

Sugarbeet sensitivity to dicamba at low dose

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NDSU | EXTENSION



Dicamba damage to susceptible soybean

- Cupping leaf phenotype appears 14 to 21 days after application
- Areas with the most Xtend soybean and sprayed with Engenia, XtendiMax, or FeXapan are areas with the greatest amount of off-target movement and damage to sensitive soybean
- Air temperature and lack of precipitation exasperates damage
 - Volatility might be related to air temperature?
 - Volatility might be related to lack of precipitation?
- Soybean in 'R-stages' are more sensitive



Objective was to evaluate sugarbeet sensitivity to dicamba at low dose

- Determine if dicamba volatility or particle movement injures sugarbeet.
- Determine if dicamba residues accumulate in leaf or root tissue and if they are present at harvest.

Dicamba at 1/1000x, 1/100x, 1/10x and labeled rate



Materials and Methods

2017 experiments

- Experiments at Comstock, MN, and Amenia, ND
- Dicamba at 1/10x, 1/33x (Comstock), 1/100x and 1/1000x (Amenia) of labeled rate with a backpack sprayer
- Visual assessment of growth reduction and malformation injury (Amenia)
- Drone imagery 3 and 16 DAT (Comstock) to get LAI
- Leaf and root tissue samples 17 and 38 DAT (Amenia)
- Harvested September 29, 2017 at Comstock

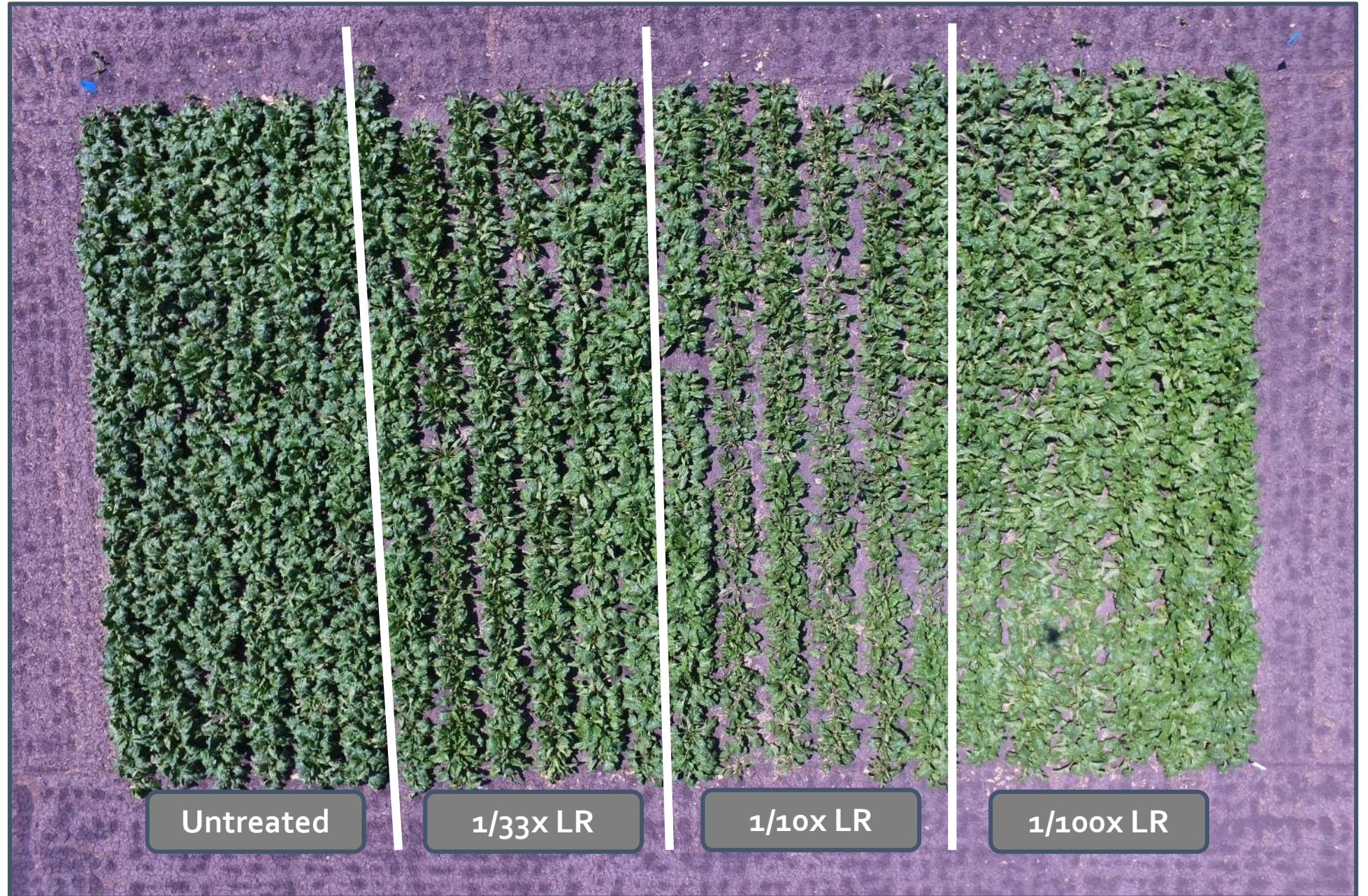
Sugarbeet malformation injury from XtendiMax, 7 to 10 DAT (early) and 17 to 35 DAT (late) at Amenia, ND

Rate (lb/acre)	Percent of labeled rate	Visual malform injury early	Visual malform injury late
		%	%
0.05	1/10X	35	55
0.005	1/100X	5	20
0.0005	1/1000X	0	6

XtendiMax at 1/10x the labeled rate, applied June 19, image 3 DAT



Drone
image from
July 5,
16 DAT



Simulated dicamba particle movement on sugarbeet, at 1/10x, 1/33x, and 1/100x labeled rate, Comstock, MN, 2017

Treatment ^a	Rate	Plot canopy Jul 5	Yield	Sugar	Recoverable Sugar
	% of LR	(cm ²)	(tons/acre)	(%)	(lb/acre)
XtendiMax	1/10x	16,400 b	23.9 b	15.3	5,682 b
XtendiMax	1/33x	28,000 ab	27.7 a	15.8	6,889 a
XtendiMax	1/100x	32,500 a	29.9 a	16.1	7,678 a
Untreated		29,700 a	28.4 a	15.0	6,761 b
LSD (0.10)		12,928	2.6	NS	1,151

^aXtendiMax applied at 3.3 fl oz/a, 1.0 fl oz/a, and 0.33 fl oz/a at the 10 to 12-lf stage

Dicamba residue measured in sugarbeet tissue 17 and 38 DAT, Amenia, ND, 2017

Rate		17 DAT		38 DAT	
		Leaf	Root	Leaf	Root
(lb/acre)	(% of LR)	-----(ppm)-----			
0.5	X	0.57	0.48	1.40	0.47
0.05	1/10X	0.11	0.07	0.07	0.06
0.005	1/100X	0.12	0.01	0.01	0
0.0005	1/1000X	0	0.001	0	0
0		0	0	0	0

Materials and Methods

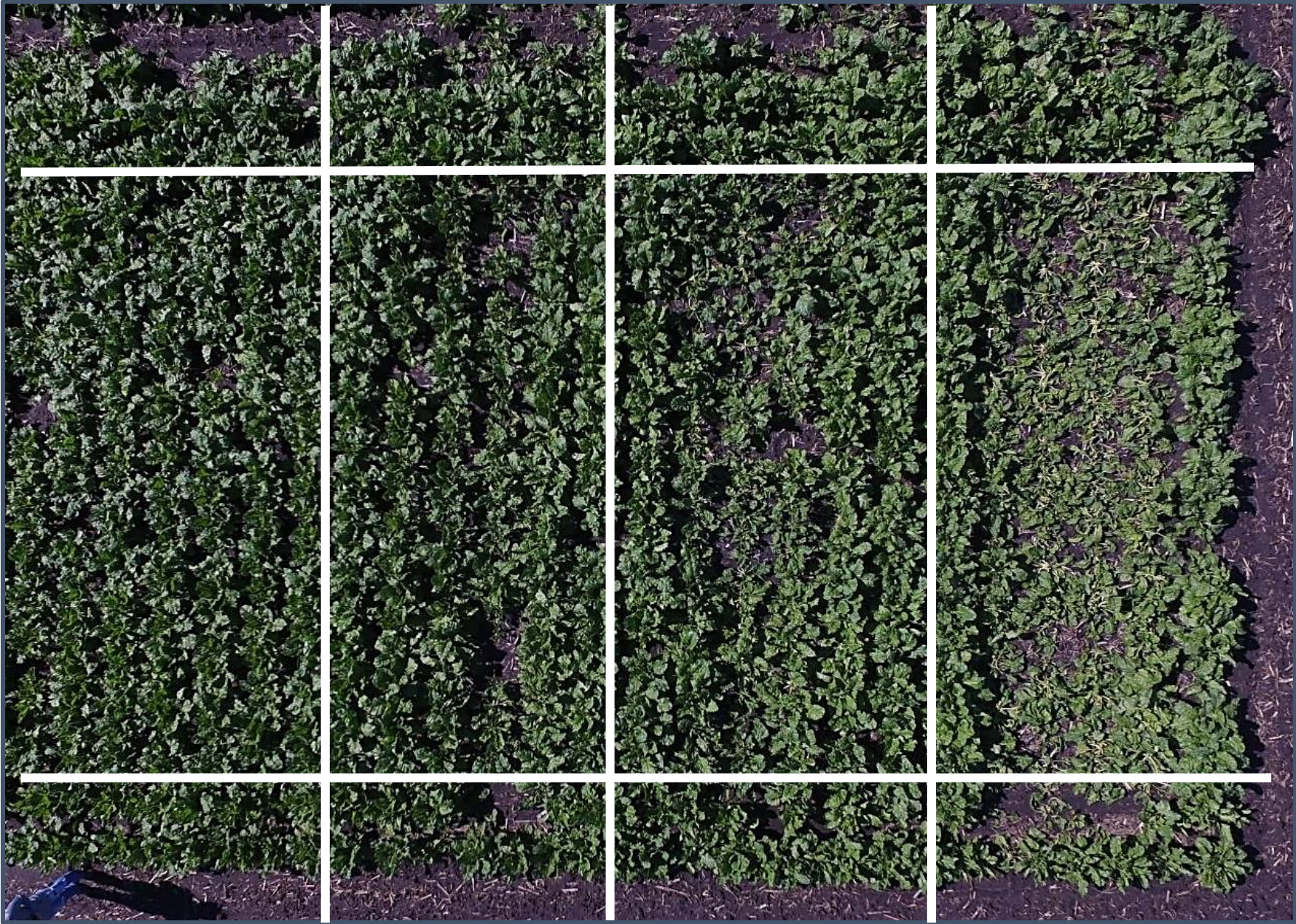
2018 experiments

- Experiments at Norcross, MN, and Amenia, ND, in 2018
- Dicamba at 1/10x, 1/33x, 1/100x (Norcross), and 1/2x, 1/20x, 1/200x (Amenia) of labeled rate with a backpack sprayer
- Visual assessment of growth reduction and malformation injury (Amenia)
- Drone imagery 2 and 15 DAT (Norcross) to get LAI
- Leaf and root tissue samples at two harvest timings
 - Preharvest = 58 to 69 DAT; Harvest = 84 to 94 DAT
- Harvested September 22 (Norcross) and September 18 (Amenia)

**Sugarbeet
malformation
injury, 2 DAT**



Drone image, 5 July
2018, 15 DAT



Untreated

1/100x LR

1/33x LR

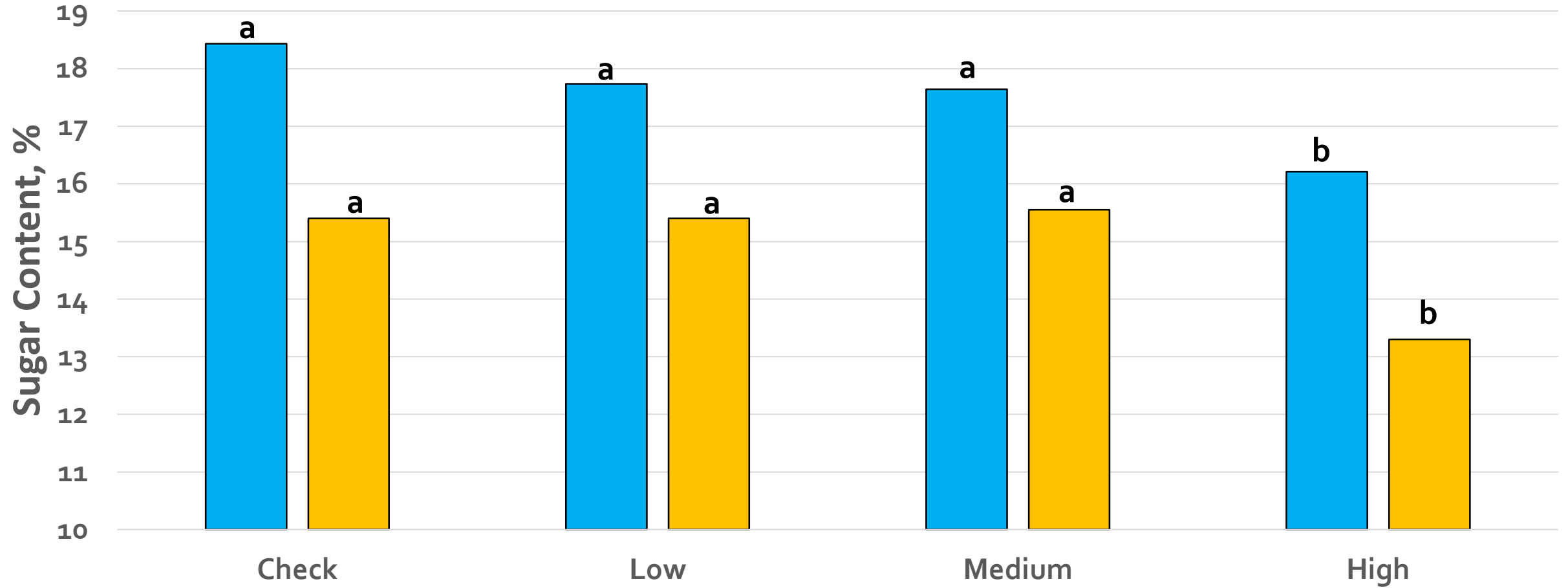
1/10x LR

Sugarbeet malformation and growth reduction injury from dicamba, 12 DAT, Amenia, ND, and plot canopy, 15 DAT, Norcross, MN, 2018

Dicamba rate ^a	Visual malform	Growth reduction	Plot canopy
	%	%	(cm ²)
Untreated check	0 c	0 c	303,400 a
High	100 a	100 a	210,000 c
Medium	60 b	50 b	257,000 b
Low	0 c	15 c	289,100 a
LSD (0.10)	30.2	16.9	31,375

^aHigh = 1/2x or 1/10x LR; Medium = 1/20x or 1/33x LR; Low = 1/200x or 1/100x LR

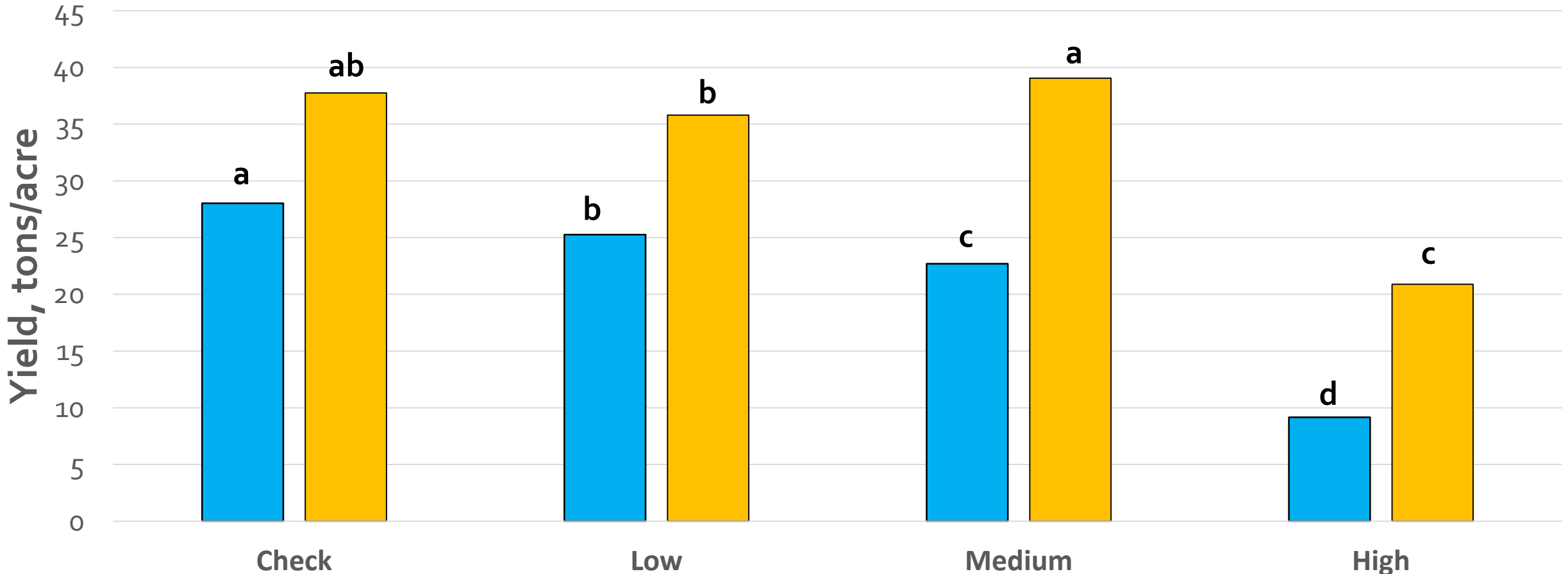
Sugarbeet sensitivity to dicamba at low dose, Norcross, MN, and Amenia, ND, 2018



LSD (0.10):
Norcross = 1.14
Amenia = 1.41

■ Norcross ■ Amenia

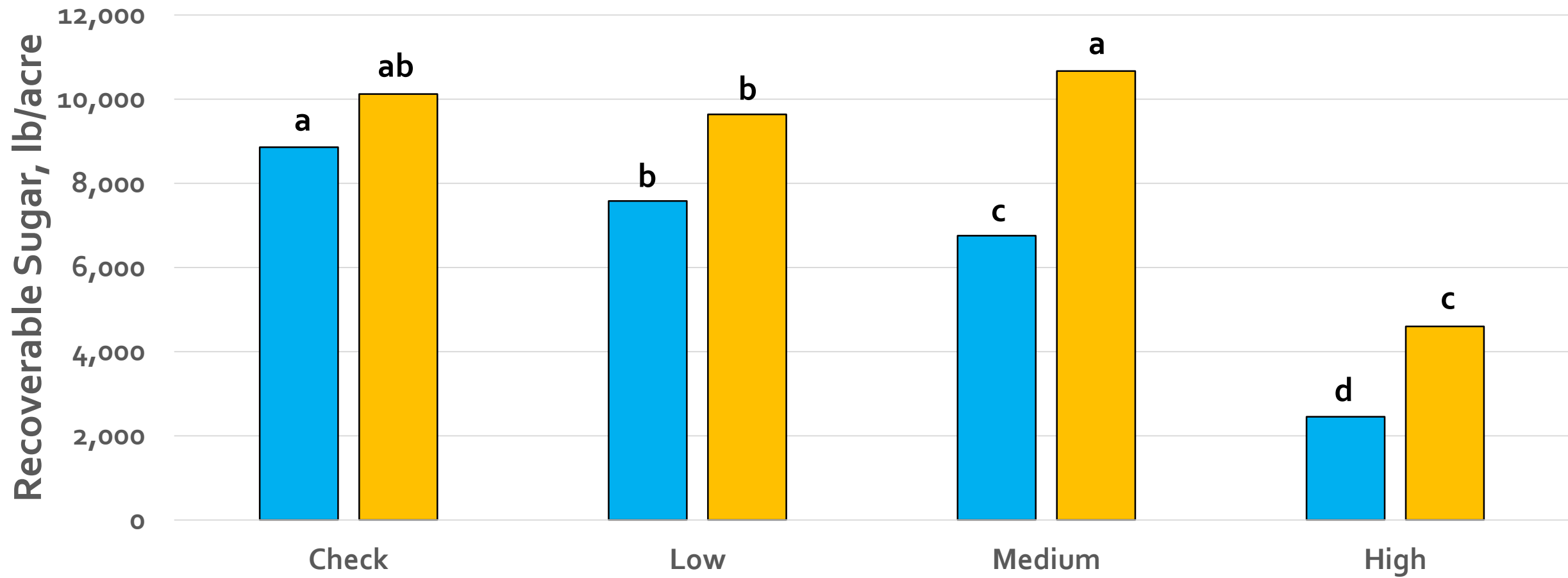
Sugarbeet sensitivity to dicamba at low dose, Norcross, MN, and Amenia, ND, 2018



LSD (0.10):
Norcross = 2.13
Amenia = 3.24

■ Norcross ■ Amenia

Sugarbeet sensitivity to dicamba at low dose, Norcross, MN, and Amenia, ND, 2018



LSD (0.10):
Norcross = 578
Amenia = 833

■ Norcross ■ Amenia

Dicamba residue measured in leaf and root tissue at Amenia, ND, 2018

Rate (lb/acre)	% of LR	58 DAT		84 DAT	
		Leaf	Root	Leaf	Root
		-----(ppm)-----			
0.25	1/2X	0.165 a	0.110 a	0.027 a	o
0.025	1/20X	0.045 b	o b	o b	o
0.0025	1/200X	o c	o b	o b	o
o	Untreated	o c	o b	o b	o
LSD (0.10)		0.042	0.060	0.012	NS

Dicamba residue measured in leaf and root tissue at Norcross, MN, 2018

Rate	% of LR	69 DAT		94 DAT	
		Leaf	Root	Leaf	Root
(lb/acre)		-----(ppm)-----			
0.05	1/10X	0.014 a	0.030	0	0
0.165	1/33X	0.012 a	0	0	0
0.005	1/100X	0 b	0	0.003	0
0	Untreated	0 b	0	0	0
LSD (0.10)		0.010	NS	NS	NS



Discolored sugarbeet at Amenia, ND, 2018



Untreated
Check

1/200x LR

1/20x LR

1/2x LR

Summary

- Sugarbeet is not as sensitive to dicamba as some of the other rotational crops (i.e. soybean or sunflower)
- Sugarbeet leaves will lay flat on the ground within a few hours of exposure, regardless of rate
 - Higher dosage = Greater visible injury
 - Leaves may remain more prostrate than normal for the remainder of the growing season, especially if the injury is severe
- New leaf growth will generally resume around 6 – 10 days after exposure
 - The new leaves will likely have crinkled leaf margins, parallel veins, or leaf strapping
- Dicamba is rapidly metabolized by sugarbeet
 - It is unlikely dicamba residue will be detected in the roots at harvest
- 1/10x rate was near the tipping point for yield and quality loss