Trends in Green Foxtail and Wild Oat Resistance and Implications for Control

North Dakota State University

North Central Research Extension Center

Minot, ND

Green foxtail response to Group 1 and Group 2 herbicides.

Herbicide	S	SR	MR	R	Total
Puma	20	3	2	10	35
Axial	20	7	4	2	33
Discover	16	1	1	11	29
Assure II	22	1	6	3	32
Select	28	2	0	0	30
Assure II + Select	24	0	0	0	24
Raptor	30	0	0	0	30
Everest	27	3	1	1	32
Varro	21	3	3	2	29
GoldSky	21	3	3	2	29
Roundup	28	0	0	0	28

S=Susceptible; SR=Slightly resistant; MR=Moderately resistant; R=Resistant

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Spartan + Sharpen tank mix allowed in dry pea and chickpea (Preplant or PRE)

Dry pea: Sharpen 1 oz + Spartan

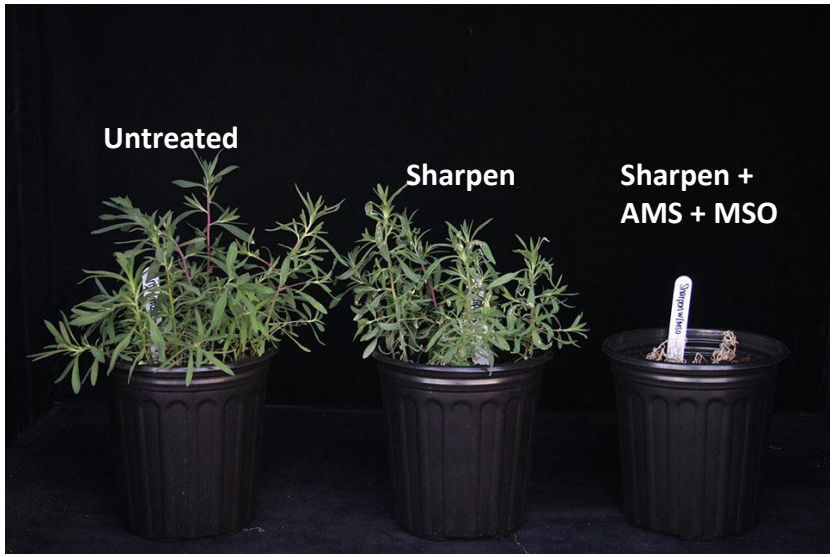
Chickpea: Sharpen 1-2 oz + Spartan

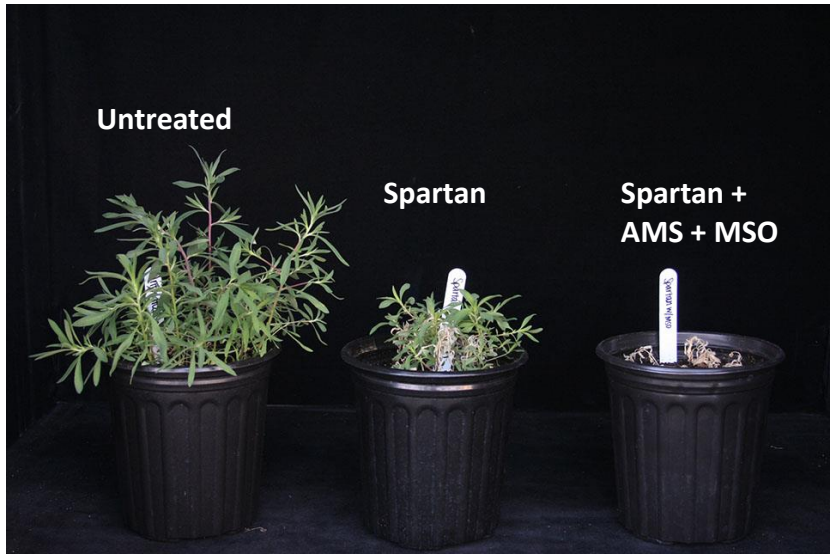
Group 14 herbicides

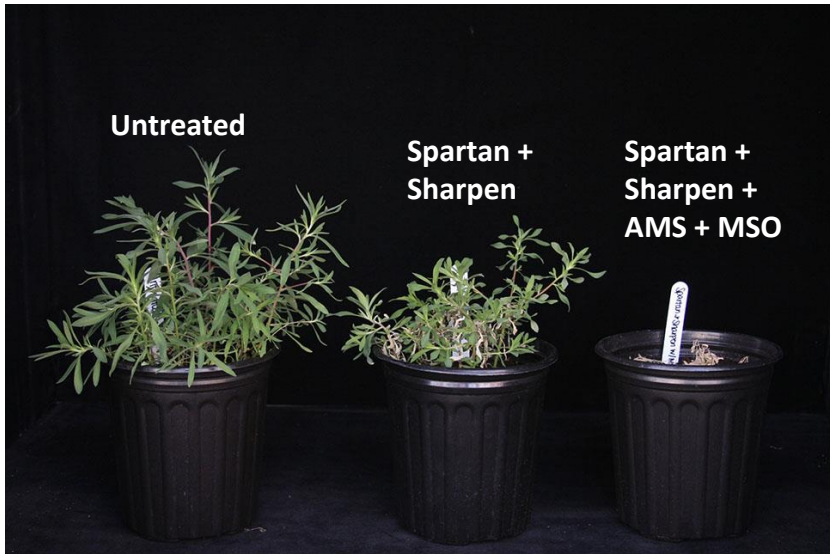
- **Aim** — Foliar, no residual *More effective with AMS + MSO
- **Sharpen** — Foliar, residual rate dependent *More effective with AMS + MSO
- **Spartan** — Soil, has residual
- **Valor** — Soil, has residual

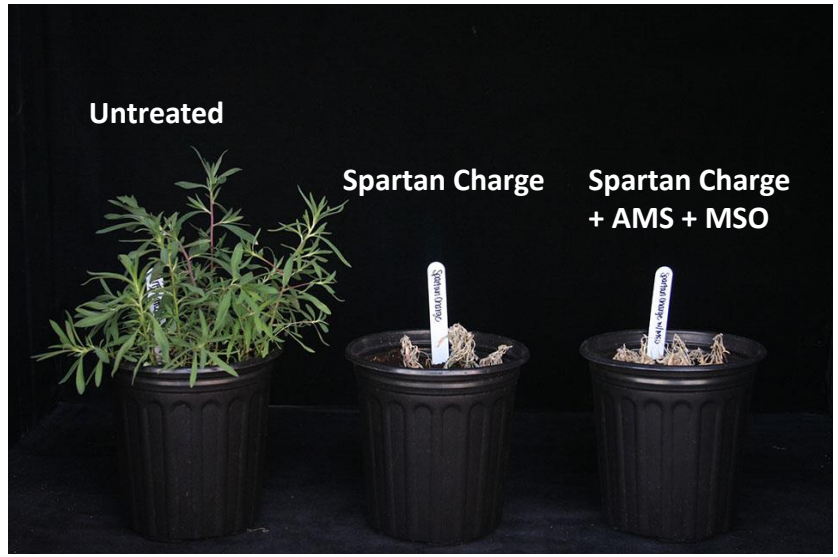
- **Authority MTZ** — Spartan + Metribuzin
- **Authority Assist** — Spartan + Pursuit
- **Authority Elite** — Spartan + Dual
- **BroadAxe** — Spartan + Dual
- **Spartan Charge** — Spartan + Aim

Tank mixing AMS + MSO with Group 14 herbicides enhances <u>emerged</u> kochia control

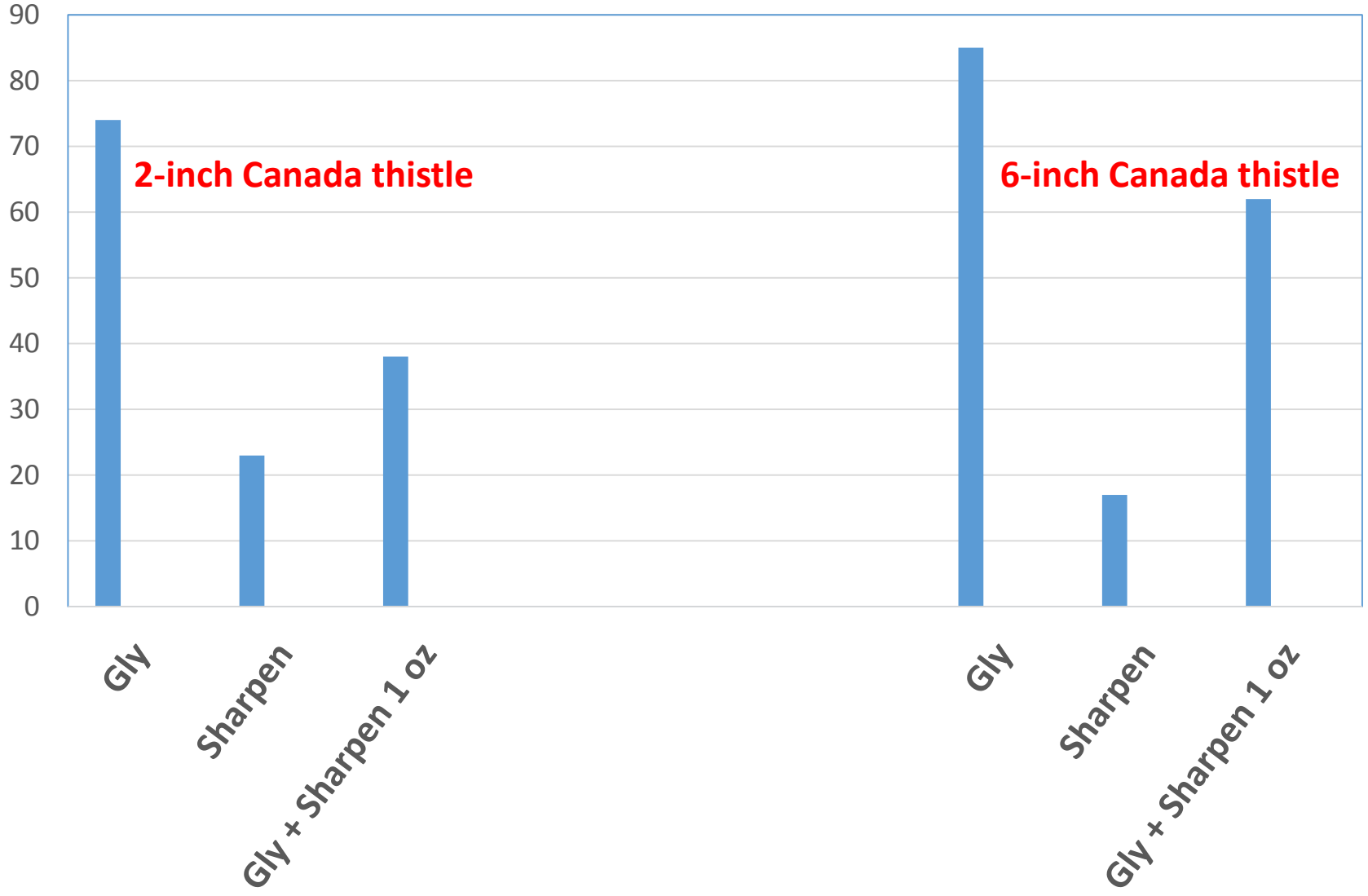








Canada thistle control with Glyphosate and Group 14 herbicides (60 DAT)



Preplant dandelion control with Glyphosate + Group 14 herbicides

Treatment[a]	Rate	% Dandelion control
Untreated		
Glyphosate[b]	22 fl oz	
Glyphosate + Aim[c]	22 fl oz + 1 fl oz	
Glyphosate + Sharpen[c]	22 fl oz + 1 fl oz	
Glyphosate + Sharpen[c]	22 fl oz + 2 fl oz	
Glyphosate + Spartan[c]	22 fl oz + 4 fl oz	
Glyphosate + Spartan Charge[c]	22 fl oz + 5 fl oz	
Glyphosate + Valor[c]	22 fl oz + 2 oz	
Glyphosate + Express[d]	22 fl oz + 0.25 oz	
Glyphosate + 2,4-D[b]	22 fl oz + 0.5 pt	

[a] Treatments applied May 7; Evaluation on June 15

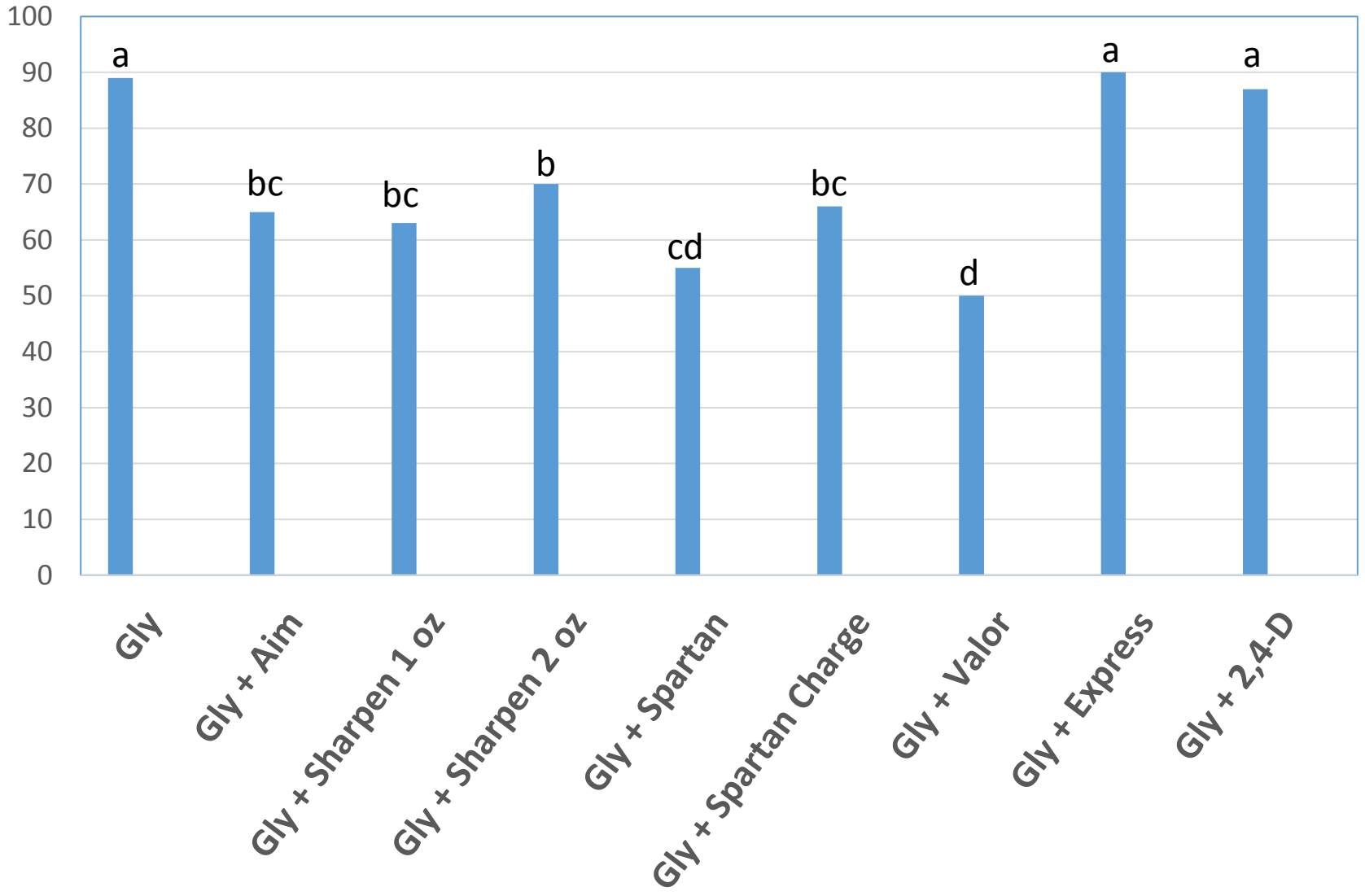
[b] Applied with AMS (2.5 gal/100 gal)

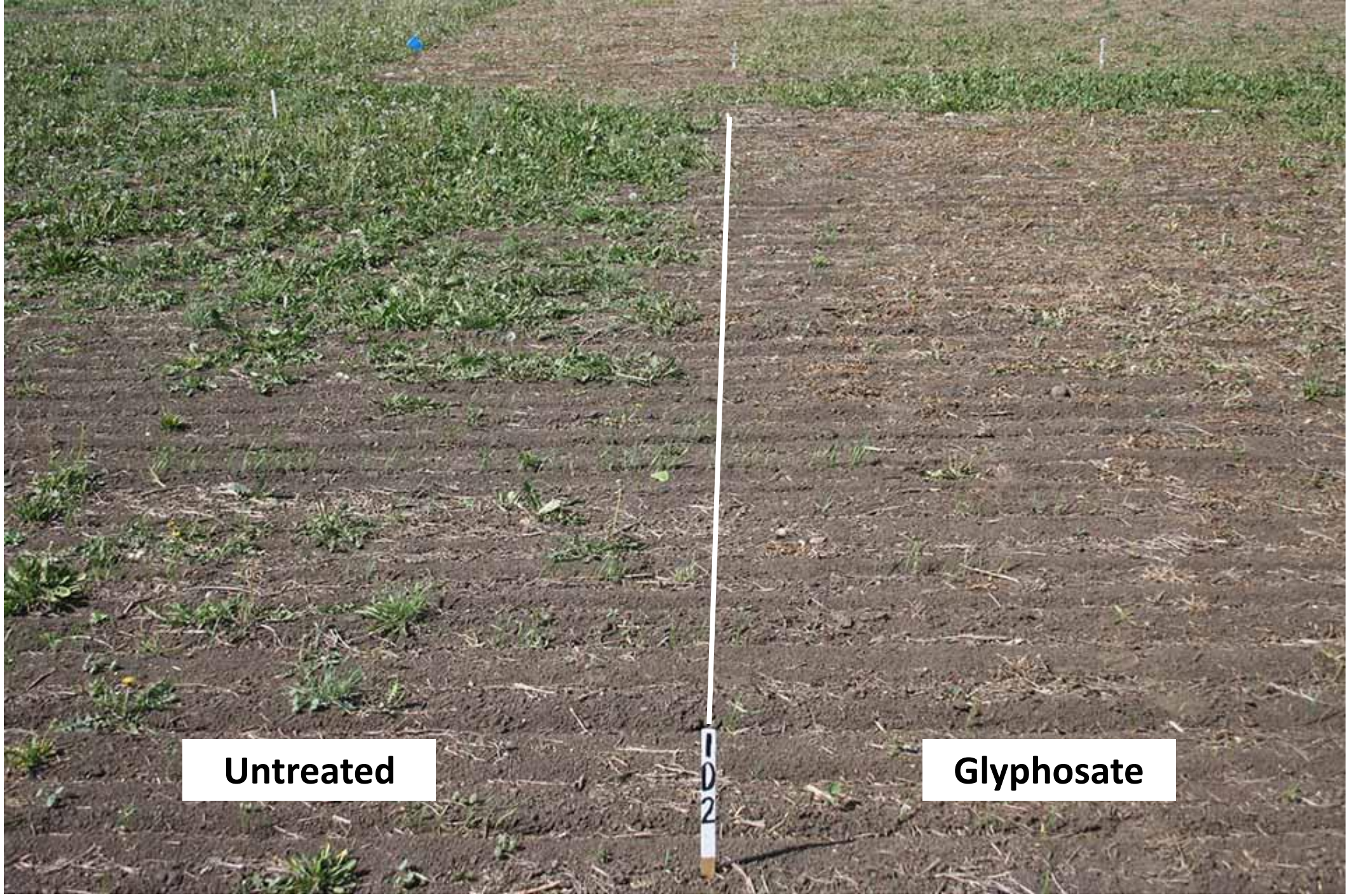
[c] Applied with AMS + MSO (2.5 gal/100 gal + 1%)

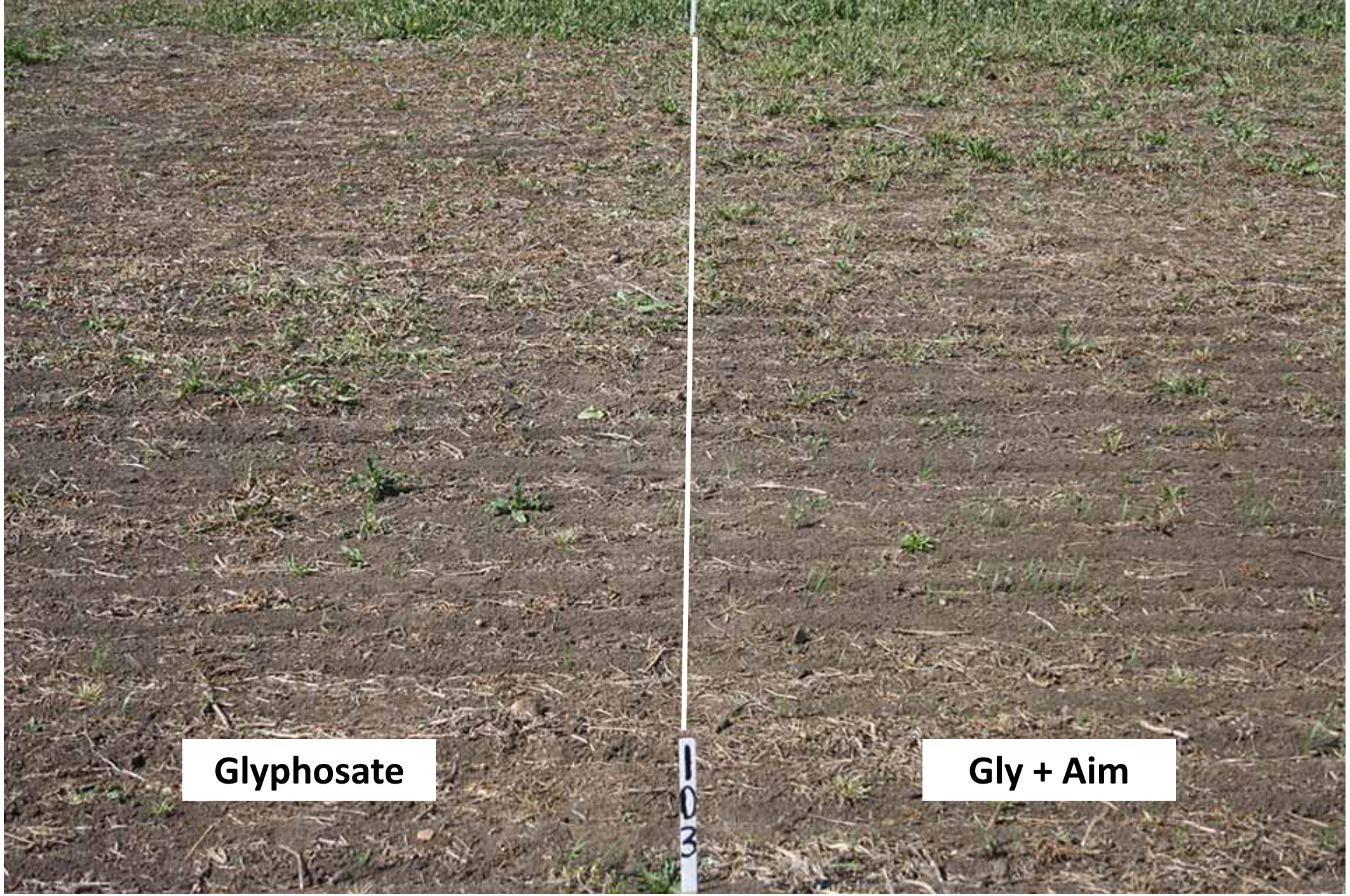
[d] Applied with AMS + NIS (2.5 gal/100 gal + 0.25%)

[e] Group 14 herbicides include Aim, Sharpen, Spartan, and Valor. Express is Group 2. 2,4-D is Group 4.

Dandelion control with Glyphosate and Group 14 herbicides

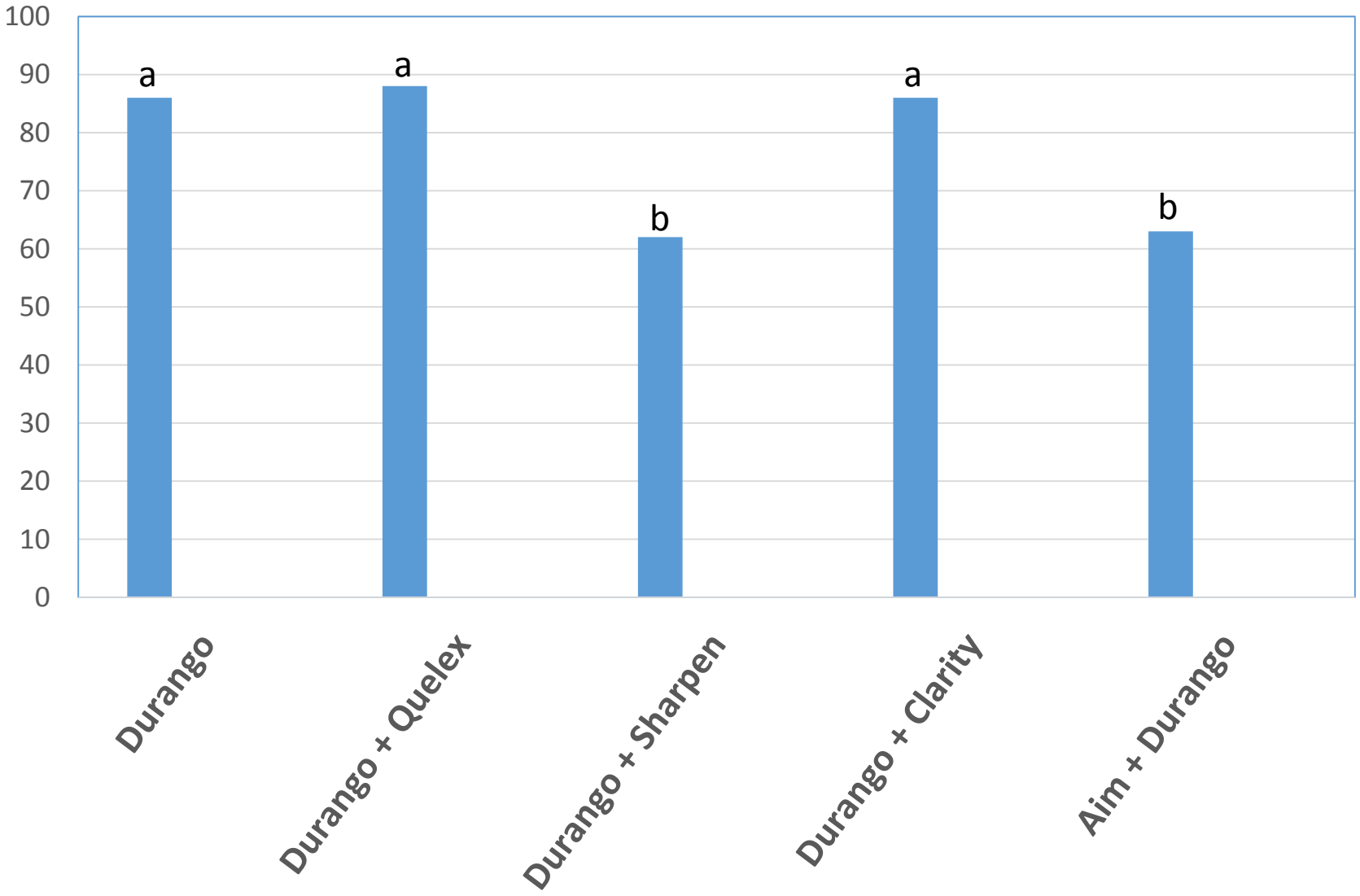



Untreated
Glyphosate


Glyphosate
Gly + Aim


Gly + Express
Gly + Valor

Dandelion control with Glyphosate tank mixes (5 WAT)



Group 1 and 2 tank mixes for grass control in wheat

Herbicide	Grft	Yeft	Bygr
Puma	13	80	81
Puma + Everest	95	62	52
Puma + GoldSky	30	78	99
Puma + Varro	55	89	99

Herbicide	Grft	Yeft	Bygr
Axial	27	99	98
Axial + Everest	91	92	37
Axial + GoldSky	20	86	99
Axial + Varro	48	93	99

Group 1 and 2 tank mixes for grass control in wheat

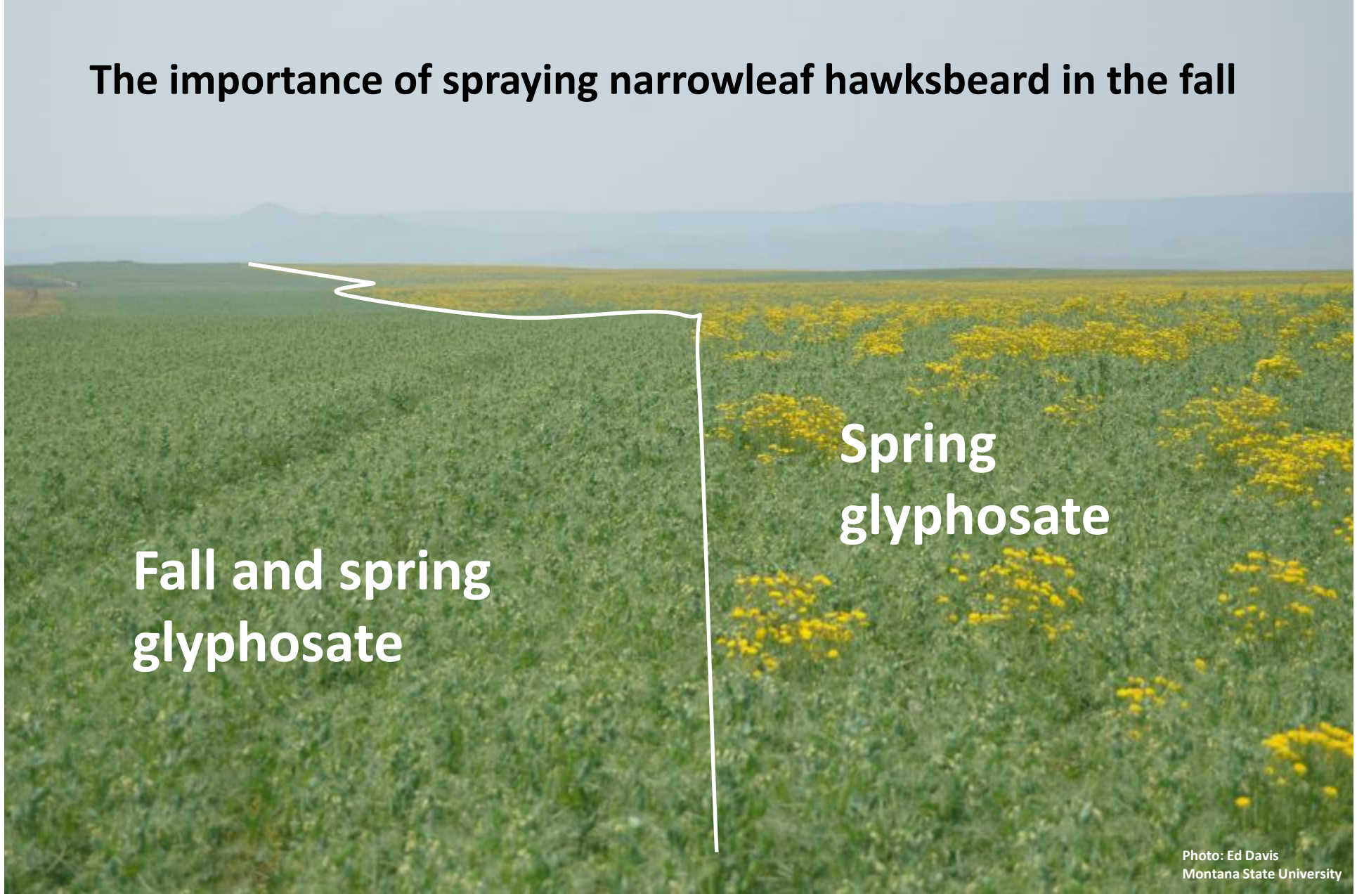
Herbicide	Grft	Yeft	Bygr
Everest	99	60	30
Everest + Puma	95	62	52
Everest + Axial	91	92	37
Everest + GS	74	68	94
Everest + Varro	78	74	99

Herbicide	Grft	Yeft	Bygr
GoldSky	42	68	99
GS + Puma	30	78	99
GS + Axial	20	86	99
GS + Everest	74	68	94
GS + Varro	62	71	99

Group 1 and 2 tank mixes for grass control in wheat

Herbicide	Grft	Yeft	Bygr
Varro	62	93	99
Varro + Puma	55	89	99
Varro + Axial	48	93	99
Varro + Everest	78	74	99
Varro + GS	62	71	99

The importance of spraying narrowleaf hawksbeard in the fall



Narrowleaf hawksbeard control

Fall:

1. Glyphosate + Express (or Panoflex)
2. Glyphosate + Sharpen
3. Glyphosate + 2,4-D
4. Glyphosate + dicamba (be aware of rotation restrictions)

Spring:

1. Glyphosate + Sharpen
2. Glyphosate
3. In-crop wheat: Affinity BS + 2,4-D, GoldSky, Starane Flex + 2,4-D

Horseweed Escapes from Glyphosate

Horseweed control must start in the fall

Horseweed control

Fall:

1. Glyphosate + 2,4-D
2. Glyphosate + Sharpen
3. Glyphosate + dicamba (be aware of rotation restrictions)
4. Glyphosate + Valor + 2,4-D (may consider applying Valor separate)

Wheat:

1. Preplant Glyphosate + 2,4-D or with Sharpen
2. In-crop wheat: dicamba, 2,4-D, WideMatch, Starane NXT, Bronate, Huskie, Kochiavore, Weld

Horseweed control

Dry Pea:

1. Glyphosate + Sharpen (preplant/PRE)
2. Basagran (2 pt POST)

Horseweed control

Soybean preplant/PRE:

1. Glyphosate + 2,4-D ester (7 day plantback for ester)
2. Glyphosate + Sharpen
    - 1 oz: 0 days
    - 1.5 oz: 14 days
    - 2 oz: 30 days
3. Glyphosate + 2,4-D + Sharpen (follow plantback intervals)
4. 2,4-D + Gramoxone + Metribuzin
5. Apply residuals for suppression (Spartan, Valor, Metribuzin)

Horseweed control

Soybean POST:

1. Basagran + MSO: (2 pt POST) on small horseweed
2. FirstRate: will not control ALS-resistant plants
3. Dicamba: only apply approved dicamba formulations in dicamba-resistant soybeans.
4. Liberty: apply Liberty in LL soybeans only

CANOLA

Table 3. REDUCED RATE *SELECT MAX* TANK MIXES WITH BROADLEAF HERBICIDES FOR CANOLA
(Refer to the recommendation tables above for specific grasses and growth stages.)

PRODUCT	APPLICATION RATES/ACRE	ADJUVANT RECOMMENDATIONS	AMMONIUM SULFATE	
	ANNUAL GRASSES[1]		GROUND	AIR
Select Max[2] + Liberty®[3]	8 to 10 fl oz + 28 to 34 fl oz	NIS at 0.25% v/v	3 lbs/A	3 lbs/A
Select Max[2] + Stinger®[4]	8 to 10 fl oz + 0.33 pts/A	NIS at 0.25% v/v	3 lbs/A	3 lbs/A

(1) Annual grasses and sizes controlled with these tank mixtures are those that are identified in the **DIRECTIONS FOR REDUCED RATE USE TO CONTROL SMALL ANNUAL GRASSES** table.

(2) Do not apply *Select Max* tank mix during or after bolting or flowering or crop injury will occur.

FLAX

Table 7. REDUCED RATE *SELECT MAX* TANK MIXES WITH BROADLEAF HERBICIDES FOR FLAX (Refer to the recommendation tables above for specific grasses and growth stages.) (continued)

PRODUCT	APPLICATION RATES/ACRE	ADJUVANT	
	ANNUAL GRASSES(1)	GROUND	AIR
Select Max + Buctril(2, 3)	6 to 9 fl oz + 0.125 lb ai/A	AMS at 2.4 to 4.0 lbs/A + NIS at 0.125% v/v	AMS at 2.5 to 4.0 lbs/A
Select Max + MCPA(2, 3)	8 to 10 fl oz + 0.25 to 0.5 pt	AMS at 2.4 to 4.0 lbs/A + NIS at 0.125% v/v	AMS at 2.5 to 4.0 lbs/A
Select Max + Curtail® M(2, 3)	6 to 9 fl oz + 1.33 to 1.75 pt/A	AMS at 2.4 to 4.0 lbs/A + NIS at 0.125% v/v	AMS at 2.5 to 4.0 lbs/A

(1) Annual grasses and sizes controlled with these tank mixtures are those that are identified in the **DIRECTIONS FOR REDUCED RATE USE TO CONTROL SMALL ANNUAL GRASSES** table.

(2) Do not apply *Select Max* tank mix during or after the bud stage or to ornamental flax or crop injury may occur.

Pea, Shelled (*Pisum* spp.) Field Pigeon	30 days	9 to 16 fl oz[5]	12 to 16 fl oz	NIS at 0.25% v/v	None	Do not apply more than 16 fl oz/A per application. Do not apply more than one (1) application per acre per season. Apply before bloom but not later than 30 days prior to harvest.[9]

[9] Applications of *Select Max* to peas during the bloom period could result in severe crop injury, including loss of yield and delayed maturity.

Weed control in Faba bean

Herbicides tested in Faba bean

Sharpen
Spartan
Sharpen + Spartan
Authority MTZ
BroadAxe
Metribuzin
Prowl H2O
Valor
Fierce

Basagran
Raptor X
Have observed yield reduction when Raptor was applied alone (2 years)
Basagran + Raptor

***Not all these herbicides are labeled yet**

Upcoming IR-4 trials

- Reglone as a desiccant for flax, mustard, safflower
- Express preplant for dry pea

- *This means these uses may be labeled in 3-4 years

Spartan for safflower

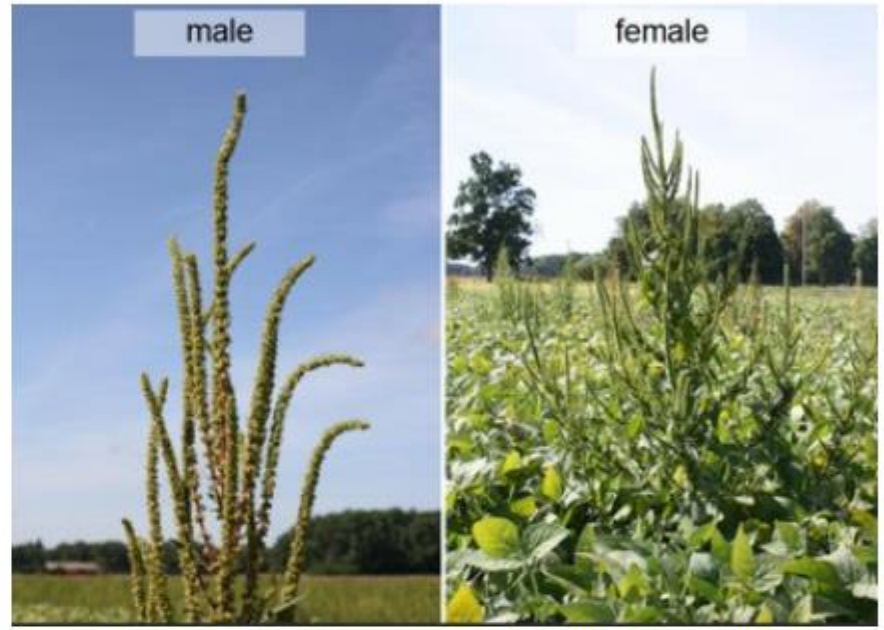
- **Label possible for 2017**
- **Indemnification statement**

Prevention and early detection are essential!!

Palmer amaranth

The #1 weed problem in the country is not in North Dakota, YET. We need to keep it that way. Palmer amaranth is a type of pigweed that has devastated crops in the South and Midwest. It has now been identified in SD, IA, and MN. We need to establish a zero tolerance for this weed. Palmer amaranth has these characteristics:

- Grows aggressively: Can grow 2 to 3 inches per day in optimum conditions
- Can grow to 6-8 feet tall
- Has reduced yield up to 91 percent in corn and 79 percent in soybean
- Prolific seed producer: Up to 1 million seeds per plant
- Emerges throughout the growing season
- Very prone to herbicide resistance (multiple modes of action)



Palmer amaranth seed heads, Photo Credit Christy Sprague, Michigan State University

Palmer amaranth identification

Palmer amaranth identification. Dr. Christy Sprague, Michigan State University

Eight Key Points to Palmer Amaranth and Waterhemp Identification. Penn State University
http://extension.psu.edu/pests/weeds/palmer-amaranth/eight-key-points-to-palmer-amaranth-and-waterhemp-identification

Palmer amaranth vs. Waterhemp, Ohio State University
https://www.youtube.com/watch?v=6UjFfOfWeXc

Palmer amaranth ID, Purdue University
https://www.youtube.com/watch?v=wNgRvvnPQJ8

Palmer amaranth in the news

Palmer amaranth in Iowa, Iowa State University (August 19, 2016 – Updated Sept 6)
http://crops.extension.iastate.edu/cropnews/2016/08/palmer-amaranth-iowa-what-we-know

Minnesota Crop News, University of MN (August 23, 2016)
http://blog-crop-news.extension.umn.edu/2016/08/palmer-amaranth-new-weed-threat-to.html

Herbicides that will control Palmer Amaranth

2,4-D
Banvel/Clarity
Status
Liberty
Glyphosate
Flexstar