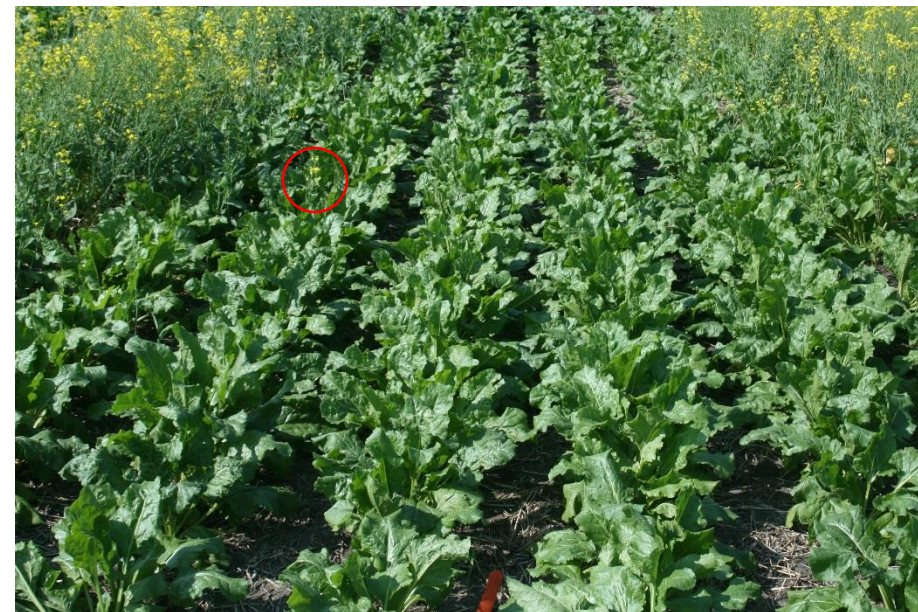
Roundup PowerMax control



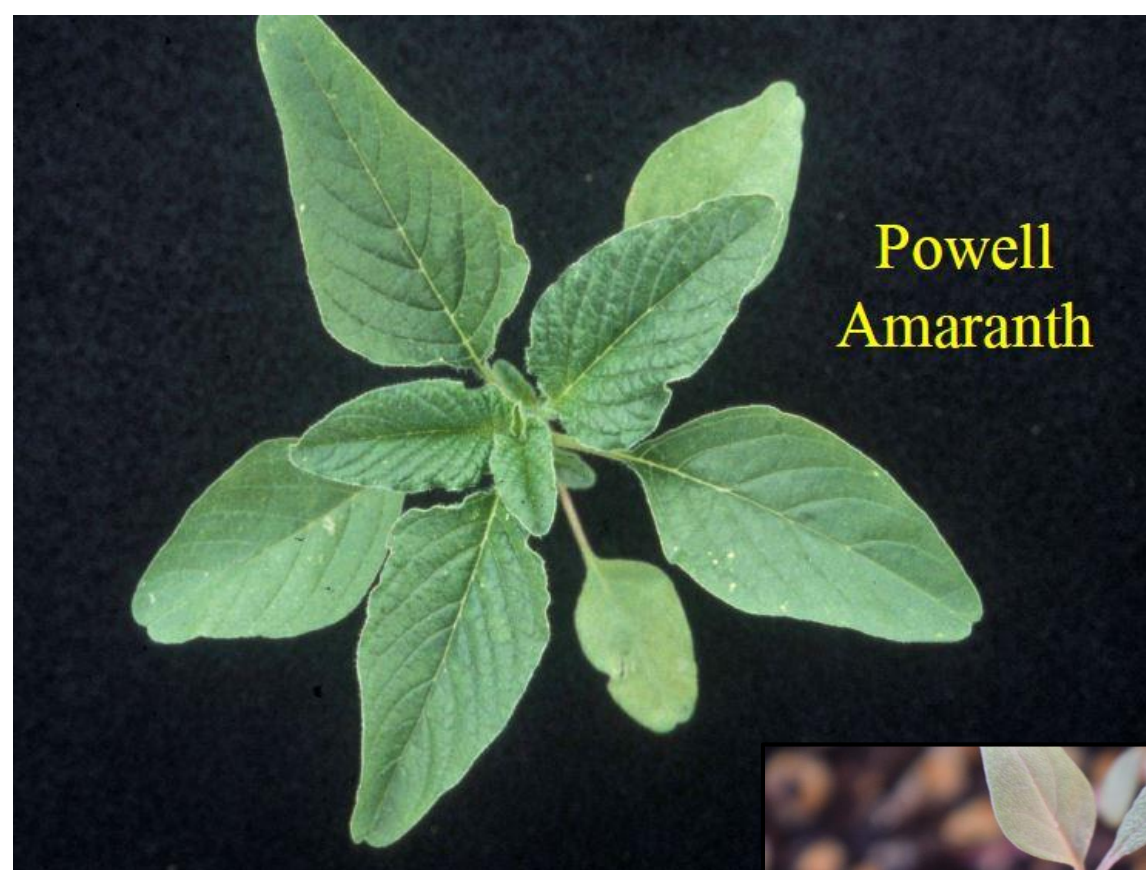
UpBeet, 0.5 oz/A, cotyledon timing

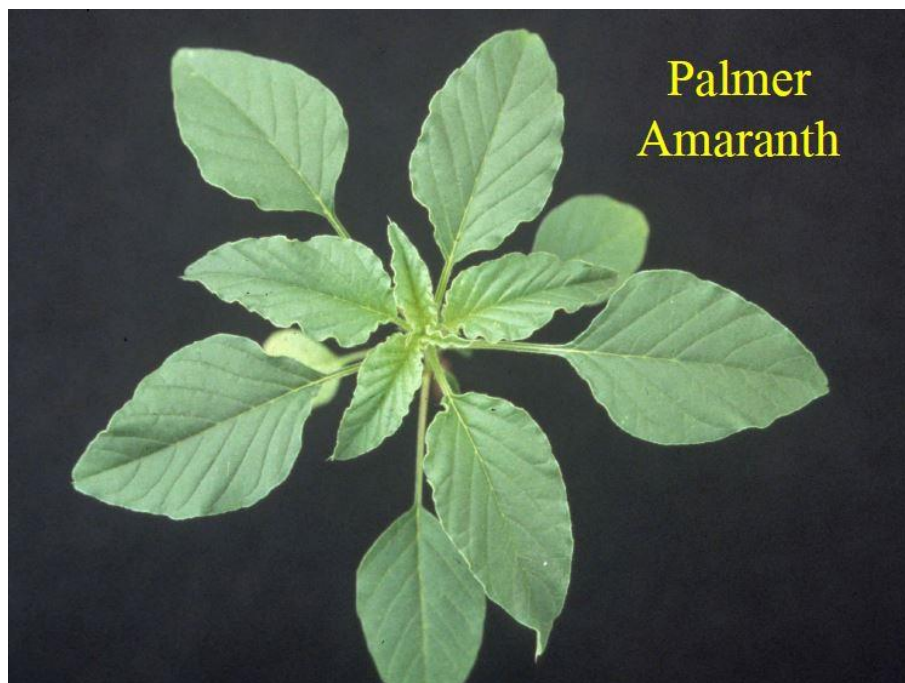
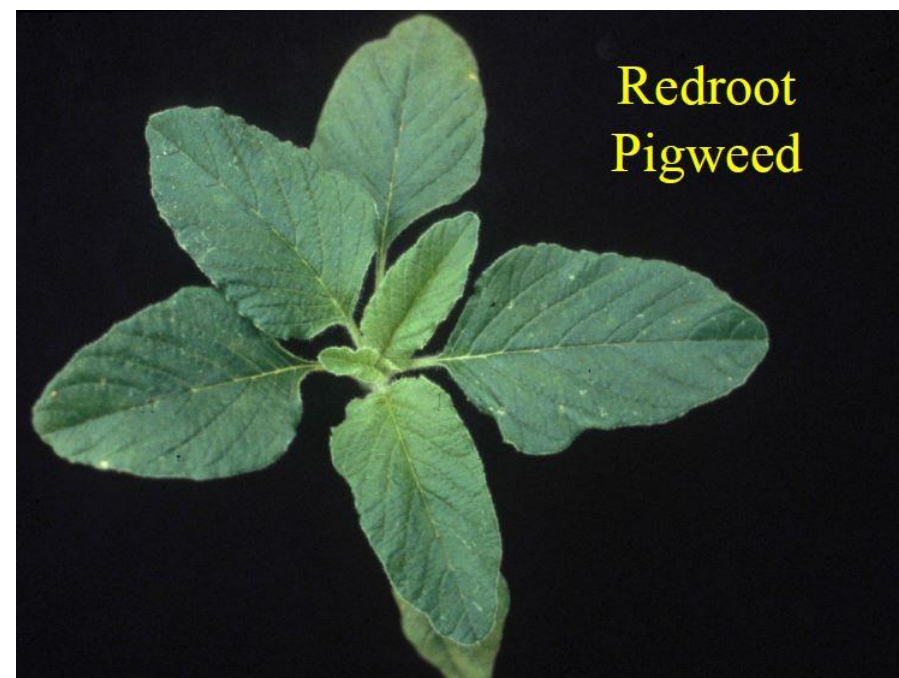


UpBeet, 0.75 oz/A, cotyl timing



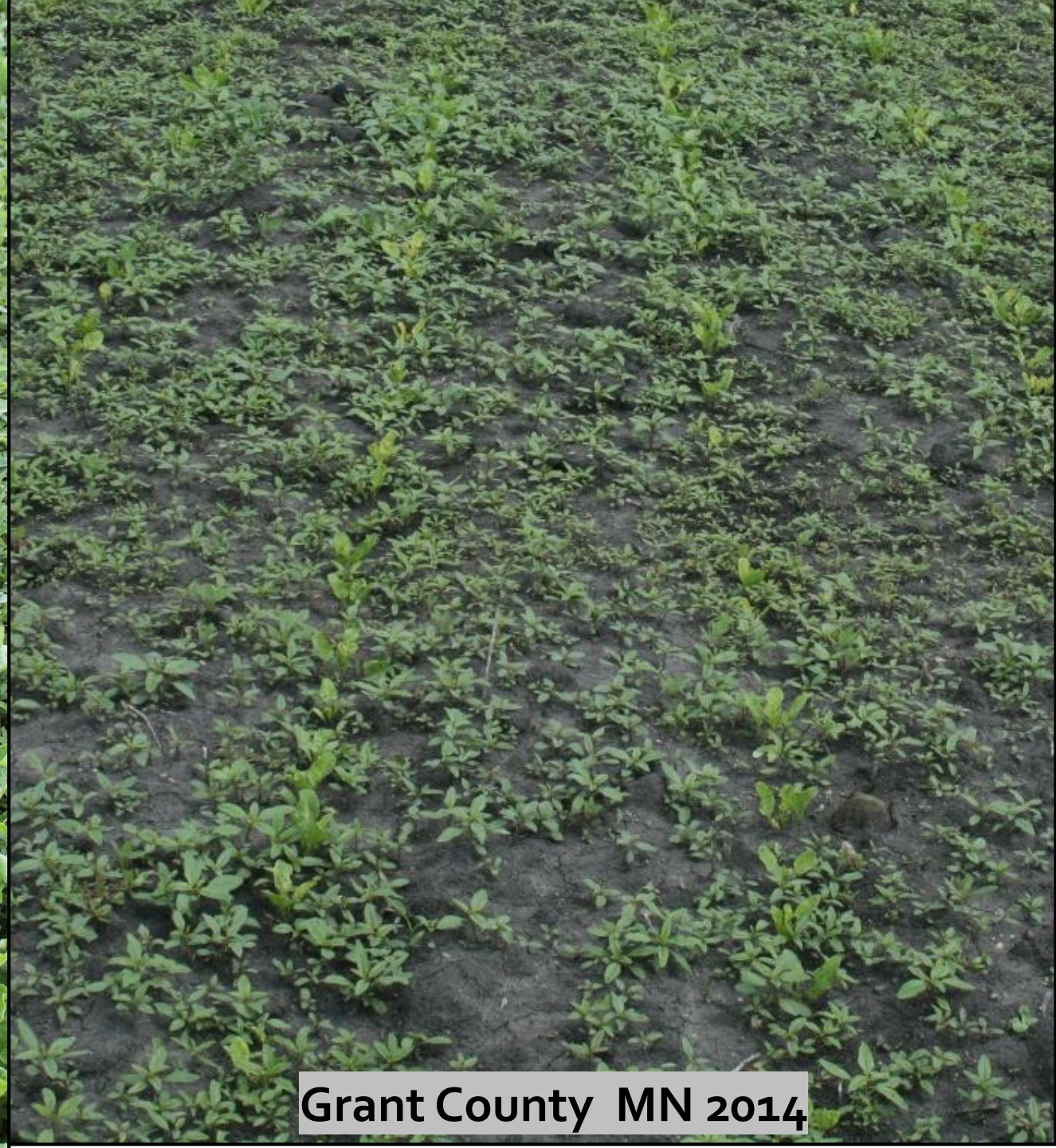
UpBeet, 0.75 oz/A, 2-leaf timing







Redwood County MN 2018



Grant County MN 2014

Sugarbeet injury and waterhemp control from glyphosate or glyphosate mixtures, 4-, 6- to 8- and 10- to 12-sugarbeet leaf stage, across environments, 2014 and 2015^a.

Treatment ^b	Rate	Sugarbeet 9-16 DAT	Waterhemp mid-season	Waterhemp pre-harvest
	oz or fl oz/A	%	%	%
PowerMax/PMax/PMax	28/28/22	1	63 d ^e	48 e
PowerMax+etho/PMax+etho/ PMax+etho/	28+4/28+4/ 22+4	2	76 c	67 cd
PowerMax+UpBeet/PMax+UpB/ PMax+UpBeet	28+0.75/28+0.75/ 22+0.75	3	84 abc	73 abc
PMax+Betamix/PMax+Betamix/ PMax+Betamix	28+12/28+16/ 28+24	5	81 abc	67 cd
PMax+Stinger/PMax+Stinger/ PMax+Stinger	28+2/28+2/ 22+2	5	66 d	59 d
p-value (0.05)		0.0877	<.0001	<.0001

^aHerman MN 2014, Herman MN 2015, and Moorhead MN 2015

^bPowerMax with Prefer go non-ionic surfactant at 0.25% v/v plus N-Pak ammonium sulfate at 2.5% v/v. PowerMax tank-mixes with Destiny HC at 1.5 pt/A plus N-Pak ammonium sulfate at 2.5% v/v.

Summary of Cultivation Research in Sugarbeet

Nathan Haugrud and Tom Peters, NDSU

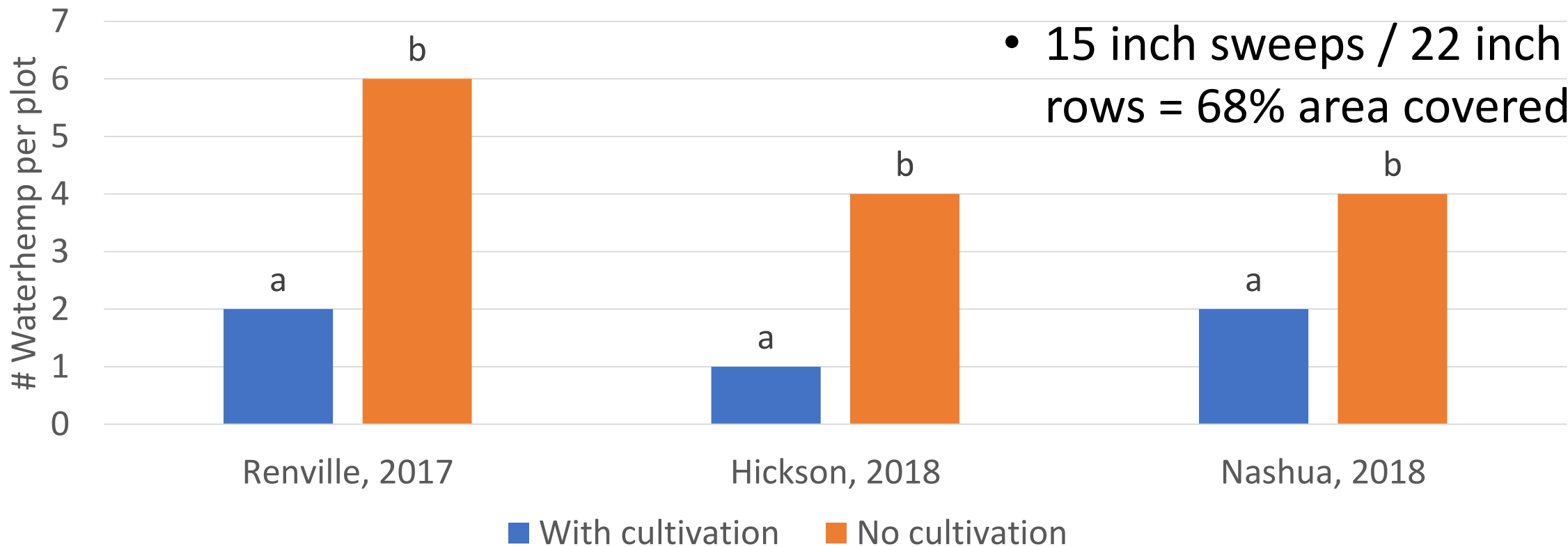


Technical questions

- Cultivation to remove herbicide-resistant weeds?
 - Effects on weed emergence?
- Interactions with residual herbicide?
 - Incorporation and activation
 - Damage to an established herbicide barrier?
- Negative effects on sugarbeet yield and quality?

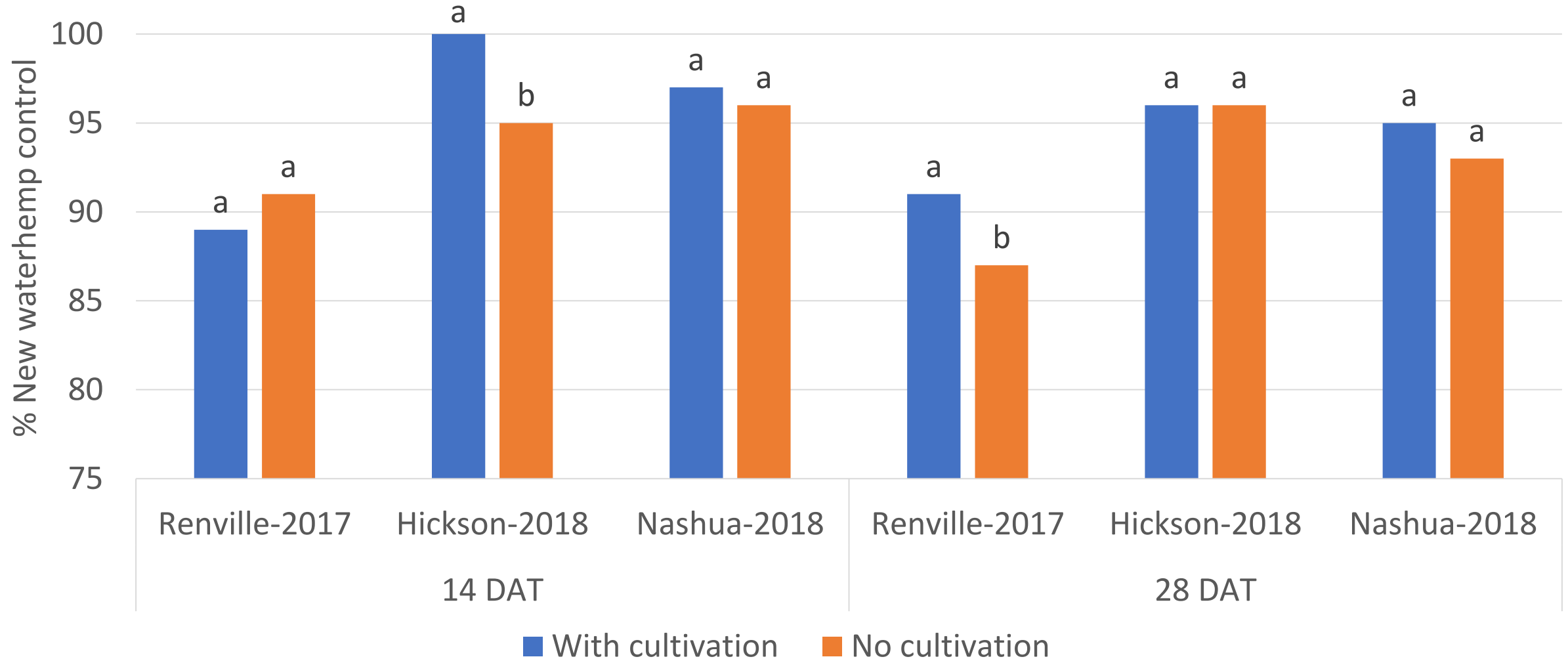


Cultivation immediately after herbicide resulted in 50-75% less waterhemp, 14 DAT



	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





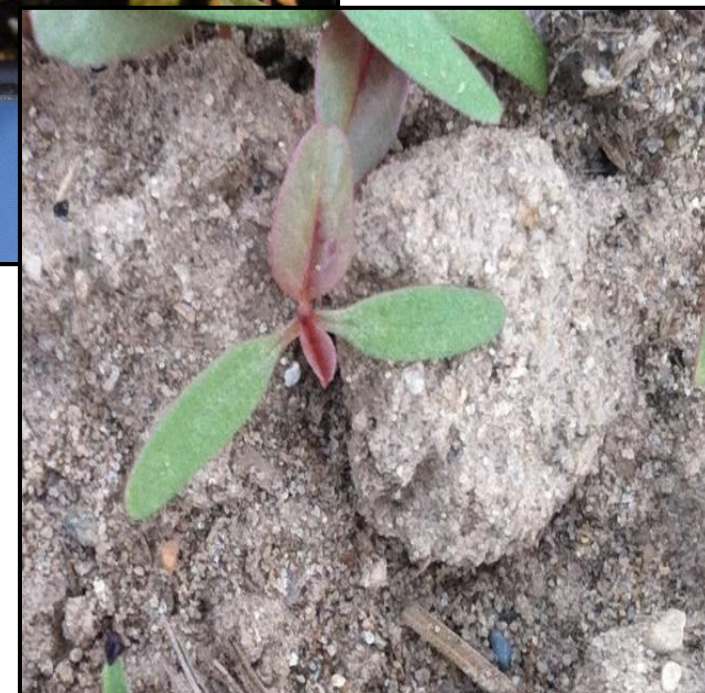
Redroot pigweed



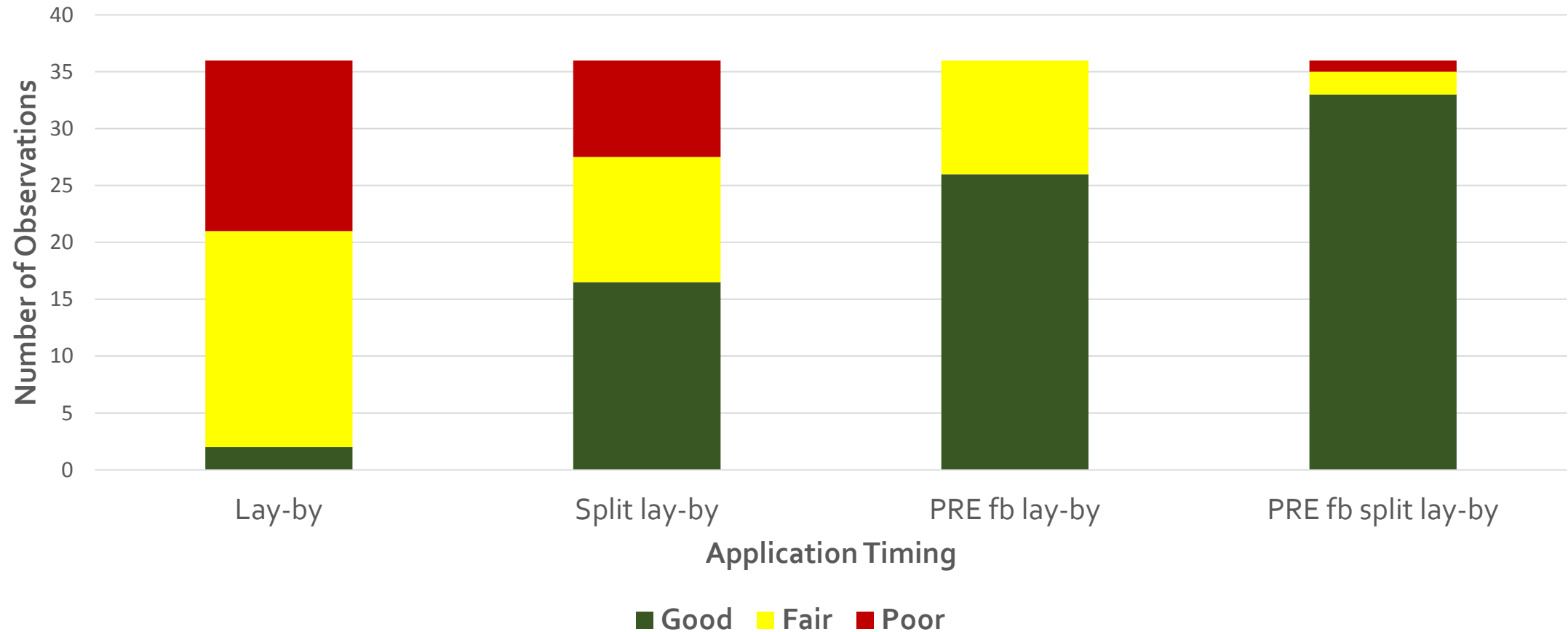
Palmer amaranth



Waterhemp

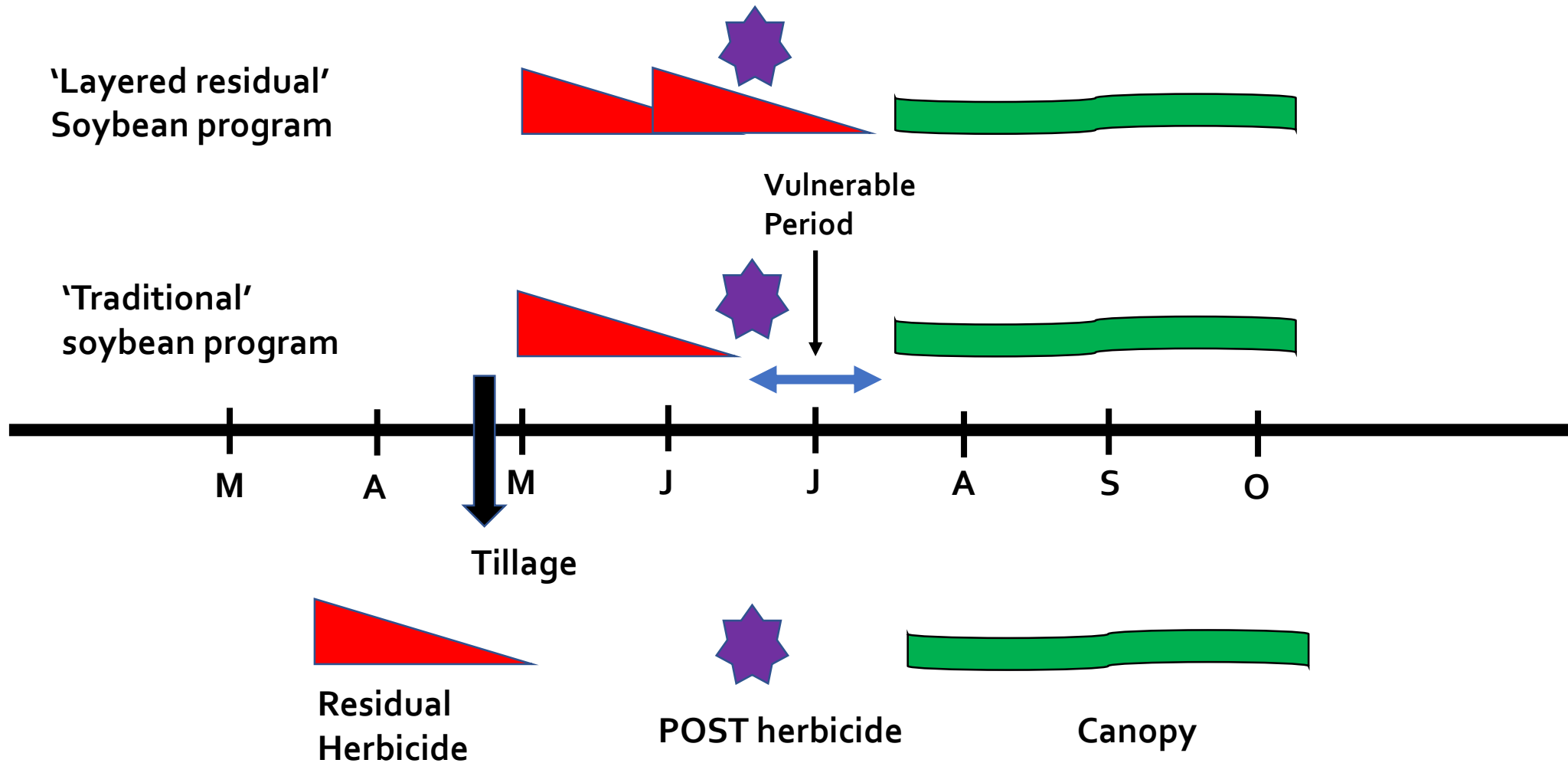


Number of good, fair, and poor estimates of waterhemp control across herbicides and application timing, summed across evaluations, locations, and years



Layered Residual Herbicides

Objective: Prolong PRE activity until canopy fills



How do you decide what product to use?

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, ?

These steps are general for all sprayers, but...

- Know your sprayer
 - Where can residues hide? Where are my valves? Screens? Hoses?
 - Consult your operators manual
- Develop a checklist
- Know the physical properties of the chemical you're applying
 - Dry vs. EC vs. solution
 - Jar mix to test incompatibility

Seven steps of sprayer cleanout

1. Spray out booms every night (or when herbicides demand it)
2. First rinse is in the field
3. Remove and clean all screens
4. Remove and clean boom end caps
5. Second rinse with water
6. Add tank cleaner
7. Final rinse and flush



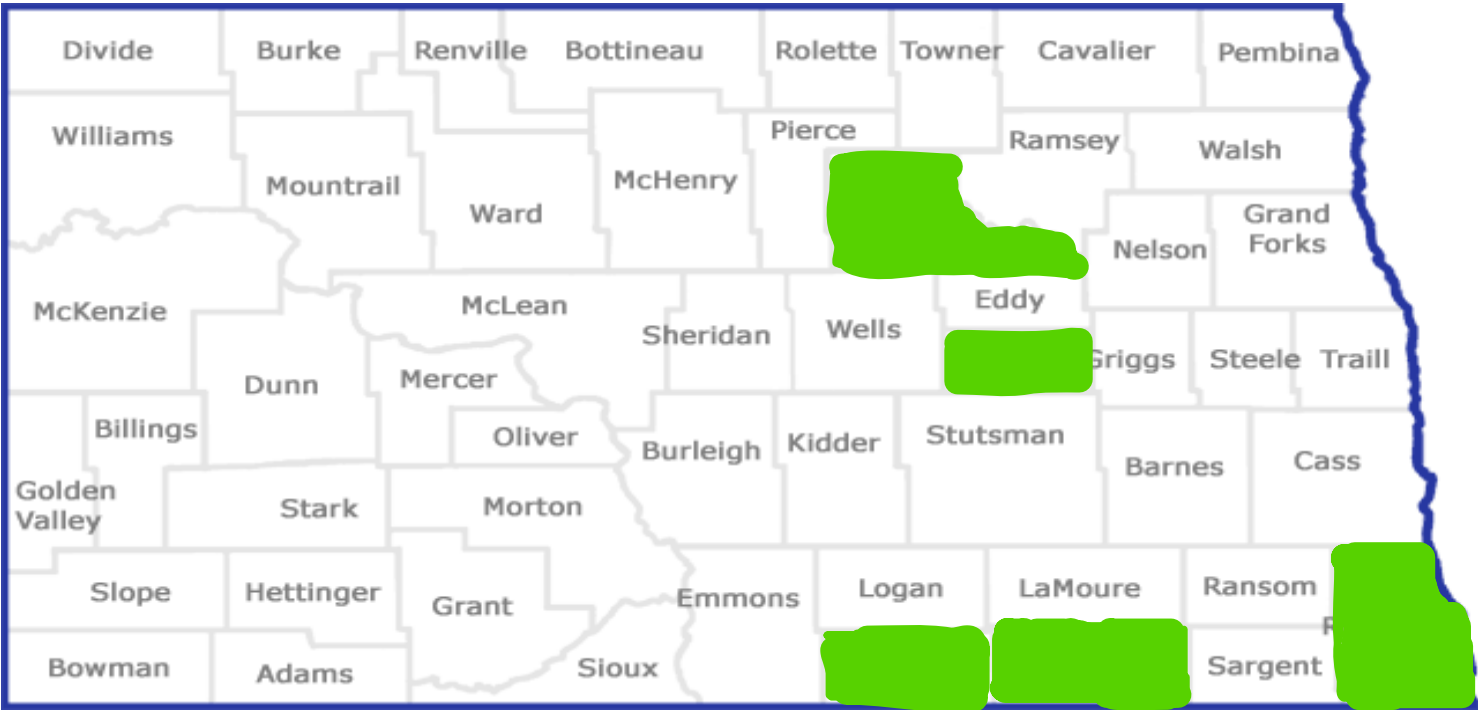
Ammonia, bleach, detergents and tank-cleaners

- Ammonia - increases the pH of the solution which increases the herbicide solubility, ex. SU and weak acid herbicides
 - is effective at penetrating and loosening deposits and residues
 - 1 gallon ammonia in 100G water
- Chlorine bleach - lowers the pH of the solution which speeds the degradation of some herbicides.
- Detergents – cleaners, designed to remove oil-soluble herbicides
- Commercial tank cleaners – usually contain ammonia and a detergent
 - Commercial tank cleaners usually perform better than household detergents

Palmer amaranth (left) and waterhemp (right) 35 days after planting



Palmer amaranth was confirmed in five North Dakota Counties in August and September

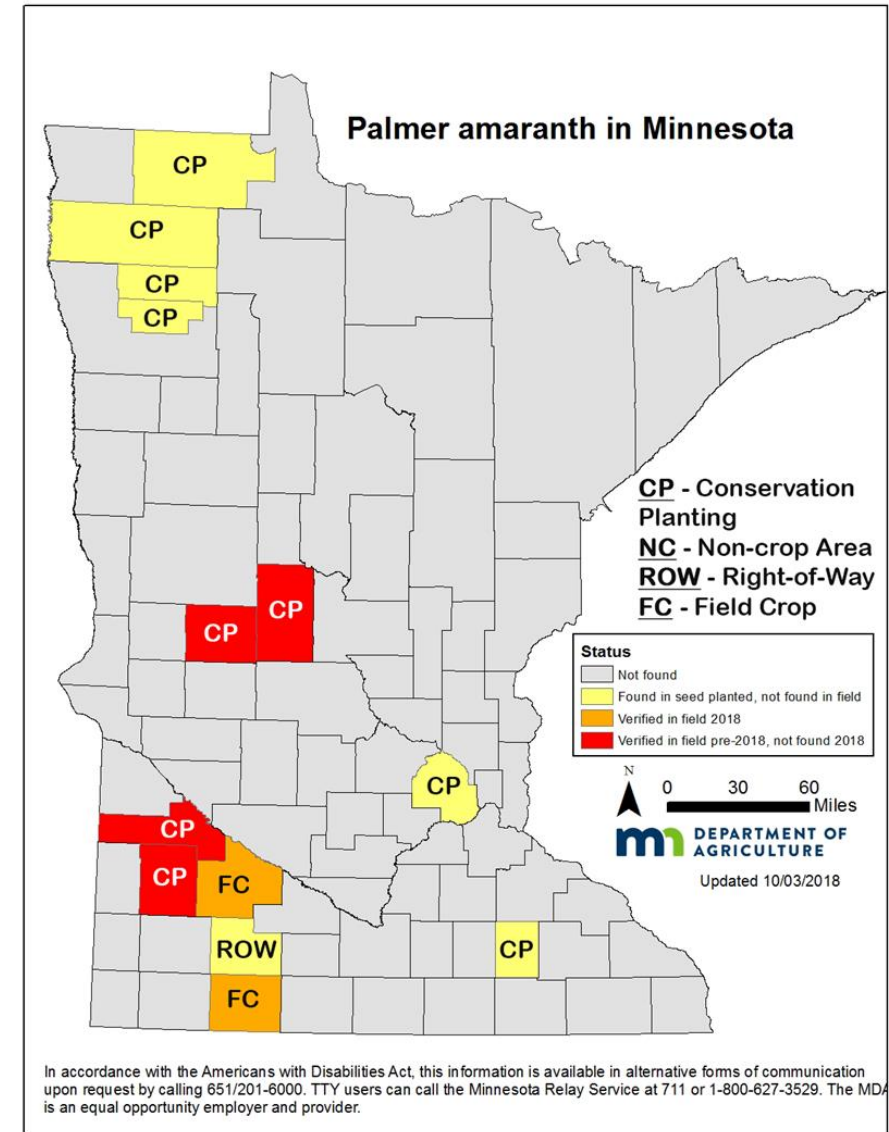


County	Possible source
McIntosh	Migratory birds
Dickey	Purchase of used combine out-of-state
Foster	Custom combining
Benson	Railroad car cleanout
Richland	Alternative sources for cattle feed

Current Status in Minnesota

• STATEWIDE SUMMARY

- 18 landowners in Six Counties With Confirmed Palmer plants since 2016
 - 42 CRP plantings in 4 Counties (2016 – 2017)
 - **NO PALMER** discovered in Lyon, Yellow Medicine, Todd or Douglas counties in Fall 2018 on these plantings
 - 2 Soybean fields - 1 Jackson & 1 Redwood County – Fall 2018
 - Plants hand-pulled and destroyed; no seed produced
 - **No other Palmer plants found within a 5-mile radius MDA field survey**
- * 2017 – Summer – seed lot tested positive for Palmer
 - Sold to MNDOT for seeding a ROW in SW MN
 - **MDA Found No Palmer On This Site In 2017 or 2018**
- ** 2018 – Spring - seed lot tested positive for Palmer
 - Sold to 8 Landowners, planted at 14 locations in 4 counties potentially impacting 1,400 acres
 - **MDA Found No Palmer On These Acres In 2018**



Acknowledgements

- Sugarbeet Research and Education Board for funding these research
- Our cooperators: **James Bergman (Oslo), Glenn and Danny Brandt (Ada), Pinta Brothers (Minto)**, American Crystal Sugar (Moorhead)
- North Dakota State University Experiment Station and Crookston Research and Outreach Center

Thank you for your Support

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