

A wide-angle photograph of a field, likely a grain field, showing rows of golden-brown grain interspersed with patches of green weeds. The field extends to a flat horizon under a clear sky.

Kochia Control Update

Brian Jenks
North Dakota State University

Can you identify the crop?



Kochia burndown options in Sunflower

- **Glyphosate**
- **Aim**
- **Spartan Charge**
- **Gramoxone**

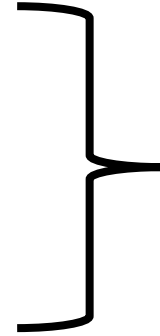
Group 14 Herbicides

Aim

Sharpen

Vida

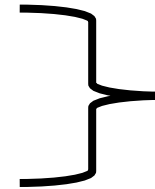
Reviton



**Burndown
herbicides**

Spartan products

Valor

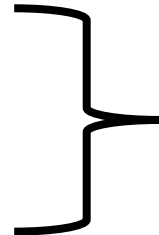


**Soil-applied
herbicides
(residual)**

Flexstar

Cobra

Ultra Blazer



**Foliar soybean
herbicides**

Aim 1 and 2 oz
with AMS + MSO

6 DAT

Kochia sprayed
at 2-2.5"

3 reps



Sharpen 1 & 2 oz
with AMS + MSO

13 DAT

Kochia sprayed
at 2-2.5"

3 reps

2X

1X

Susceptible

Minot

Berthold

Mandan

Mott



Kochia control with Aim

Resistant

Susceptible

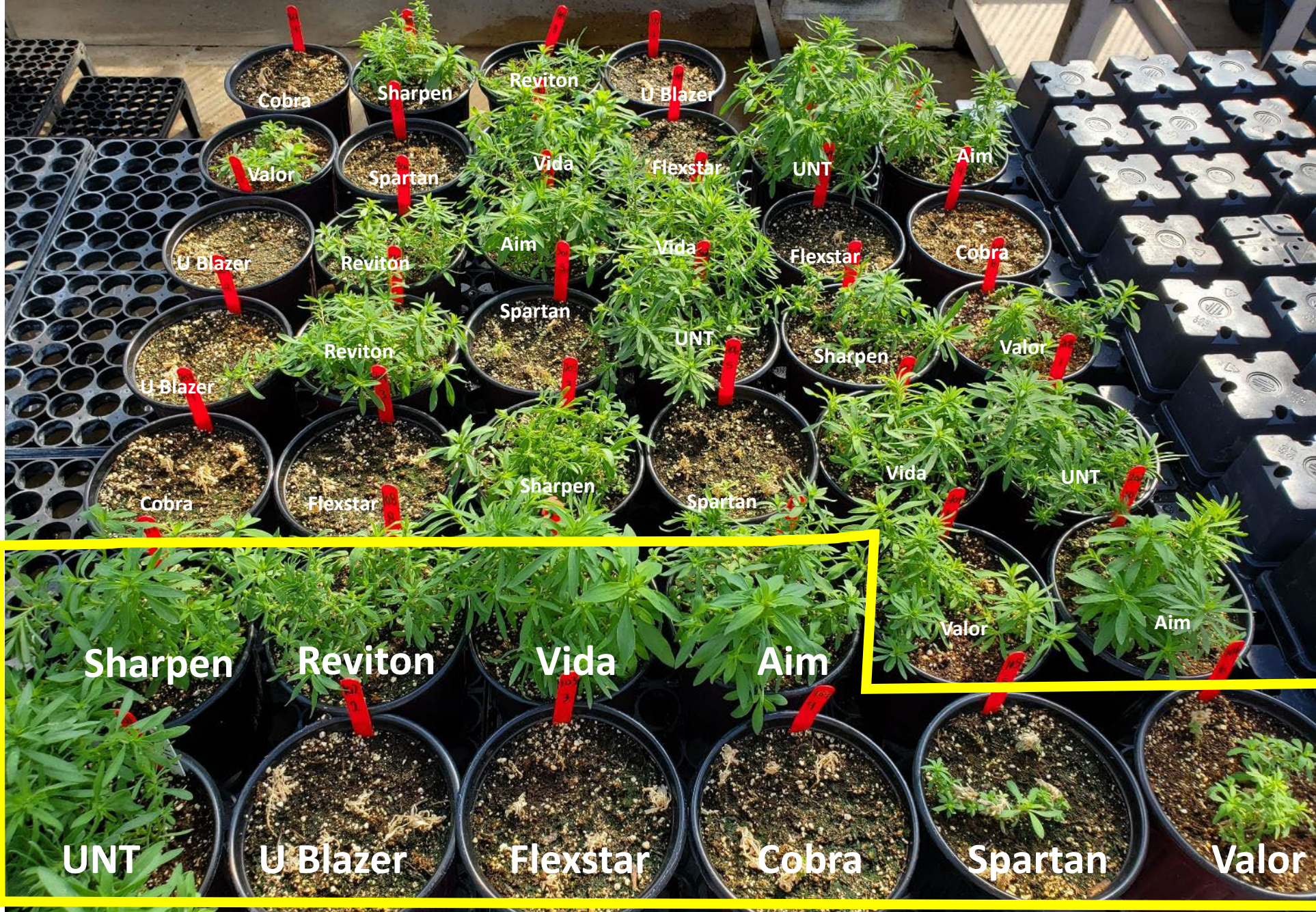


Photo: 6 DAT

Group 14 Classification

Class	Trade Name	Common Name
Diphenylether	Flexstar Cobra Ultra Blazer	Fomesafen Lactofen Acifluorfen
N-phenylimide	Valor Sharpen Reviton Cadet	Flumioxazin Saflufenacil Tiafenacil Fluthiacet
Phenylpyrazole	Vida	Pyraflufen
Triazolinone	Spartan Aim	Sulfentrazone Carfentrazone

Minot



Will Flexstar, Cobra, and Ultra Blazer control 4-inch kochia?

No. Target 1-3 inch kochia.

Susceptible



Mandan



Planted/Sprayed
Feb 22

Photo: 20 DAT

3 reps



1. Mott
2. Mandan
3. Berthold
4. Minot
5. Mohall-F
6. Mohall-I
7. Susceptible

Spring weed burndown options for sunflower

Treatment	Rate	Weed Control					
		Kochia		Lambsquarters		Yellow foxtail	
		-----%-----		-----%-----		-----%-----	
Untreated							
Glyph + Spartan Charge ^{ab}	20 oz + 5 oz						
Liberty ^a	29 oz						
Reglone ^c	1.5 pt						
Gramoxone ^c	2 pt						
Elevore ^b	1 oz						
Pixxaro ^b	6 oz						
LSD (0.05)							

^a Treatments applied with AMS (2.5 gal/100 gal)

^b Treatments applied with MSO (1 %)

^c Treatments applied with NIS (0.5 %)

Treatments applied May 30

Kochia: 1-4" (average 3")

Lambsquarters: 1-7" (average 4")

Yellow foxtail: 2"

Spring weed burndown options for sunflower

Treatment	Rate	Weed Control					
		Kochia		Lambsquarters		Yellow foxtail	
		-----%-----		-----%-----		-----%-----	
Bromoxynil	1 pt						
Bromoxynil + Armezon^{ab}	1 pt + 0.25 oz						
Bromoxynil + Armezon^{ab}	1 pt + 0.5 oz						
Spart + Brom + Armezon^{ab}	4 oz + 1 pt + 0.5 oz						
LSD (0.05)							

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		6-Jun	20-Jun	6-Jun	20-Jun	6-Jun	20-Jun
		-----%-----		-----%-----		-----%-----	
Untreated		0	0	0	0	0	0
Glyph + Spartan Charge ^{ab}	20 oz + 5 oz	57	48	99	99	99	98

^a Treatments applied with AMS (2.5 gal/100 gal)

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		-----%-----		-----%-----		-----%-----	
Untreated		0	0	0	0	0	0
Glyph + Spartan Charge ^{ab}	20 oz + 5 oz	57	48	99	99	99	98
Liberty ^a	29 oz	99	99	99	99	98	94

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		-----%-----		-----%-----		-----%-----	
Untreated		0	0	0	0	0	0
Glyph + Spartan Charge ^{ab}	20 oz + 5 oz	57	48	99	99	99	98
Liberty ^a	29 oz	99	99	99	99	98	94
Reglone ^c	1.5 pt	84	83	45	42	60	23

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		-----%-----		-----%-----		-----%-----	
Untreated		0	0	0	0	0	0
Glyph + Spartan Charge ^{ab}	20 oz + 5 oz	57	48	99	99	99	98
Liberty ^a	29 oz	99	99	99	99	98	94
Reglone ^c	1.5 pt	84	83	45	42	60	23
Gramoxone ^c	2 pt	99	99	99	99	97	93

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		-----%-----		-----%-----		-----%-----	
Untreated		0	0	0	0	0	0
Glyph + Spartan Charge ^{ab}	20 oz + 5 oz	57	48	99	99	99	98
Liberty ^a	29 oz	99	99	99	99	98	94
Reglone ^c	1.5 pt	84	83	45	42	60	23
Gramoxone	2 pt	99	99	99	99	97	93
Elevore ^b	1 oz	42	40	90	95	0	0

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		-----%-----		-----%-----		-----%-----	
Untreated		0	0	0	0	0	0
Glyph + Spartan Charge ^{ab}	20 oz + 5 oz	57	48	99	99	99	98
Liberty ^a	29 oz	99	99	99	99	98	94
Reglone ^c	1.5 pt	84	83	45	42	60	23
Gramoxone	2 pt	99	99	99	99	97	93
Elevore ^b	1 oz	42	40	90	95	0	0
Pixxaro ^b	6 oz	73	73	91	95	0	0
LSD (0.05)		7.1	7.7	4.5	5.5	4.8	10.3

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		Kochia		Lambsquarters		Yellow foxtail	
		6-Jun	20-Jun	6-Jun	20-Jun	6-Jun	20-Jun
		-----%-----		-----%-----		-----%-----	
Bromoxynil	1 pt	75	79	99	98	0	0

^a Treatments applied with AMS (2.5 gal/100 gal)

^b Treatments applied with MSO (1 %)

^c Treatments applied with NIS (0.5 %)

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		Kochia		Lambsquarters		Yellow foxtail	
		6-Jun	20-Jun	6-Jun	20-Jun	6-Jun	20-Jun
		-----%-----		-----%-----		-----%-----	
Bromoxynil	1 pt	75	79	99	98	0	0
Bromoxynil + Armezon ^{ab}	1 pt + 0.25 oz	98	94	99	99	64	50

^a Treatments applied with AMS (2.5 gal/100 gal)

^b Treatments applied with MSO (1 %)

^c Treatments applied with NIS (0.5 %)

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		Kochia		Lambsquarters		Yellow foxtail	
		6-Jun	20-Jun	6-Jun	20-Jun	6-Jun	20-Jun
		-----%-----		-----%-----		-----%-----	
Bromoxynil	1 pt	75	79	99	98	0	0
Bromoxynil + Armezon ^{ab}	1 pt + 0.25 oz	98	94	99	99	64	50
Bromoxynil + Armezon ^{ab}	1 pt + 0.5 oz	97	97	99	99	78	68

^a Treatments applied with AMS (2.5 gal/100 gal)

^b Treatments applied with MSO (1 %)

^c Treatments applied with NIS (0.5 %)

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Yellow foxtail: 2"

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		Kochia		Lambsquarters		Yellow foxtail	
		6-Jun	20-Jun	6-Jun	20-Jun	6-Jun	20-Jun
		-----%-----		-----%-----		-----%-----	
Bromoxynil	1 pt	75	79	99	98	0	0
Bromoxynil + Armezon ^{ab}	1 pt + 0.25 oz	98	94	99	99	64	50
Bromoxynil + Armezon ^{ab}	1 pt + 0.5 oz	97	97	99	99	78	68
Spart + Brom + Armezon ^{ab}	4 oz + 1 pt + 0.5 oz	96	96	99	99	74	65
LSD (0.05)		7.1	7.7	4.5	5.5	4.8	10.3

^a Treatments applied with AMS (2.5 gal/100 gal)

^b Treatments applied with MSO (1 %)

^c Treatments applied with NIS (0.5 %)

Treatments applied May 30

Kochia: 1-4" (average 3")

Lambsquarters: 1-7" (average 4")

Yellow foxtail: 2"

Spring weed burndown options for sunflower

Treatment	Rate	Sunflower injury		
		19-Jun	3-Jul	13-Jul
		-----%-----		
Untreated				
Glyphosate + Spartan Charge	20 oz + 5 oz			
Liberty	29 oz			
Reglone + Spartan + Metribuzin	1.5 pt + 4 oz + 6 oz			
Gramoxone + Spartan + Metribuzin + Dual	2 pt+4 oz+6oz+1.67 pt			
Elevore	1 oz			
Pixxaro	6 oz			
Bromoxynil	1 pt			
Bromoxynil + Armezon	1 pt + 0.25 oz			
Bromoxynil + Armezon	1 pt + 0.5 oz			
Spartan + Bromoxynil + Armezon	4 oz + 1 pt + 0.5 oz			
LSD (0.05)				

*Treatments applied PRE June 6

Rainfall: June 22 (0.47"); June 28 (0.20"); July 19 (0.39")

Spring weed burndown options for sunflower

Treatment	Rate	Sunflower injury		
		19-Jun	3-Jul	13-Jul
		-----%-----		
Untreated		0	0	0
Glyphosate + Spartan Charge	20 oz + 5 oz	0	0	0
Liberty	29 oz	0	0	0
Reglone + Spartan + Metribuzin	1.5 pt + 4 oz + 6 oz	0	0	0
Gramoxone + Spartan + Metribuzin + Dual	2 pt+4 oz+6oz+1.67 pt	0	0	0
Elevore	1 oz	0	0	0
Pixxaro	6 oz	0	0	0
Bromoxynil	1 pt	0	0	0
Bromoxynil + Armezon	1 pt + 0.25 oz	0	0	0
Bromoxynil + Armezon	1 pt + 0.5 oz	0	0	0
Spartan + Bromoxynil + Armezon	4 oz + 1 pt + 0.5 oz	0	0	0
LSD (0.05)		NS	NS	NS

*Treatments applied PRE June 6

Rainfall: June 22 (0.47"); June 28 (0.20"); July 19 (0.39")



HELP SAMPLE

Herbicide Resistant Pigweeds and Kochia



NDSU

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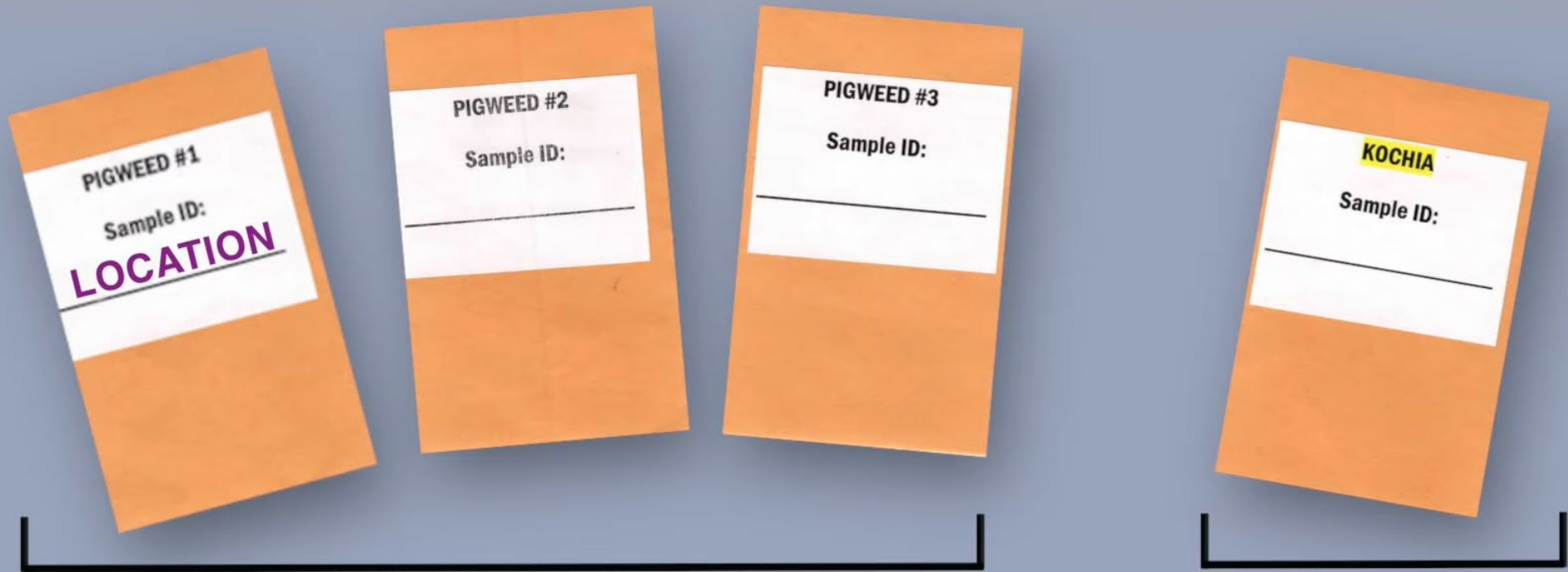
Zack Bateson

Research Manager / National Agricultural Genotyping Center
Fargo, North Dakota

I am Zach Batson, the research manager at the



Label Envelopes



envelope with a proper ID so you know where
that plant came from.



1:47 / 3:02

Scroll for details





waterhemp, go out to the field, identify one individual and collect two leaf samples from



Label/Submit Samples



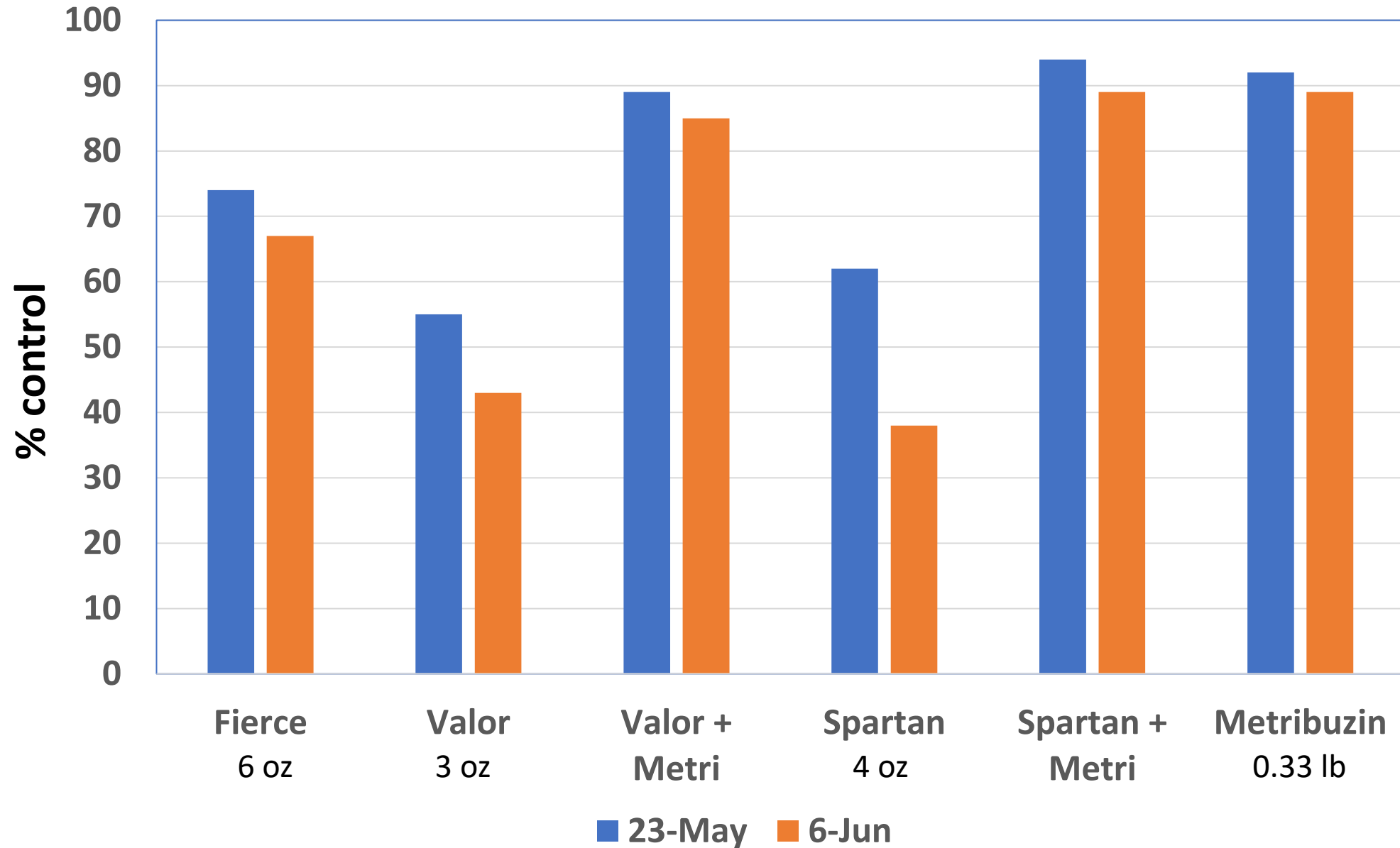
Results for pigweed 1-2 weeks. Kochia, longer.

**prepaid envelope that will be sent to the
National AG Genotyping Center for us to**

How to proceed with kochia?

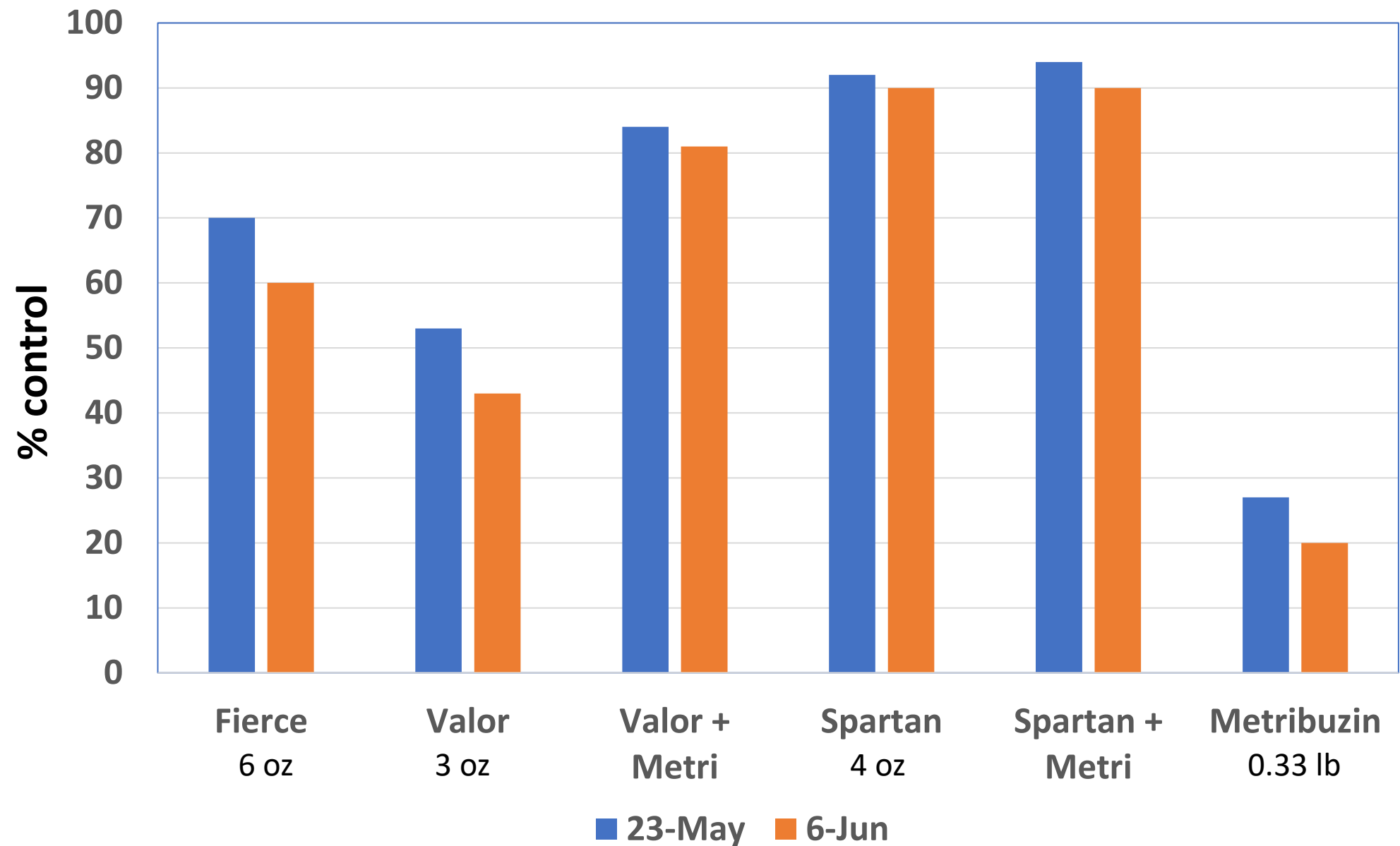
- **Group 14 resistance is not everywhere, but need to monitor for it**
- **Use different burndown products where possible**
 - **Sharpen, Aim**
 - **Roundup**
 - **Gramoxone**
 - **Dicamba (where appropriate)**
- **Monitor effectiveness 3-7 DAT**
- **If you see poor control, send leaves in for testing (pending)**
- **Use Metribuzin PRE (soybean and dry pea)**
- **Good options in corn, wheat**
- **Spray small kochia**

Kochia control with fall-applied herbicides

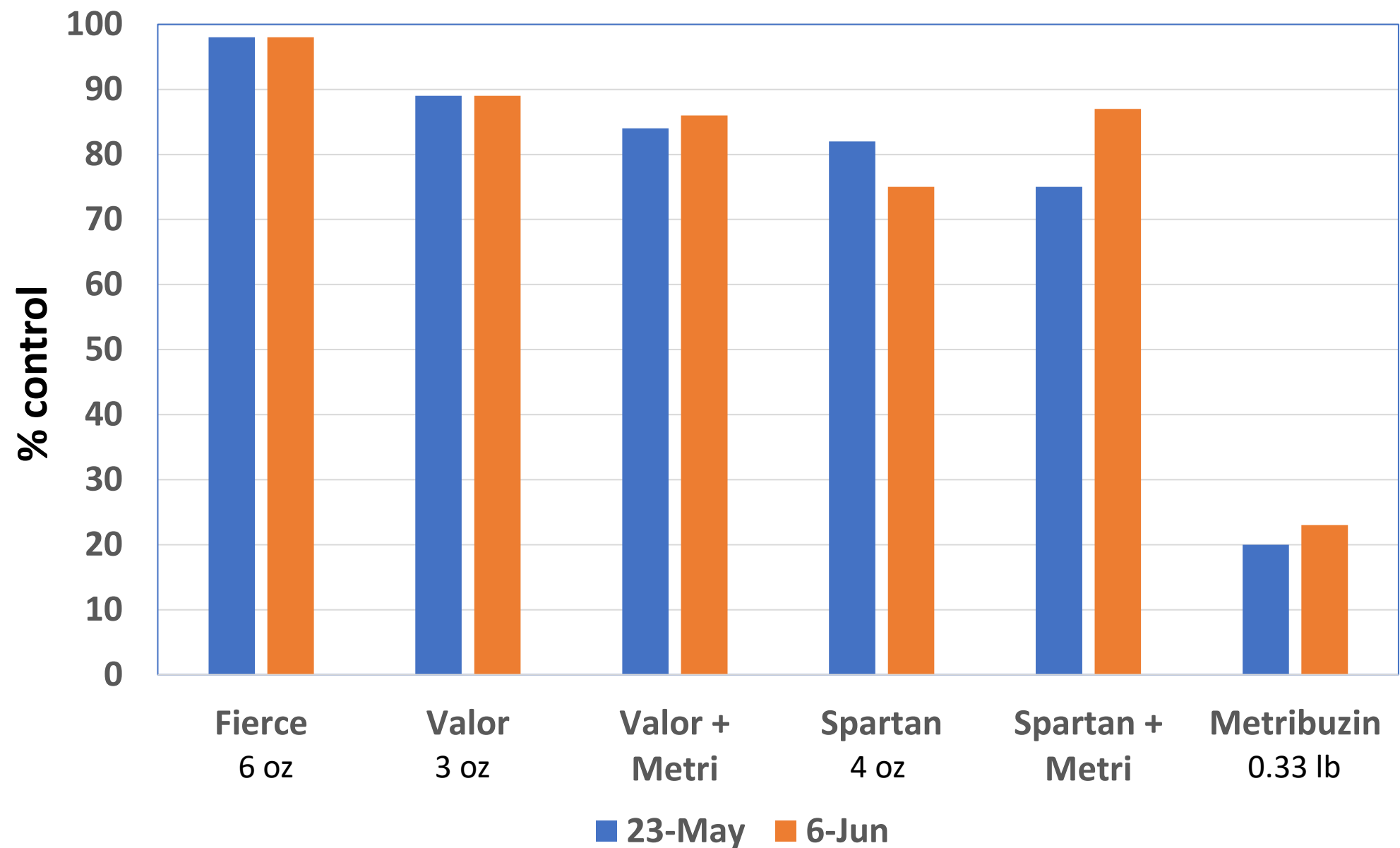


*All treatments applied Oct 18, 2022

Wild buckwheat control with fall-applied herbicides



Common Mallow control with fall-applied herbicides



Sunflower tolerance to fall- and spring-applied Valor and Spartan

Treatment ^a	Rate	Timing ^b	Injury			Density	Height	
			13-Jun	29-Jun	23-Jul	9-Jun	7-Jul	22-Jul
			-----%-----			#/m row	-----cm-----	
Untreated			0	0	0	4.4	62	135
Valor	3	Fall	0	0	0	4.8	60	139
Valor / Spartan ^a	3 / 4	Fall / PRE	0	0	0	4.6	63	139
Spartan ^a	4	PRE	1	0	0	5.2	69	138
Valor / Auth MTZ ^a	3 / 11	Fall / PRE	4	3	0	4.8	60	135
Authority MTZ ^a	11	PRE	6	5	2	5.8	68	138
Valor / Spartan + Sharpen ^a	3 / 4+1	Fall / PRE	6	11	7	4.7	55	125
Spartan + Sharpen ^a	4 + 1	PRE	5	6	7	4.6	53	120
<u>LSD (0.05)</u>			NS	NS	NS	NS	NS	<u>NS</u>

^aApplied with AMS + MSO (2.5% + 1%)

^bFall treatments applied October 8, 2019. Spring treatments applied preplant May 6, 2020.

Loam, pH 5.3, OM 3.2

Rainfall: May 9 (0.40"); May 24 (0.54")

Fall-applied Metribuzin prior to dry pea and lentil (2018-19)

		Crop injury		
		Dry pea	Lentil	Chickpea
Treatment ^a	Rate	June 10		
		-----%-----		
Untreated		0	0	0
Metrior	0.5 pt	0	1	0
Metrior	0.75 pt	0	5	0
Metrior	1 pt	4	11	5
Metrior + Valor	0.75 pt + 2 oz	0	0	0
Metrior + Valor	0.75 pt + 3 oz	0	0	0
Metrior + Panoflex	0.75 pt + 0.4 oz	18	31	25
Metrior + Panoflex	0.75 pt + 0.6 oz	21	34	26
Metrior + Sonalan HFP	0.75 pt + 2 pt	0	0	0
Metrior + Prowl H2O	0.75 pt + 3 pt	0	3	0
LSD (0.05)		5.2	5.6	6.1

No yield diff

^a Glyphosate was applied to all treatments fall and spring

*Applied Nov 22, 50 F

Loam, OM 2.3%, pH 8.0

0.5 pt 4L = 0.33 lb product 75DF

Source: Ed Davis, MSU

Fall-applied Metribuzin for NLHB control in dry pea and lentil (2019-20)

		Crop injury				Weed control
		Dry pea		Lentil		NLHB
Treatment ^a	Rate	Jun 4	Jul 9	Jun 4	Jul 9	Jul 9
		-----%-----				# per plot
Untreated		0	0	0	0	13.5
Metrior	0.5 pt	0	0	0	0	1.5
Metrior	0.75 pt	0	0	0	0	0.3
Metrior	1 pt	0	3	0	3	0.3
Metrior + Valor	0.75 pt + 2 oz	0	0	5	0	1.3
Metrior + Valor	0.75 pt + 3 oz	0	0	12	0	0.0
Metrior + Panoflex	0.75 pt + 0.4 oz	0	0	0	0	0.3
Metrior + Panoflex	0.75 pt + 0.6 oz	1	0	12	4	1.0
Metrior + Sonalan HFP	0.75 pt + 2 pt	0	0	0	0	0.8
Metrior + Prowl H2O	0.75 pt + 3 pt	4	0	11	0	0.3
LSD (0.05)		NS	NS	7.7	NS	3.5

^a Glyphosate was applied to all treatments fall and spring