

Variety x Nitrogen Study

2023 Field Trial

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Research Objectives

Identify the best performing varieties for growers with high nitrogen soils

2022 Conclusions

- varieties responded differently to high nitrogen
- variety selection was key to getting the best performance from high-N soils





Methodology



Design

Experimental design split plot
main plot factor 34 varieties
sub-plot factor 3 nitrogen levels

Treatments

nitrogen levels Control-N 240 lb N/A
Low-N 135 lbN/A
High-N 500 lb N/A

Replication 8
Plot Size 4 row x 30 ft.
Plant Date 5/1/2023
Row Spacing 22 inch
Plant Spacing 8 inch
Irrigation solid set
Previous crop wheat
Harvest Date 10/2/2023



Varieties



BTS 2024
BTS 210N
BTS 228NC
BTS 2523
BTS 2559
BTS 2627
BTS 278N
BTS 2937



Crystal A068
Crystal A095NT
Crystal A179NT
Crystal A263
Crystal A501
Crystal A702NT
Crystal A793
Crystal A862NT



HIL 2355NT
HIL 2356NT
HIL 2357NT
HIL 2384
HIL 2415NT
HIL 2416NT
HIL 2432NT
HIL 9916
HM RT9334RR



SX 1578N
SX 3526N
SX 3527N
SX 3584



SESVANDERHAVE
sugar beet seed

SV 014N
SV 099N
SV 101N
SV 123N
SV 183N





Results



Data

V x N interaction effect

Nitrogen main effect

Variety	Yield T/A			Variety Effect	
	<i>Variety x Nitrogen Level</i>			Mean	Groups
	Low-N	Control-N	High-N		
BTS 2024	32.0 EFGHIJKLM	46.7 uvwxyzAB	53.3 defghi	44.0	defghijk
BTS 210N	29.3 JKLMNO	44.6 ABC	51.8 efghijklmno	41.9	lm
BTS 228N	32.6 EFGH	46.9 uvwxyzAB	51.3 fghijklmno	43.6	efghijklm
BTS 2523	32.6 EFGH	50.1 jklmnopqrs	56.8 abc	46.5	abc
BTS 2559	29.0 MNO	49.7 klmnopqrst	54.2 cdef	44.3	defghi
BTS 2627	32.4 EFGHI	49.6 lmnopqrstu	54.9 bcd	45.7	abcd
BTS 278N	29.2 KLMNO	47.8 qrstuvwxyz	53.0 defghij	43.3	ghijklm
BTS 2937	29.6 HIJKLMNO	45.2 zABC	53.4 defgh	42.8	hijklm
Crystal A068	31.5 EFGHIJKLM	47.7 rstuvwxyZA	53.6 defg	44.2	defghij
Crystal A095NT	32.3 EFGHIJK	47.8 qrstuvwxyz	53.5 defgh	44.6	defgh
Crystal A179NT	31.4 EFGHIJKLM	43.6 CD	52.1 defghijklm	42.4	jklm
Crystal A263	29.4 IJKLMNO	45.1 zABC	53.2 defghi	42.6	ijklm
Crystal A501	34.1 E	49.4 lmnopqrstu	57.6 ab	47.0	a
Crystal A702NT	32.2 EFGHIJKL	48.3 pqrstuvwxy	52.0 defghijklm	44.2	defghij
Crystal A793	33.4 EF	48.8 opqrstuvw	58.0 a	46.7	ab
Crystal A862NT	32.4 EFGHI	49.4 lmnopqrstu	52.9 defghij	44.9	bcdefg
HIL 2355NT	31.1 EFGHIJKLM	48.5 pqrstuvw	50.8 ghijklmnop	43.5	efghijklm
HIL 2356NT	31.0 EFGHIJKLM	46.4 vwxyzABC	48.9 nopqrstuvw	42.1	klm
HIL 2357NT	31.8 EFGHIJKLM	47.5 rstuvwxyZA	52.0 defghijklm	43.8	defghijkl
HIL 2384	31.8 EFGHIJKLM	45.9 xyzABC	50.5 hijklmnop	42.7	hijklm
HIL 2415NT	31.0 FGHJKLMN	47.3 stuvwxyZA	52.5 defghijkl	43.6	efghijklm
HIL 2416NT	28.7 NO	48.4 pqrstuvwxy	52.2 defghijklm	43.1	ghijklm
HIL 2432NT	28.2 O	40.7 D	47.1 tuvwxyzA	38.7	n
HIL 9916	31.2 EFGHIJKLM	43.8 BC	50.3 ijklmnopqr	41.8	m
HM RT9334RR	29.1 LMNO	45.4 yzABC	54.6 bcde	43.1	ghijklm
SV 014N	30.2 GHIJKLMNC	46.2 wxyzABC	53.2 defghij	43.2	ghijklm
SV 099N	32.7 EFG	47.0 uvwxyzA	51.3 fghijklmno	43.7	defghijklm
SV 101N	32.1 EFGHIJKL	48.8 opqrstuvw	51.7 efghijklmno	44.2	defghij
SV 123N	31.9 EFGHIJKLM	49.2 mnopqrstu	51.3 fghijklmno	44.1	defghij
SV 183N	33.9 EF	49.3 mnopqrstu	52.7 defghijk	45.3	abcdef
SX 1578N	33.9 EF	49.4 lmnopqrstu	53.2 defghi	45.5	abcde
SX 3526N	32.3 EFGHIJ	48.6 pqrstuvw	53.2 defghi	44.7	cdefg
SX 3527N	30.9 FGHJKLMN	47.9 qrstuvwxyz	48.8 opqrstuvw	42.5	ijklm
SX 3584	32.5 EFGH	48.7 opqrstuvw	52.4 defghijkl	44.6	cdefgh
Nitrogen Effect Mean	31.4 c	47.4 b	52.6 a		
Main Effects					
Nitrogen Level (Pr>F)	<0.001				
Variety (Pr>F)				<0.001	
Interaction Effect					
Variety x N (Pr>F)	<0.001				

Variety main effect





 **Variety Main Effects**



Yield

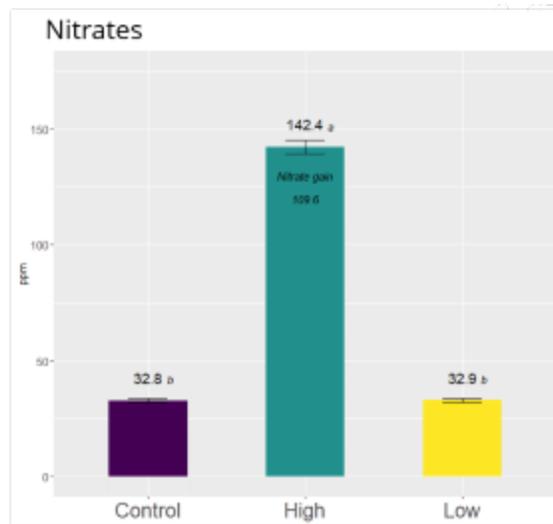
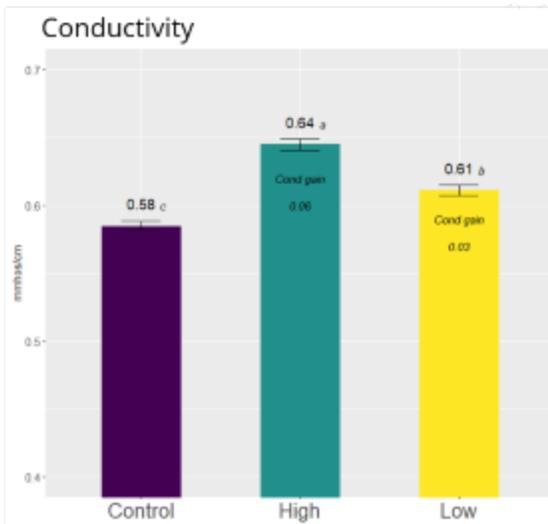
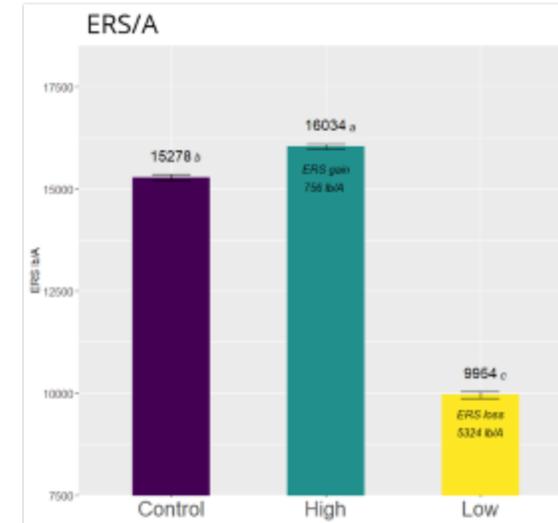
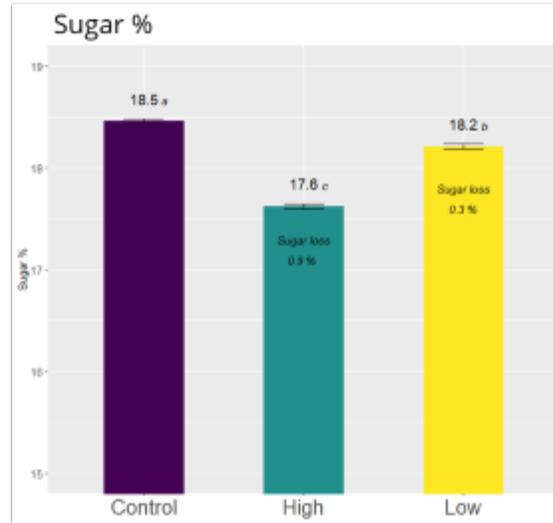
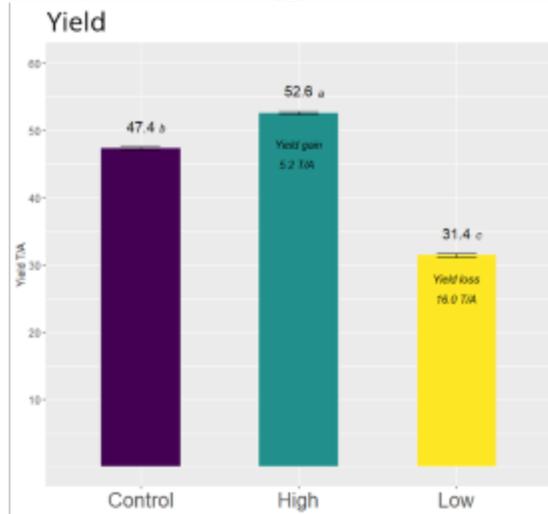
Variety	Yield T/A	Groups
Crystal A501	47.0	a
Crystal A793	46.7	ab
BTS 2523	46.5	abc
BTS 2627	45.7	abcd
SX 1578N	45.5	abcde
SV 183N	45.3	abcdef
Crystal A862NT	44.9	bcdefg
SX 3526N	44.7	cdefg
SX 3584	44.6	cdefgh
Crystal A095NT	44.6	defgh
BTS 2559	44.3	defghi
SV 101N	44.2	defghij
Crystal A068	44.2	defghij
Crystal A702NT	44.2	defghij
SV 099N	43.7	defghijklm
BTS 228NC	43.6	efghijklm
HIL 2415NT	43.6	efghijklm
HIL 2355NT	43.5	fghijklm
BTS 278N	43.3	ghijklm
SV 014N	43.2	ghijklm
HIL 2416NT	43.1	ghijklm
HM RT9334RR	43.1	ghijklm
BTS 2937	42.8	hijklm
HIL 2384	42.7	hijklm
Crystal A263	42.6	ijklm
SX 3527N	42.5	ijklm
Crystal A179NT	42.4	jklm
HIL 2356NT	42.1	klm
BTS 210N	41.9	lm
HIL 9916	41.8	m
HIL 2432NT	38.7	n
<i>mean</i>	43.8	
<i>F>P</i>	<0.001	

Variety had a significant effect on Yield, Sugar %, ERS/A, Conductivity, and Nitrates



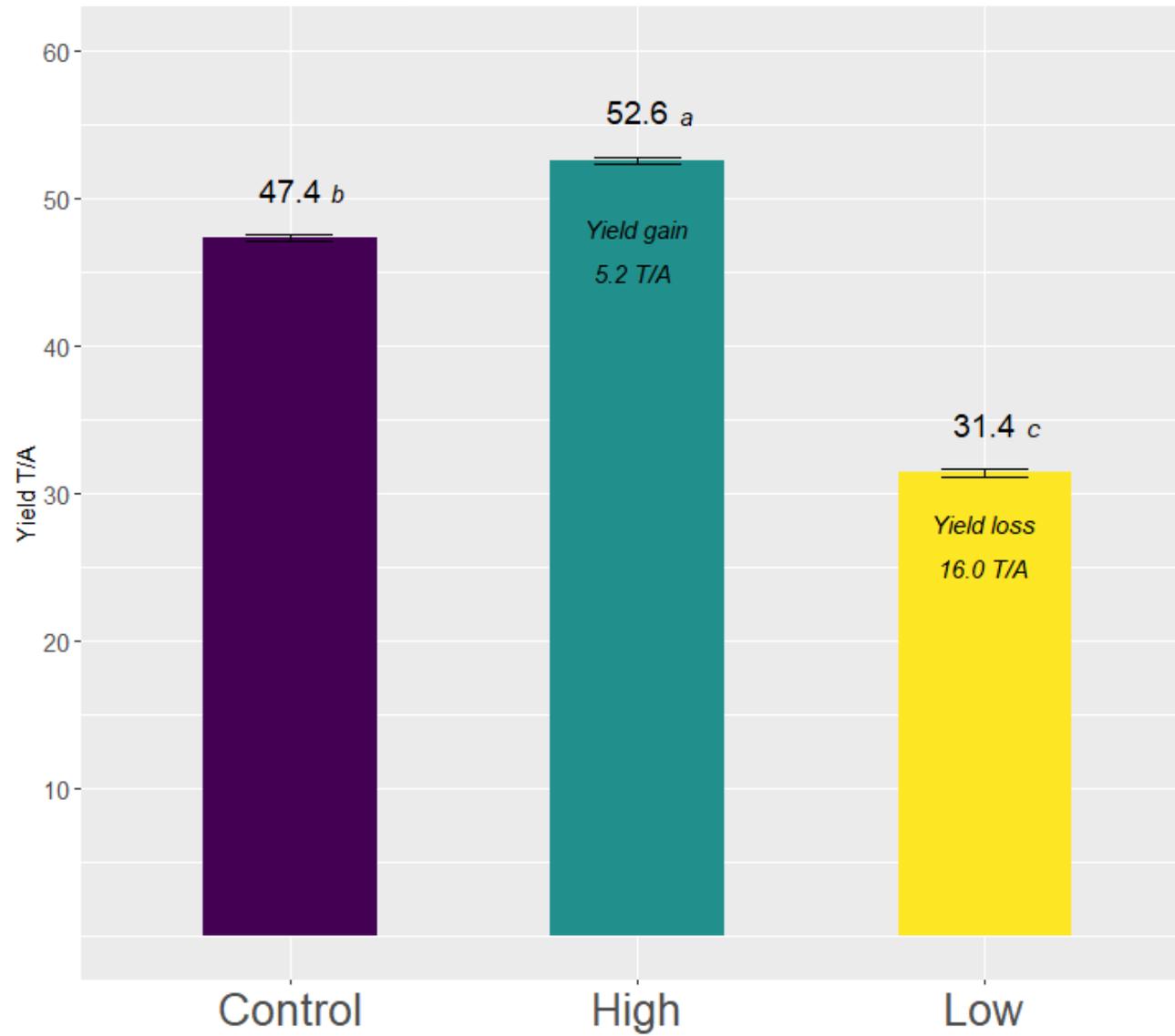
Nitrogen Main Effects

Nitrogen Main Effects

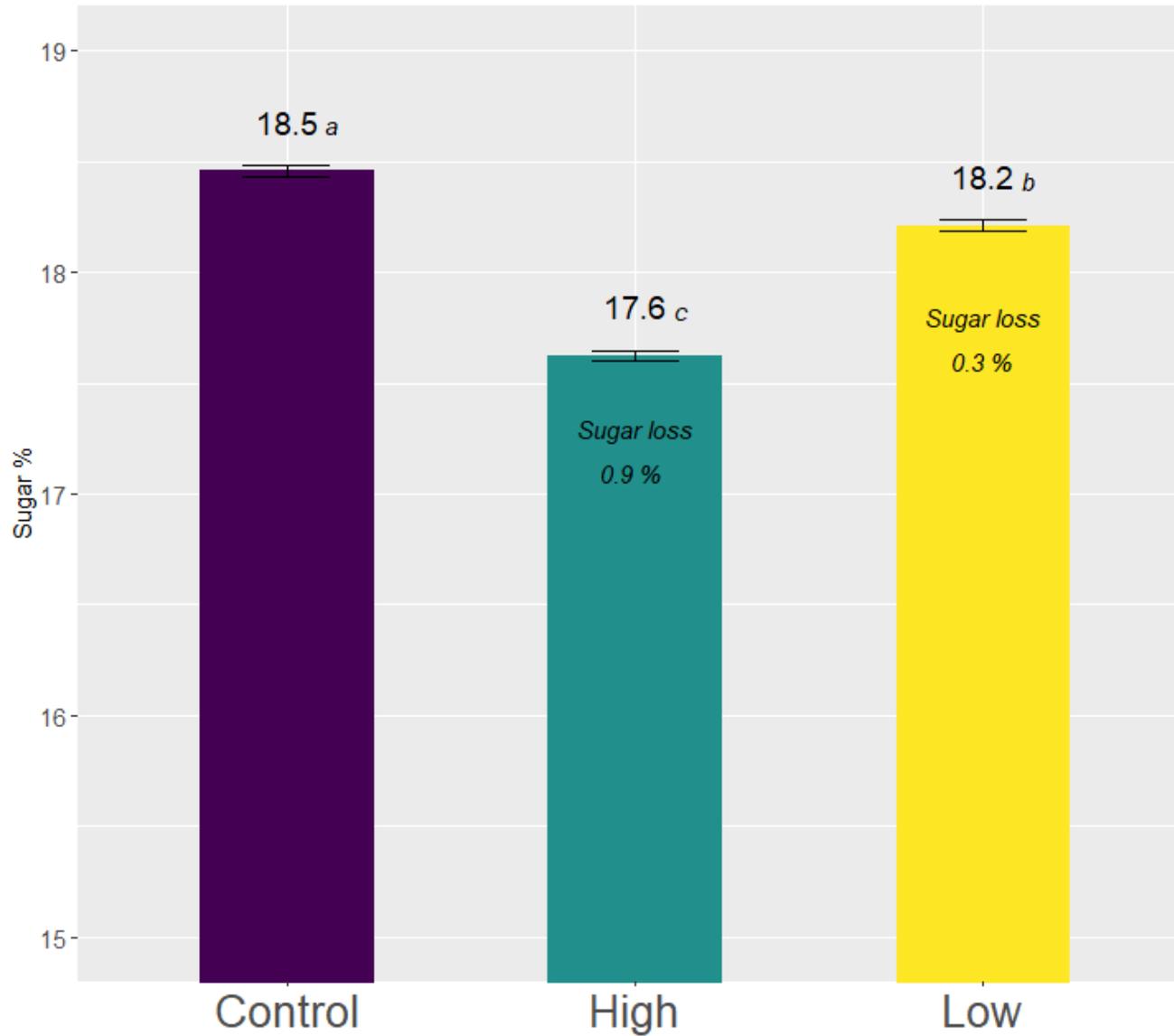


- Nitrogen averaged across varieties
- Average impact of the 3 nitrogen levels

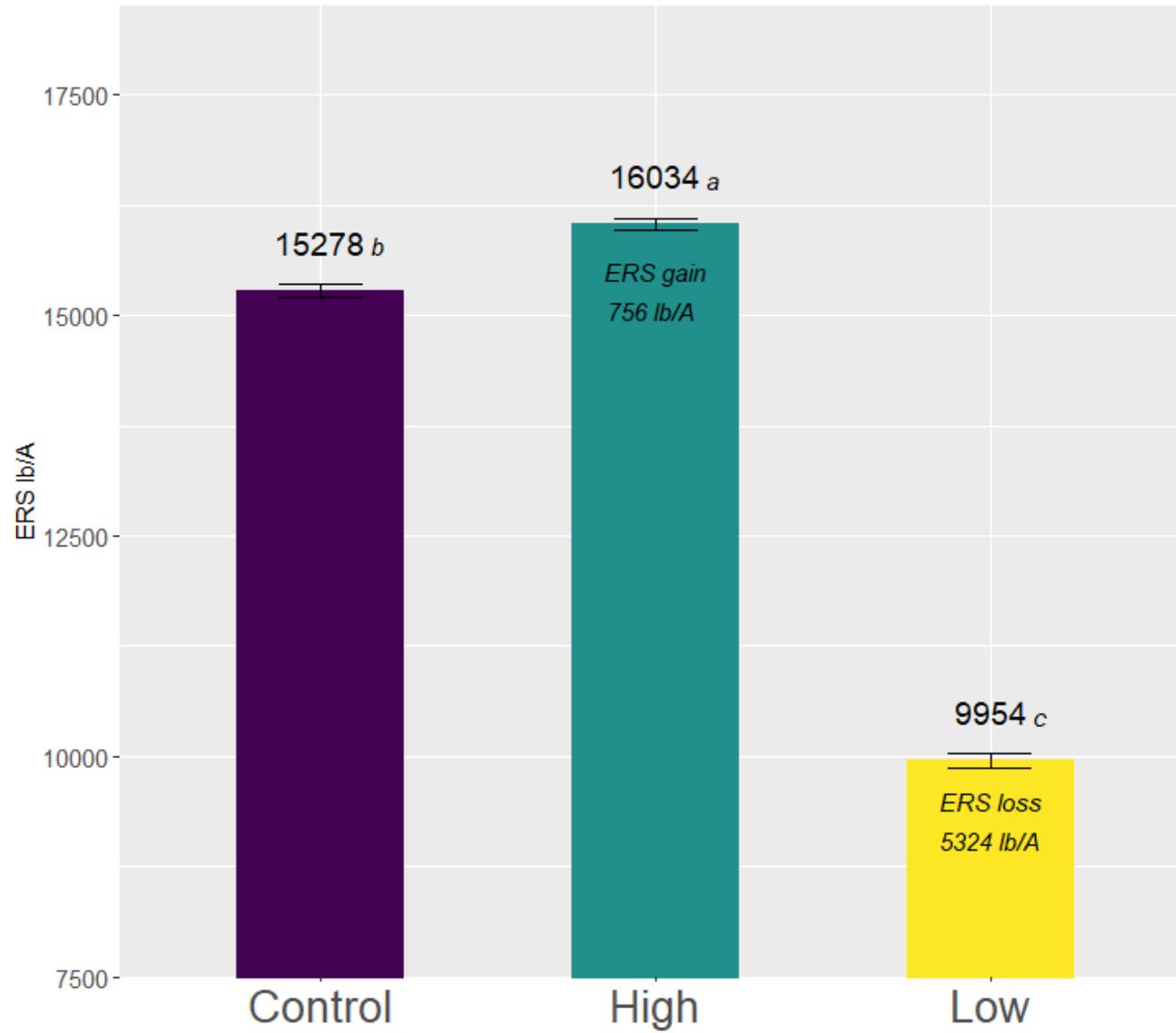
Yield



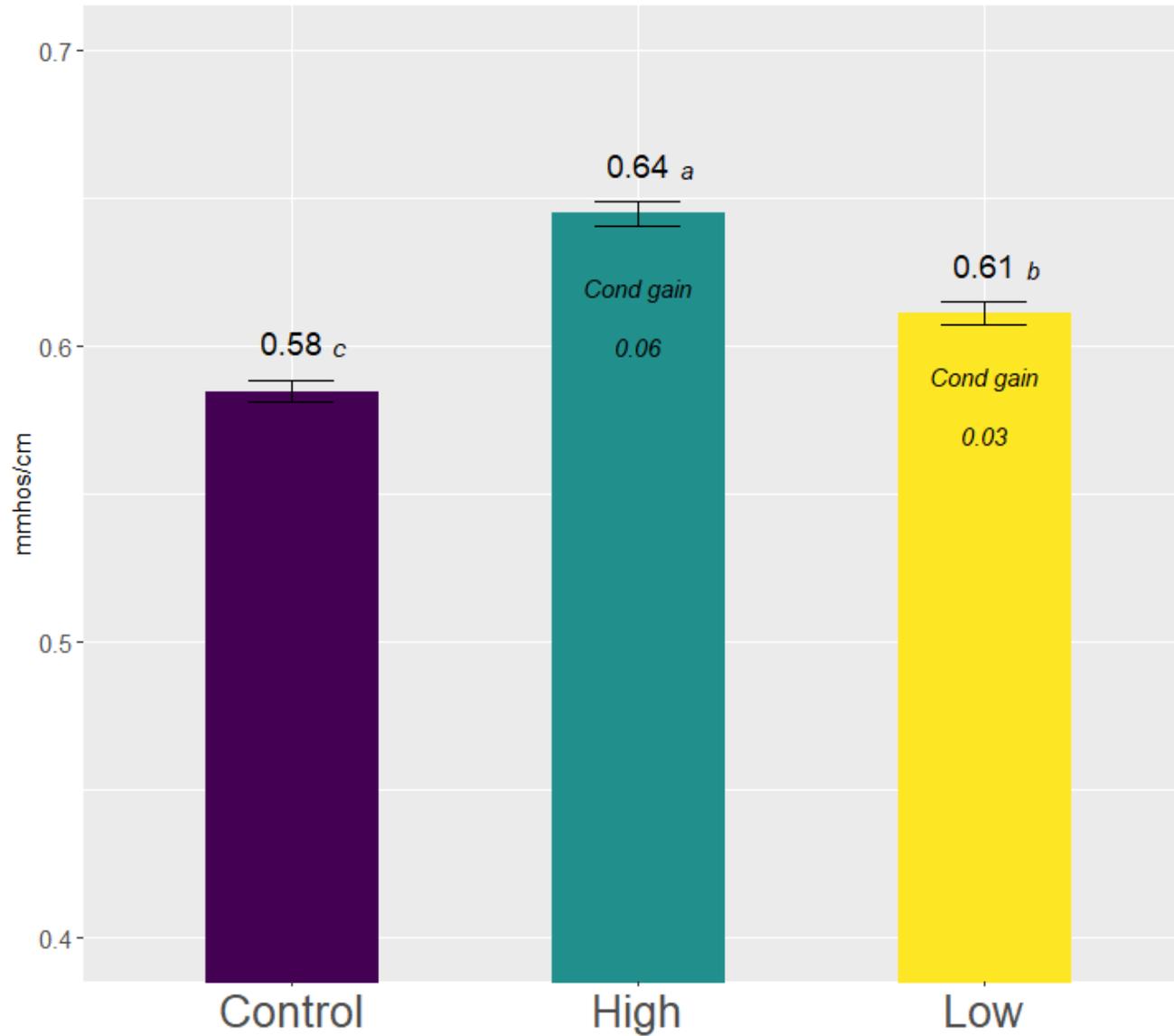
Sugar %



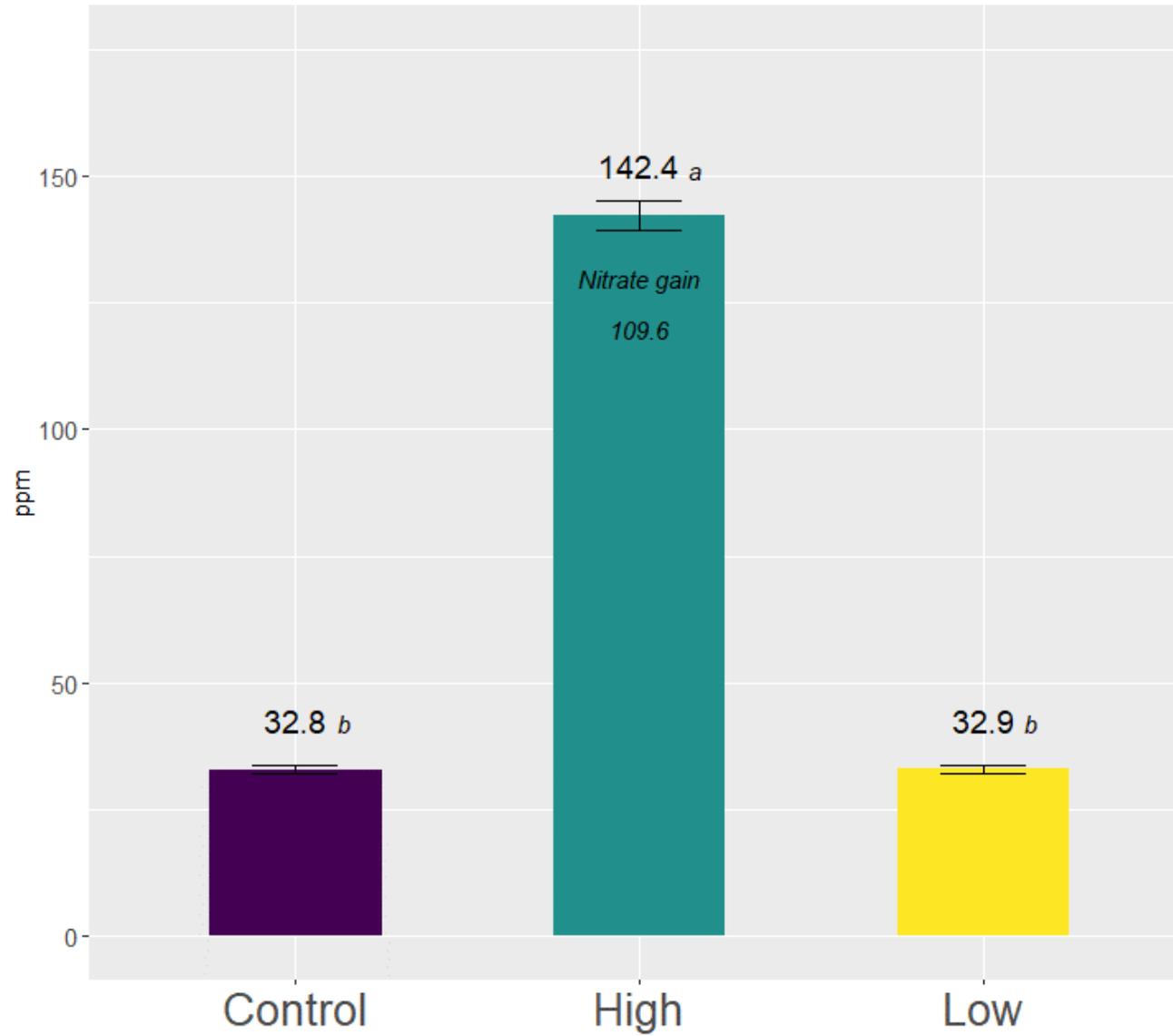
ERS/A



Conductivity



Nitrates





V x N Interaction Effects



Yield

Variety x Nitrogen (Yield) (P= <0.001)

The magnitude of the variety effect for Yield is dependent on N level

- 5 varieties showed no yield difference
- 29 varieties had significantly higher yields than Control

Yield T/A		Control-N	
Variety	T/A	Rank	
BTS 2523	50.1	1	
BTS 2559	49.7	2	
BTS 2627	49.6	3	
SX 1578N	49.4	4	
Crystal A862NT	49.4	5	
Crystal A501	49.4	6	
SV 183N	49.3	7	
SV 123N	49.2	8	
SV 101N	48.8	9	
Highest	Crystal A793	48.8	10
SX 3584	48.7	11	
SX 3526N	48.6	12	
HIL 2355NT	48.5	13	
HIL 2416NT	48.4	14	
Crystal A702NT	48.3	15	
Smallest gain	SX 3527N	47.9	16
Crystal A095NT	47.8	17	
BTS 278N	47.8	18	
Crystal A068	47.7	19	
HIL 2357NT	47.5	20	
HIL 2415NT	47.3	21	
SV 099N	47.0	22	
BTS 228NC	46.9	23	
BTS 2024	46.7	24	
HIL 2356NT	46.4	25	
SV 014N	46.2	26	
HIL 2384	45.9	27	
HM RT9334RR	45.4	28	
BTS 2937	45.2	29	
Crystal A263	45.1	30	
BTS 210N	44.6	31	
HIL 9916	43.8	32	
Crystal A179NT	43.6	33	
Lowest	HIL 2432NT	40.7	34

Sugar

Variety x Nitrogen (Sugar) (P= <0.001)

The magnitude of the variety effect for Sugar is dependent on N level

- all 34 varieties had significantly lower sugar %

		Sugar %	
Variety		Control-N	
		%	Rank
	SX 3526N	18.9	1
	HIL 2432NT	18.8	2
	SV 099N	18.8	3
	SX 3527N	18.8	4
	SV 123N	18.8	5
	SV 183N	18.7	6
	SV 101N	18.7	7
	SV 014N	18.7	8
Greatest loss	HIL 9916	18.7	9
	Crystal A702NT	18.7	10
	BTS 2937	18.6	11
Highest	BTS 210N	18.6	12
	Crystal A862NT	18.6	13
	HIL 2355NT	18.6	14
	Crystal A793	18.6	15
	BTS 2024	18.6	16
	BTS 278N	18.5	17
	SX 3584	18.5	18
	BTS 228NC	18.5	19
	SX 1578N	18.5	20
	HIL 2415NT	18.5	21
	BTS 2627	18.4	22
	Crystal A263	18.4	23
	Crystal A068	18.4	24
	Crystal A095NT	18.4	25
	HIL 2416NT	18.3	26
	Crystal A179NT	18.3	27
	HIL 2356NT	18.2	28
	BTS 2559	18.2	29
	HIL 2357NT	18.1	30
	BTS 2523	18.1	31
Smallest loss	Crystal A501	18.0	32
	HIL 2384	17.7	33
Lowest	HM RT9334RR	17.4	34

Sugar Yield ERS/A

Variety x Nitrogen (ERS/A) (P= <0.001)

The magnitude of the variety effect for ERS is dependent on N level

- 22 varieties showed no ERS difference
- 12 varieties had significantly higher ERS than Control

Smallest gain

Greatest gain

Lowest

Variety	ERS/A	
	Control-N lb/A	Rank
SX 3526N	16,274	1
SV 123N	16,228	2
SV 183N	16,150	3
SV 101N	16,058	4
Crystal A862NT	16,028	5
BTS 2627	16,017	6
SX 1578N	16,015	7
HIL 2355NT	15,886	8
SX 3584	15,840	9
BTS 2523	15,796	10
SX 3527N	15,792	11
Crystal A793	15,710	12
Crystal A702NT	15,618	13
BTS 2559	15,618	14
HIL 2416NT	15,587	15
SV 099N	15,574	16
Crystal A501	15,490	17
BTS 278N	15,347	18
HIL 2415NT	15,313	19
Crystal A068	15,254	20
BTS 228NC	15,239	21
Crystal A095NT	15,188	22
BTS 2024	15,174	23
SV 014N	15,158	24
HIL 2357NT	15,066	25
HIL 2356NT	14,828	26
BTS 2937	14,643	27
Crystal A263	14,572	28
BTS 210N	14,561	29
HIL 9916	14,337	30
HIL 2384	14,179	31
Crystal A179NT	13,828	32
HM RT9334RR	13,640	33
HIL 2432NT	13,435	34

Nitrates

Variety x Nitrogen (Nitrates) (P= <0.001)

The magnitude of the variety effect for Nitrates is dependent on N level

- all 34 varieties had significantly higher nitrates

Variety	Nitrates	
	Control-N ppm	Rank
SV 101N	23	1
BTS 2627	28	2
HIL 2355NT	28	3
SV 123N	28	4
Crystal A263	28	5
SV 183N	28	6
BTS 2523	28	7
HIL 2384	28	8
HIL 2415NT	30	9
SV 099N	30	10
Crystal A702NT	30	11
HIL 2416NT	30	12
SX 3527N	30	13
Crystal A501	31	14
HIL 2356NT	31	15
BTS 2937	32	16
SX 3526N	32	17
HIL 2432NT	32	18
BTS 228NC	32	19
Crystal A793	32	20
BTS 210N	32	21
HIL 2357NT	32	22
Crystal A068	35	23
BTS 278N	35	24
BTS 2024	35	25
SX 1578N	36	26
SV 014N	36	27
HIL 9916	36	28
SX 3584	37	29
Crystal A095NT	37	30
Crystal A862NT	38	31
BTS 2559	39	32
HM RT9334RR	46	33
Crystal A179NT	51	34

Lowest

Greatest gain

Highest

2023 Compared to 2022

2022 Top 10 Varieties

Crystal A793
Crystal A501
Crystal A862NT
BTS 2559
SX RR1578N
SV 099N
BTS 2024
BTS 2627
HIL 2416NT
BTS 278N

2023 Top 10 Varieties

Crystal A793
Crystal A501
BTS 2023
BTS 2627
BTS 2559
Crystal 095NT
SX 3526N
SV 014N
BTS 2024
Crystal A862NT



Conclusions



Conclusions

- High nitrogen generally increases yield, decreases sugar %, increases conductivity, and increases nitrates
- Varieties responded differently to high nitrogen
- Variety selection makes a difference and is key to getting the best returns on high nitrogen soils
- Some varieties were able to overcome payment penalties with higher yield and/or smaller sugar % reductions and/or smaller nitrate increases
- There may be an optimal N rate for each individual variety

Thank You!



Paul

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Arianna

Gaylen

Golden

Craig