2020 PhytoGen 250 W3FE Nitrogen Rate Trial – Lonestar Gin

Lance Williams Farm – Pratt Place
Panhandle, TX

Dr. Randy Boman, Cotton Agronomics Manager – Windstar Inc.

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Summary

In 2019, a cotton variety testing program was established as a new service created by Windstar Inc. affiliated gins. These gins are working together to support a Cotton Agronomics Manager position. One of the components of this program is to work with local producers to scientifically evaluate varieties in a commercial on-farm setting from planting through ginning. These unique replicated trials are planted and harvested with the grower's commercial equipment. Each variety's round modules are combined across all replicates and then ginned and classed separately in an extremely detailed manner. Purging and weighing any remnant bale of from the press is also performed for each variety. All lint samples from each variety's commercial bales are then classed by the USDA-AMS classing office. This detailed ginning and classing management of all round modules for each variety is key to the success of this program and to the best of our knowledge is without peer in the U.S. ginning industry.

In 2020 it was decided to expand the program to include a nitrogen (N) fertilizer management component. Excess N can have a very significant impact on crop maturity and quality but it has been poorly researched in this region. Since many growers in our service area are rotating to cotton following corn, N rate trials were established. These trials included an unfertilized control (0 N) and rates of 50, 100, and 150 lbs N/acre. N rates were applied during strip-till operations and 82-0-0 (anhydrous ammonia) was used.

PhytoGen 250 W3FE with Enlist technology was planted in a center-pivot irrigated field in a scientifically valid N rate trial with three replicates. Although some weather events during the growing season were noted, subsequent growing conditions were such that excellent yields and quality were obtained. *This trial encountered minor damage associated with the June 9th regional high wind event. It also escaped hail events that occurred in the surrounding area. Overall, the trial was able to stay on track with growth and development and apparently was not adversely affected by the September 9th record low temperature.*

Harvest results indicated that statistically significant differences were observed among N rates. Lint yields ranged from a high of 1817 lbs/acre at the 150 lb/acre N rate to a low of 1317 lbs/acre in the 0 N rate treatment (Table 1). Average Loan value for varieties from commercially ginned and classed bales varied from a low of $0.5475/lb for the 150 lb N rate to a high of $0.5661/lb for the 50-lb rate. Overall Loan value for the trial across all entries was 0.5593/lb.

When including lint Loan value on a per acre basis and net gin credit (defined as gross Loan value/acre plus net gin credit) and removing N fertilizer cost, statistically significant differences were found among N treatments. N cost was determined based on $335/ton for 82-0-0 (anhydrous ammonia). The 50 and 150 lb/acre N rates generated the highest net value at $1025/acre, and $1037/acre respectively. It is unclear what occurred to result in the 100-lb N rate having a statistically lower value. This may be explained by stand and center pivot irrigation nozzle variability. Regardless, it is evident based on the data that an N rate as low as 50 lb N/acre statistically resulted in the highest profitability in this field in 2020.

Table 2 presents in-season data including stand establishment percentage, vigor, nodes above white flower and plant height on three sampling dates, leaf tissue N concentration at both early bloom and cutout, and nodes above cracked boll on September 23. Many of these plant parameters were not statistically different during the growing season, perhaps due to the stand variability and potential water distribution issues. Leaf N concentration was not affected by N fertilization at early bloom, however, by cutout on August 20, small differences were noted, with the unfertilized check having the lowest (3.8%) versus 4.0% and above for the 50, 100 and 150 lb N rates. By September 23, no significant differences among N rates were noted in nodes above cracked boll (a quantitative measure of crop maturity).

Table 3 provides the USDA-AMS classing results from each commercial bale for each variety and the variety averages. Averages indicate that color grades were excellent and were typically 11 or 21 across all N rates. Leaf grades were typically 2 and 3, with a few lesser quality grades in the 150 lb N rate. Staple was typically 37 32nds inch. Micronaire averages were excellent and ranged from 3.7 in lower N rates to 3.6 in the 100 and 150 lb N rates. Minimal bark contamination was noted in commercial bales. Fiber strength averages for N rates ranged from 30-32 g/tex, and uniformity was generally over 81%.

Disclaimer: Readers should realize that results from one trial do not represent conclusive evidence that the same response would occur where conditions vary. Multi-site and multi-year data are always best. For this trial, good scientific techniques were used and the results are presented to indicate what actually occurred in the trial. Context of the environment, overall growing season impact, management techniques, and trial methodology used are important and must be considered.

Site Information and Methods

Elevation: 3490 ft

Previous crop: corn harvested in 2019

Tillage system: strip-till, with N rates applied on February 8

Planted: April 27

Replicates: 3 replicates of 0, 50, 100, and 150 lb N/acre in a randomized complete block design

Plot width: 12-row harvested plots, 16-row strip till and N application

Plot length: length of fertilized and harvested plot ~2,500 ft

Seeding rate: 50,000 seed/acre

30-inch rows under center pivot irrigation

Total rainfall: ~6.1 inches

May - 0, June – 1.3, July – 2.0, August – 2.8

Total irrigation: ~10.5 inches

April – 2.0, May - 1.0, June – 1.0, July – 3.5, August – 3.0, September – 0

Additional fertility: 20 gal/acre 10-27-4-1 on February 8

Herbicide management:

Preplant burndown – 2,4-D + Valor + Roundup PowerMax

Preemergence – 2,4-D + diuron

Post emergence (June 19) – Enlist (2,4-D), Outlook, Roundup PowerMax

Insecticides: acephate (June 2)

Plant growth regulators: 8 oz/acre early bloom (July 1)

Harvest aids: 1 qt/acre ethephon + 1 pt/acre Folex (October 8) followed by 1 qt/acre paraquat (October 19)

Harvesting: October 23 using a John Deere CS690, with harvested area calculated by the GPS on the stripper monitor. Approximately 2,500 ft of plot length was harvested in two round modules per individual plot. Round modules were weighed using the CS690 scale, and all round modules (from each of 3 replicates = 6 total) for each fertilizer treatment were weighed at the Lonestar Gin.

Commercial ginning: Round modules for all 3 replicates of each nitrogen rate treatment were staged together and commercially ginned separately by Lonestar Gin. Commercial ginning included: cleaning module feeder, clearing gin stream, dumping seed rolls, and purging remnant bale in press. This process was initiated before the first variety module was ginned and then repeated for each nitrogen rate treatment in the trial.

Remnants were ejected from the bale press and weighed, but not sampled for USDA-AMS classing. Only data from commercial bales are included in classing data for each variety.

Lint value: Table 1 is based on CCC Loan value from commercial ginning and USDA-AMS classing results.

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Table 3. Commercial classing data for the center pivot irrigated PhytoGen 250 W3FE nitrogen rate trial, Williams Farm, Panhandle, TX, 2020.

Appendix – Residual preplant NO_3-N in Pratt Place field, Lint yield quadratic regression function, Net value/acre quadratic regression function, Amarillo 2020 cotton heat units and weather data.

Acknowledgements

Lonestar Gin would like to thank Lance Williams with Williams Farms, LLC, for committing equipment, land, and time to conduct and manage the trial. Jimmy Osborn fertilized and harvested the trial and we are very appreciative of his excellent skills and cooperation. Gratitude is expressed to PhytoGen Cottonseed, Corteva, and Windstar Inc. Detailed ginning was performed by Malcom Jones, Dalton Skinner and the Lonestar ginning crew and a big thank you is extended to this hard-working group.

Table 1. Harvest results for the center pivot irrigated PhytoGen 250 W3FE nitrogen rate trial, Williams Farm, Panhandle, TX, 2020.

N rate	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint loan value	Net gin credit	N cost	Net value	
lb/acre	---------- % ----------		---------- lb/acre ----------			$/lb	---------- $/acre ----------				
0	30.1	42.5	4378	1317	1860	0.5597	737	57	0	794	c
50	30.4	40.7	5643	1717	2297	0.5661	972	63	10	1025	a
100	28.3	40.0	5745	1624	2300	0.5639	915	61	20	956	b
150	31.4	42.0	5792	1817	2434	0.5475	994	73	31	1037	a
Test average	30.0	41.3	5390	1619	2223	0.5593	905	64	15	953	
CV, %	--	--	4.4	4.3	4.4	--	4.3	4.6	--	4.4	
OSL	--	--	0.0009	0.0006	0.0016	--	0.0007	0.0028	--	0.0013	
LSD	--	--	374	110	155	--	61	5	--	66	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.15/cwt commercial ginning cost.
$210/ton for seed.
Net gin credit is defined as seed credit minus ginning expense.
N cost was determined based on $335/ton of 82-0-0.
Net value is defined as gross loan value/acre plus net gin credit minus N fertilizer cost.
Value for lint based on CCC loan value from commercial ginning and USDA-AMS classing results.

Table 2. Plant observation results from the center pivot irrigated PhytoGen 250 nitrogen rate trial, Williams Farm, Panhandle, TX, 2020.

N rate	Final population	Stand establishment	Vigor	Nodes above white flower			Plant height			Leaf tissue N concentration		Nodes above cracked boll
				Early bloom	+3 weeks	+5 weeks	Early bloom	+ 3 weeks	+5 weeks	Early bloom	Cutout	
lb/acre	plants/acre	%	1-5 visual scale, 5 best	count			inches			% N		count
	3-Nov	3-Nov	3-Nov	15-Jul	4-Aug	20-Aug	15-Jul	4-Aug	20-Aug	15-Jul	20-Aug	23-Sep
0	32,234	64.5	3.3	6.9	5.3	1.8	13.7	20.7	22.9	4.5	3.8	5.2
50	36,590	73.2	3.8	7.1	4.9	1.7	14.5	20.7	22.5	4.5	4.0	4.5
100	31,944	63.9	3.5	7.1	5.3	2.2	14.5	21.4	23.8	4.6	4.2	5.1
150	29,621	59.2	3.5	7.1	4.9	2.5	14.7	21.4	23.8	4.5	4.3	5.2
Test average	32,597	65.2	3.5	7.1	5.1	2.1	14.4	21.1	23.3	4.5	4.1	5.0
CV, %	11.4	8.5	11.4	7.1	10.2	20.4	3.1	3.9	3.3	1.5	1.7	13.8
OSL	0.2420	0.2430	0.3161	0.8976	0.5315	0.1717	0.3161	0.5783	0.2023	0.1488	0.0010	0.6308
LSD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.1	NS

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.10 level, NS - not significant.

Table 3. Commercial classing data for the center pivot irrigated PhytoGen 250 W3FE nitrogen rate trial, Williams Farm, Panhandle, TX, 2020.

N rate and Bale Number	Color Grade-Quadrant grade-quadrant	Color digit 1	Color digit 2	Leaf grade	Staple 32nds inch	Micronaire units	Extraneous matter	Remarks --	Strength g/tex	Rd %	+b %	Trash % area	Uniformity %	Length 100ths inch	Loan rate cents/lb
0 lb N/acre															
619023	11-2	1	1	3	38	3.1	.	.	31.7	81.6	8.4	3	82.0	118	50.50
619024	11-1	1	1	3	38	3.4	.	.	32.1	81.5	8.8	4	81.8	120	52.25
619025	11-1	1	1	2	38	3.6	.	.	32.4	81.9	8.8	2	82.1	119	57.40
619026	11-2	1	1	2	37	3.8	.	.	33.1	82.4	8.6	2	82.6	117	57.35
619027	11-2	1	1	3	38	3.9	.	.	34.7	82.3	8.5	2	80.3	119	57.00
619028	11-1	1	1	2	37	4.0	.	.	30.3	81.7	8.8	2	81.3	116	57.05
619029	11-2	1	1	3	38	4.0	.	.	32.6	80.7	9.1	3	82.8	118	57.00
619030	11-1	1	1	3	38	4.0	.	.	34.7	80.8	9.2	4	83.6	119	57.10
619031	11-1	1	1	3	38	3.6	.	.	33.6	81.6	9.0	3	81.6	118	56.95
619032	11-1	1	1	3	38	3.6	11	level 1 bark	32.3	81.9	9.2	2	83.0	118	53.60
619033	11-1	1	1	3	37	3.7	.	.	31.1	81.2	9.2	2	81.1	116	56.80
619034	11-2	1	1	3	37	3.6	.	.	32.9	81.4	9.1	2	81.6	117	56.75
619035	11-1	1	1	3	37	3.6	.	.	31.3	81.6	9.0	4	81.1	117	56.75
619036	11-1	1	1	2	38	3.6	.	.	29.8	83.1	8.6	2	83.5	118	57.05
Average	--	1.0	1.0	2.7	37.6	3.7	1/14 bales	level 1 bark	32.3	81.7	8.9	2.6	82.0	117.9	55.97
50 lb N/acre															
619037	11-1	1	1	2	38	3.5	.	.	32.7	83.1	8.3	2	82.0	119	57.40
619038	11-2	1	1	3	38	3.6	.	.	32.0	81.4	8.8	3	82.0	118	56.95
619039	11-2	1	1	3	37	3.7	.	.	29.8	81.4	9.1	3	81.6	117	56.40
619040	11-1	1	1	3	37	3.6	.	.	31.3	81.2	9.2	3	81.1	117	56.75
619041	11-2	1	1	3	38	3.7	.	.	29.0	81.2	9.1	2	80.4	119	56.55
619042	11-2	1	1	4	38	3.6	.	.	31.8	80.7	9.1	7	81.3	118	55.75
619043	11-1	1	1	3	37	3.8	.	.	31.2	81.6	9.2	3	82.0	117	56.85
619044	11-2	1	1	3	37	3.7	.	.	31.6	81.4	8.9	3	80.6	117	56.80
619045	11-2	1	1	3	37	3.6	.	.	32.1	81.3	9.0	3	81.0	117	56.75
619046	11-1	1	1	3	38	3.9	.	.	30.3	82.2	9.1	2	82.5	119	56.80
619047	11-1	1	1	3	37	3.8	.	.	32.4	81.6	8.9	3	81.8	116	56.80
619048	11-1	1	1	3	37	3.7	.	.	30.5	81.0	9.2	4	80.9	115	56.60
619049	11-2	1	1	3	39	3.9	.	.	30.5	81.2	9.0	4	82.6	122	56.80
619050	11-1	1	1	2	38	4.0	.	.	32.4	81.9	9.0	2	82.6	119	57.45
619051	11-1	1	1	3	38	3.9	.	.	31.4	81.7	9.1	4	81.5	118	56.95
619052	11-1	1	1	3	38	3.7	.	.	32.0	82.1	9.1	2	84.2	120	57.10
619053	11-1	1	1	3	39	3.7	11	level 1 bark	32.8	82.3	9.0	4	82.2	121	53.60
Average	--	1.0	1.0	2.9	37.7	3.7	1/17 bales	level 1 bark	31.4	81.6	9.0	3.2	81.8	118.2	56.61

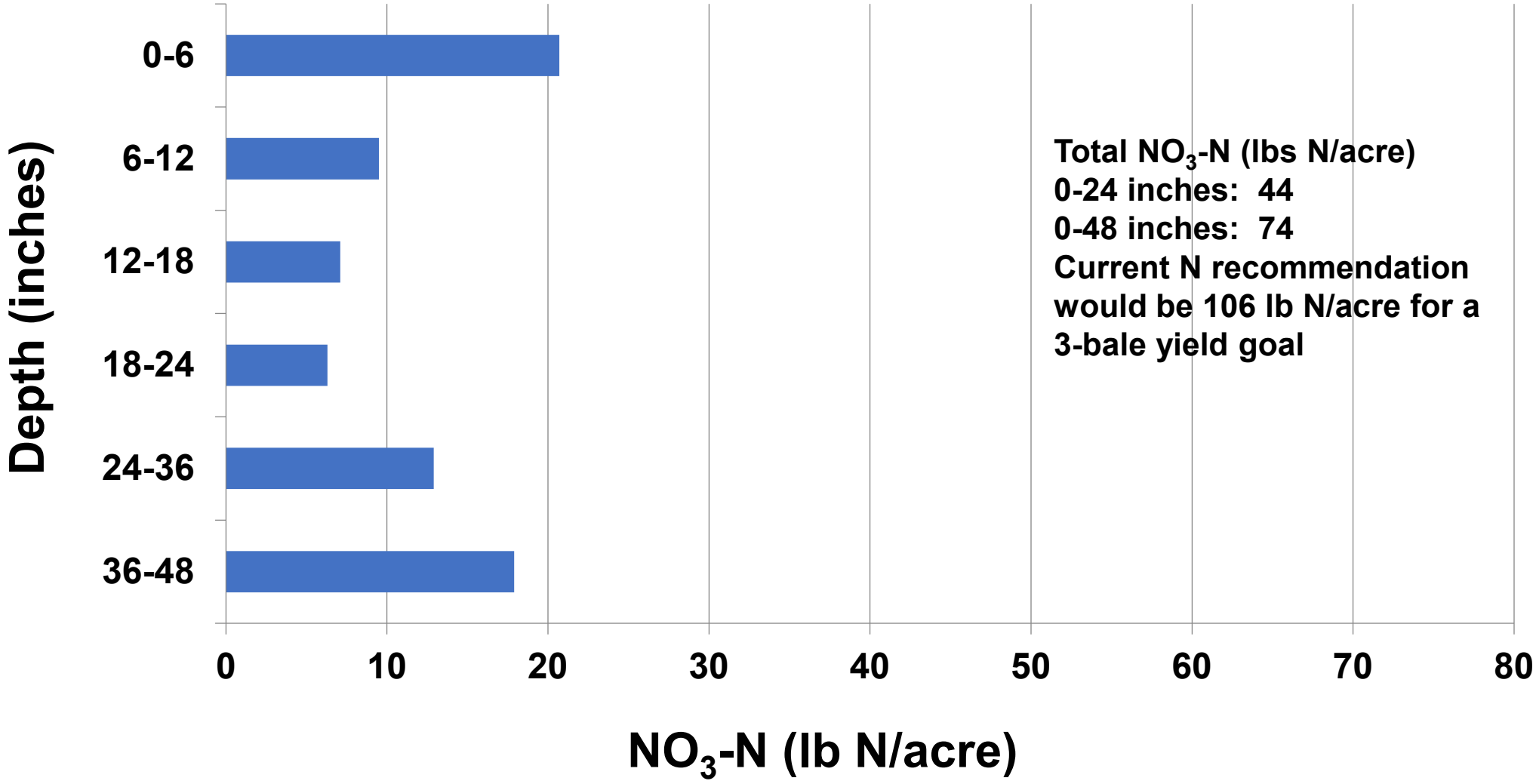
Table 3 (continued). Commercial classing data for the center pivot irrigated PhytoGen 250 W3FE nitrogen rate trial, Williams Farm, Groom, TX, 2020.

N rate and Bale Number	Color Grade-Quadrant grade-quadrant	Color digit 1	Color digit 2	Leaf grade	Staple 32nds inch	Micronaire units	Extraneous matter	Remarks --	Strength g/tex	Rd %	+b %	Trash % area	Uniformity %	Length 100ths inch	Loan rate cents/lb
100 lb N/acre															
619054	11-1	1	1	3	37	3.6	.	.	31.0	81.8	8.9	3	80.2	114	56.75
619055	11-4	1	1	3	36	3.8	.	.	28.7	78.9	9.7	4	80.4	112	55.95
619056	11-3	1	1	3	38	3.5	.	.	32.1	79.6	9.6	5	79.6	119	56.40
619057	11-1	1	1	3	38	3.7	.	.	32.8	81.2	9.3	3	81.5	119	56.95
619058	11-1	1	1	3	37	3.6	.	.	32.2	81.1	9.3	3	80.5	115	56.75
619059	11-1	1	1	3	38	3.6	.	.	34.0	81.1	9.3	2	82.9	118	57.00
619060	11-1	1	1	2	37	3.7	.	.	29.9	81.4	9.2	2	81.3	116	56.85
619061	11-2	1	1	3	37	3.4	.	.	33.2	81.2	9.1	3	80.1	115	52.15
619062	11-2	1	1	3	37	3.5	.	.	32.3	80.3	9.3	3	82.1	117	56.80
619063	11-1	1	1	3	37	3.6	.	.	32.0	80.7	9.2	3	81.4	117	56.75
619064	11-1	1	1	3	38	3.7	.	.	33.0	81.7	8.9	3	82.5	119	57.05
619065	11-1	1	1	3	37	3.6	.	.	31.7	82.2	9.0	2	82.0	117	56.80
619066	11-1	1	1	3	37	3.7	.	.	30.0	81.8	9.0	3	81.9	115	56.60
619067	11-1	1	1	3	37	3.6	.	.	32.3	80.8	9.6	3	82.2	116	56.80
619068	11-4	1	1	3	38	3.7	.	.	32.6	79.1	9.7	4	79.9	118	56.45
619069	11-4	1	1	3	37	3.6	.	.	31.2	79.2	9.8	3	80.5	116	56.75
619070	11-4	1	1	4	37	3.5	.	.	32.4	79.1	10.0	5	80.1	116	55.75
Average	--	1.0	1.0	3.0	37.2	3.6	none	none	31.8	80.7	9.3	3.2	81.1	116.4	56.39
150 lb N/acre															
619071	11-1	1	1	2	37	3.4	.	.	31.0	83.2	8.4	2	81.4	116	52.55
619072	11-1	1	1	2	37	3.6	.	.	32.0	82.4	9.0	2	80.6	117	57.20
619073	11-2	1	1	3	38	3.7	.	.	32.5	81.4	8.9	2	81.5	118	56.95
619074	11-1	1	1	3	37	3.9	.	.	31.9	80.7	9.4	3	81.2	115	56.80
619075	11-1	1	1	3	37	3.8	.	.	30.7	80.6	9.4	5	83.0	117	56.70
619076	11-2	1	1	3	37	3.6	.	.	31.9	80.1	9.3	4	81.2	117	56.75
619077	11-2	1	1	3	37	3.7	.	.	33.4	80.3	9.4	4	81.8	117	56.85
619078	11-1	1	1	3	37	3.7	.	.	31.7	81.0	9.3	4	82.5	117	56.85
619079	11-1	1	1	3	37	3.7	.	.	32.4	80.8	9.2	3	81.2	115	56.80
619080	11-1	1	1	3	37	3.5	.	.	33.8	80.5	9.2	4	81.2	116	56.80
619081	11-2	1	1	3	38	3.8	.	.	31.8	80.1	9.4	3	80.6	118	56.95
619082	11-4	1	1	4	38	3.5	.	.	32.1	79.0	10.0	5	80.5	118	55.75
619083	22-2	2	2	4	38	3.5	.	.	30.9	75.3	10.4	7	81.4	119	54.45
619084	22-2	2	2	4	38	3.5	.	.	33.3	75.5	10.1	6	80.7	119	54.70
619085	21-1	2	1	3	37	3.6	11	level 1 bark	32.3	79.1	9.1	4	81.6	116	53.35
619086	11-1	1	1	2	38	3.5	.	.	30.9	81.8	9.1	2	82.1	118	57.20
619087	11-1	1	1	2	37	3.6	.	.	30.5	81.5	9.2	2	79.9	116	56.50
619088	31-2	3	1	6	38	2.6	11	level 1 bark	29.4	78.2	7.4	8	82.4	118	32.30
Average	--	1.3	1.1	3.1	37.4	3.6	2/19 bales	level 1 bark	31.8	80.1	9.2	3.9	81.4	117.1	54.75

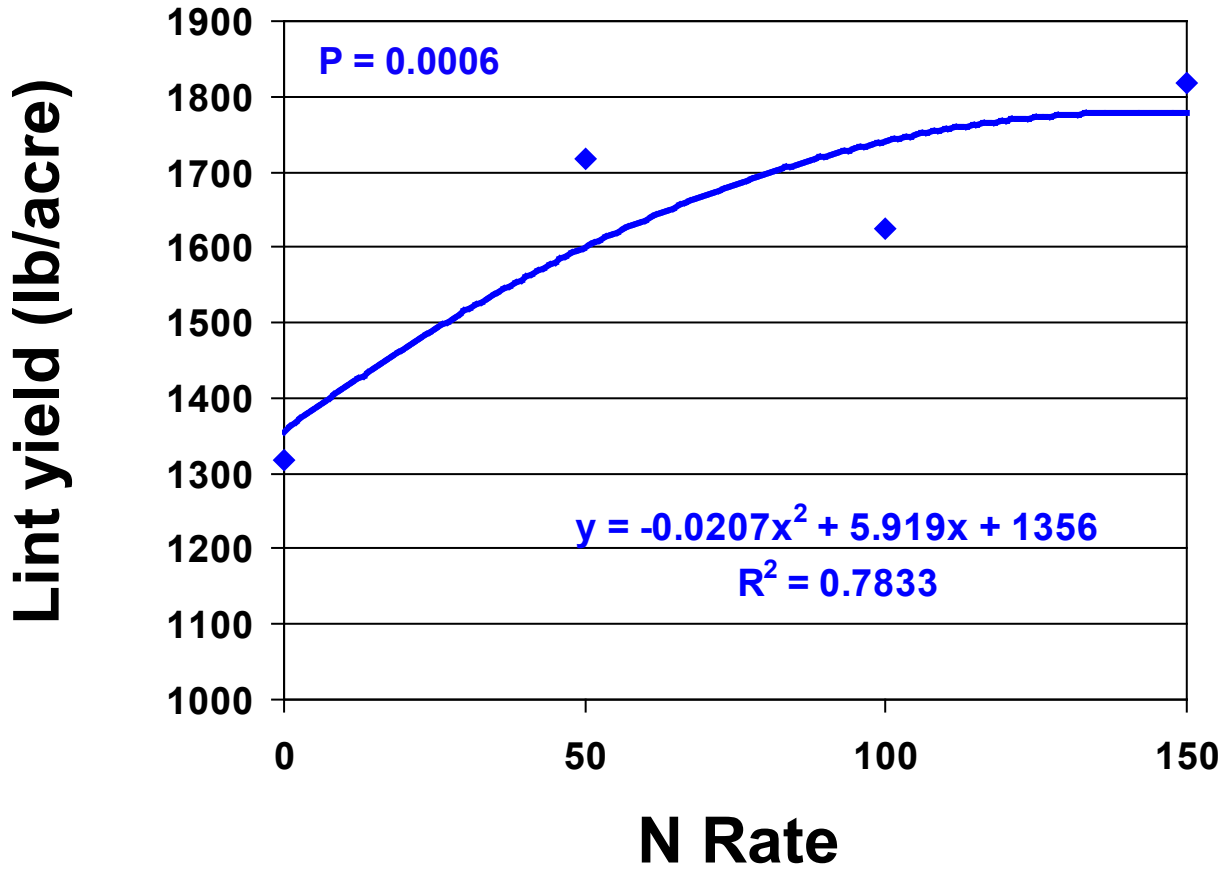
Appendix

Residual preplant NO_3-N in Pratt Place field, Lint yield quadratic regression function, Net value/acre quadratic regression function, Amarillo 2020 cotton heat units and weather data

NO_3-N (Pounds N/Acre) vs. Depth (inches)
Williams – Pratt Place, Panhandle

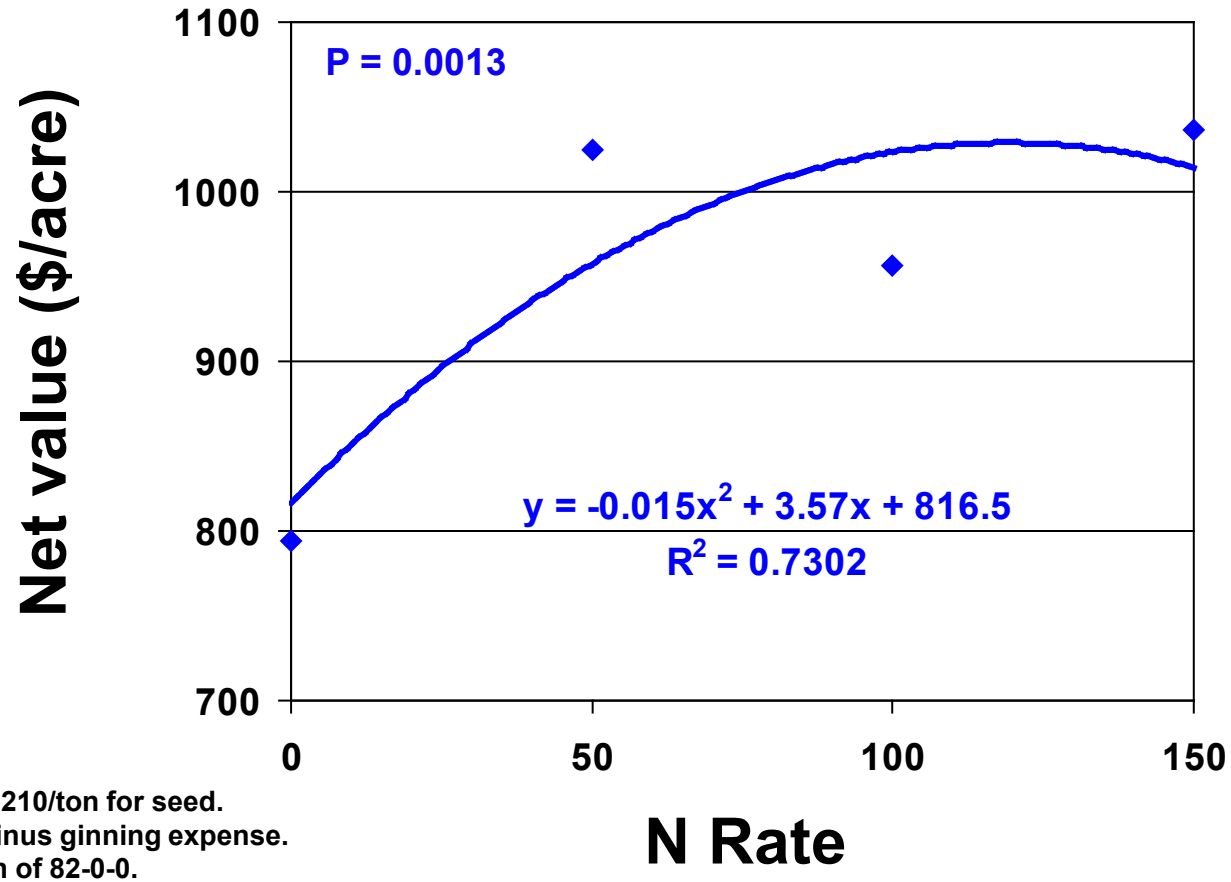


PhytoGen 250 W3FE - N Rate Trial
Panhandle, TX – 2020
3 Replicates



Strip till – N application
Planted: Apr 27
Seeding rate: 50K
1st bloom date: Jul 15
Cutout date: Aug 20

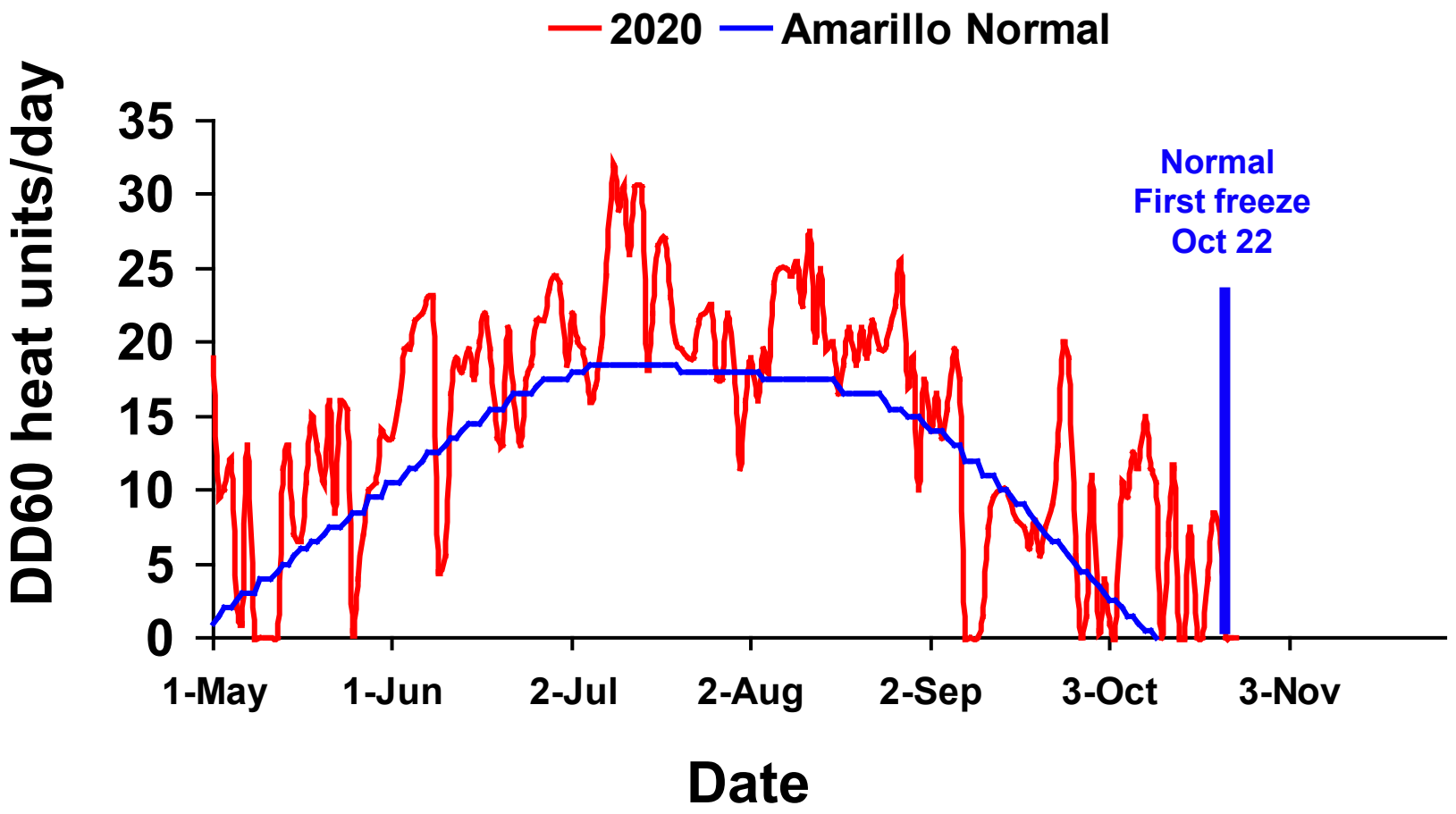
PhytoGen 250 W3FE - N Rate Trial
Panhandle, TX – 2020
3 Replicates



Strip till – N application
Planted: Apr 27
Seeding rate: 50K
1st bloom date: Jul 15
Cutout date: Aug 20

Assumes:
$3.15/cwt commercial ginning cost, and $210/ton for seed.
Net gin credit is defined as seed credit minus ginning expense.
N cost was determined based on $335/ton of 82-0-0.
Net value is defined as gross loan value/acre plus net gin credit minus N fertilizer cost.
Value for lint based on CCC loan value from commercial ginning and USDA-AMS classing results.

Amarillo
30-Year Normal (1981-2010) and 2020
Daily Heat Units



Total Accumulated Heat Units
From May 1 through Hard Freeze:

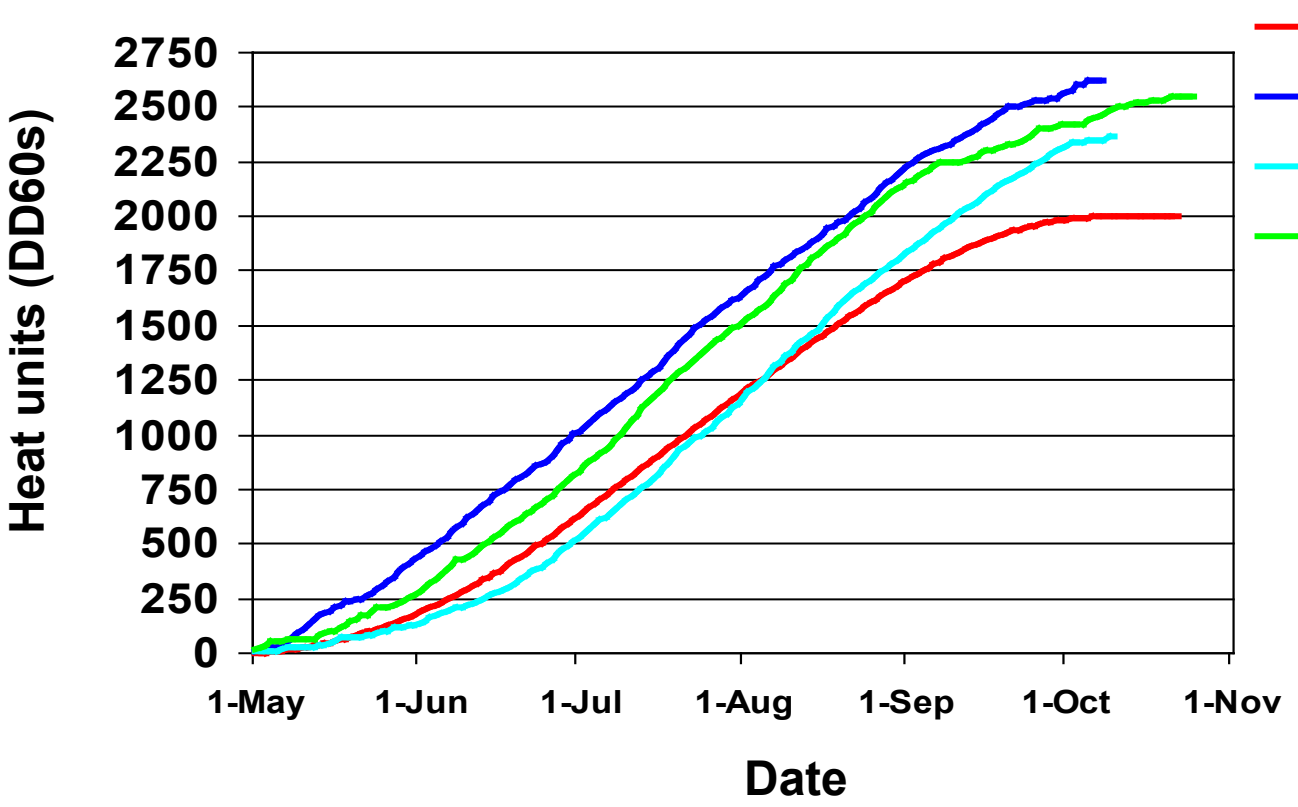
Normal: 2001
2020: 2552
% of normal: +28%

July had 10 days of 100 degrees or greater

Aug had 7 days of 100 degrees or greater

Hard freeze on Oct 25

Amarillo 30-Yr Normal (1981-2010) vs. 2018, 2019, and 2020 Cotton Heat Unit Accumulation for May 1 Through First Hard Freeze



1981-2010 (2001)
2018 (2621)
2019 (2362)
2020 (2552)

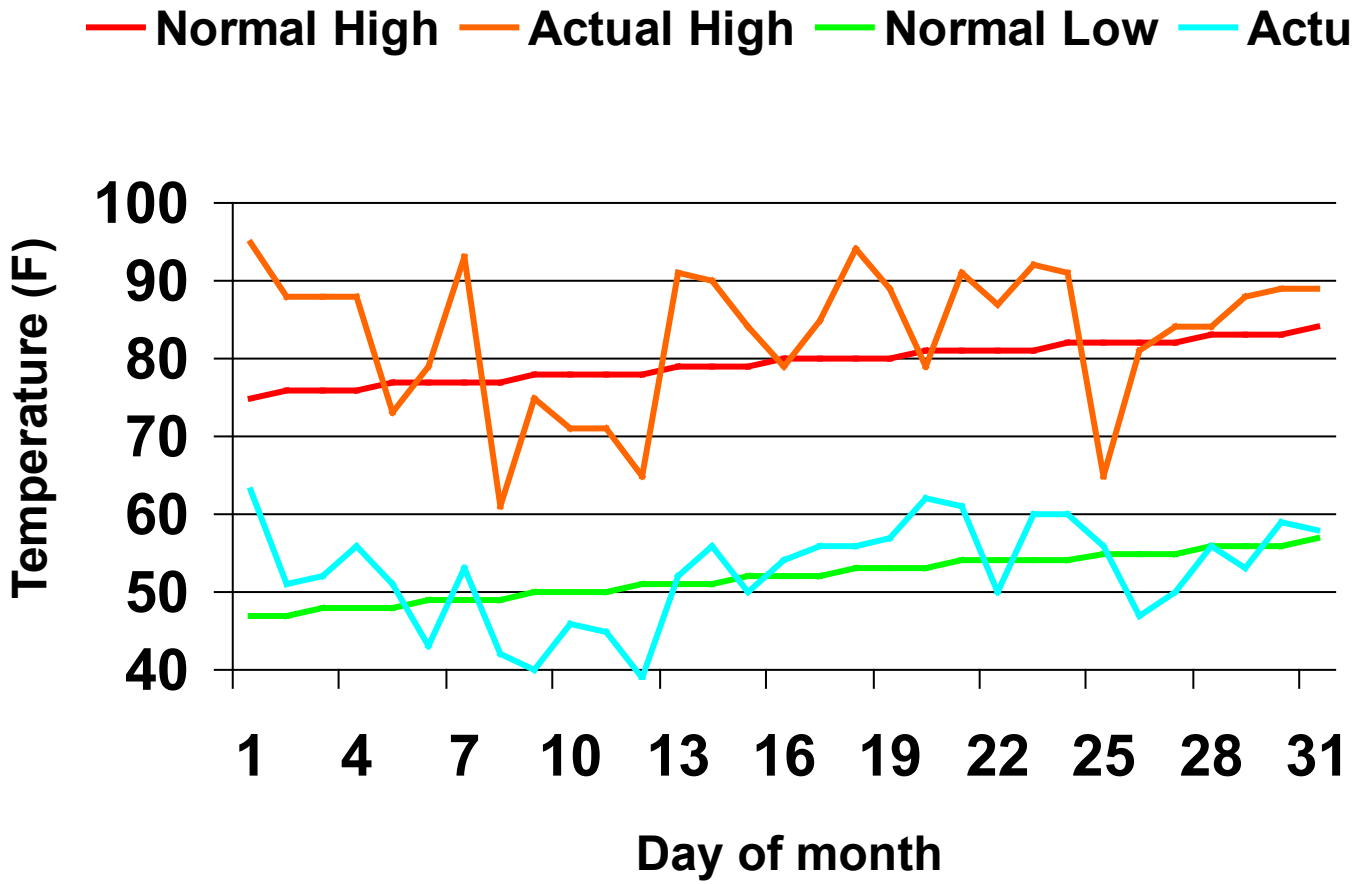
From May 1 through First Hard Freeze
Normal: 2001

2020: 2552
% of Normal: +28%

2019: 2362
% of Normal: +18%

2018: 2621
% of Normal: +31%

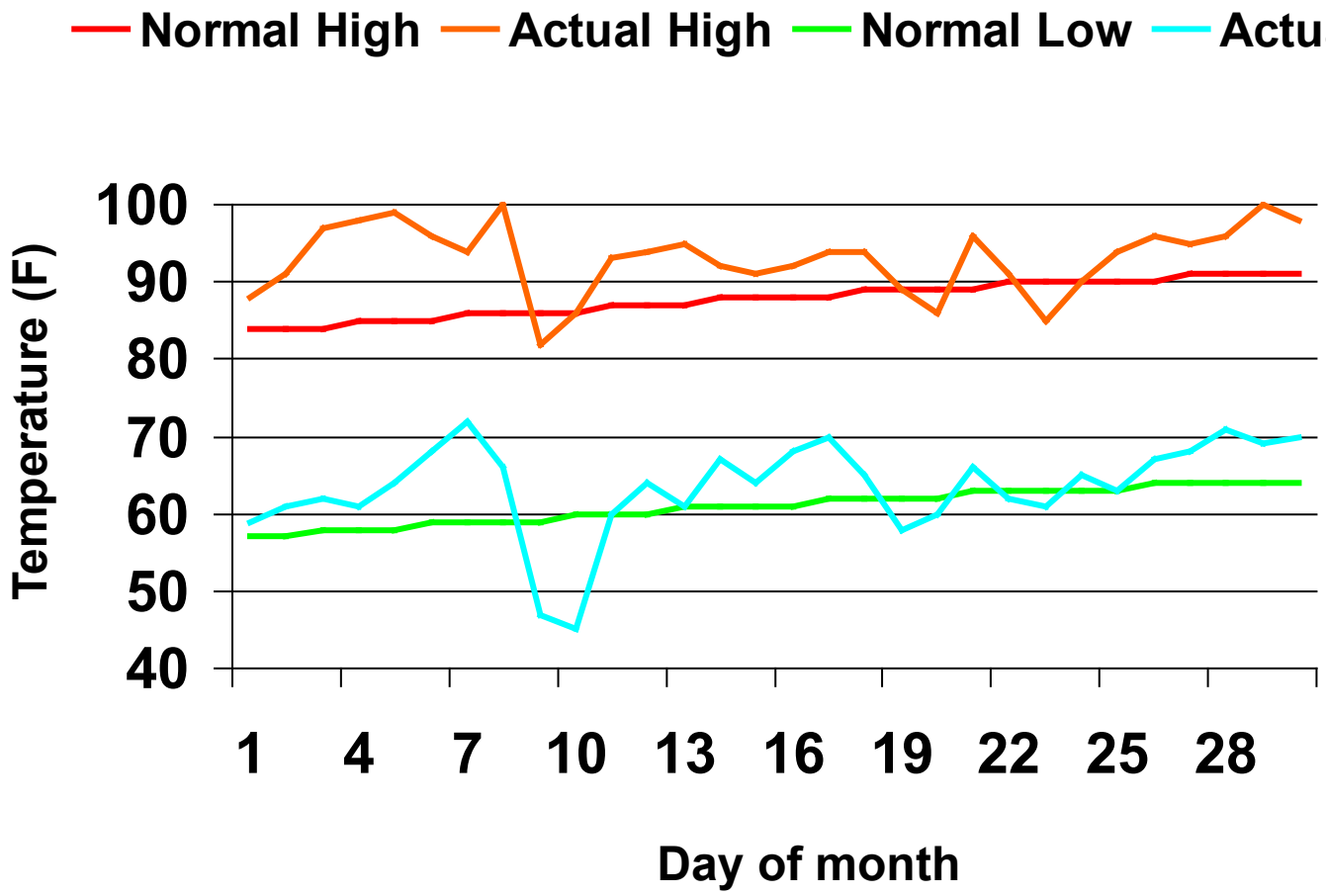
Amarillo
30-Yr Normal (1981-2010) and May 2020 Air Temperatures



Heat Units

Normal: 177
2020: 269
% of normal: +52

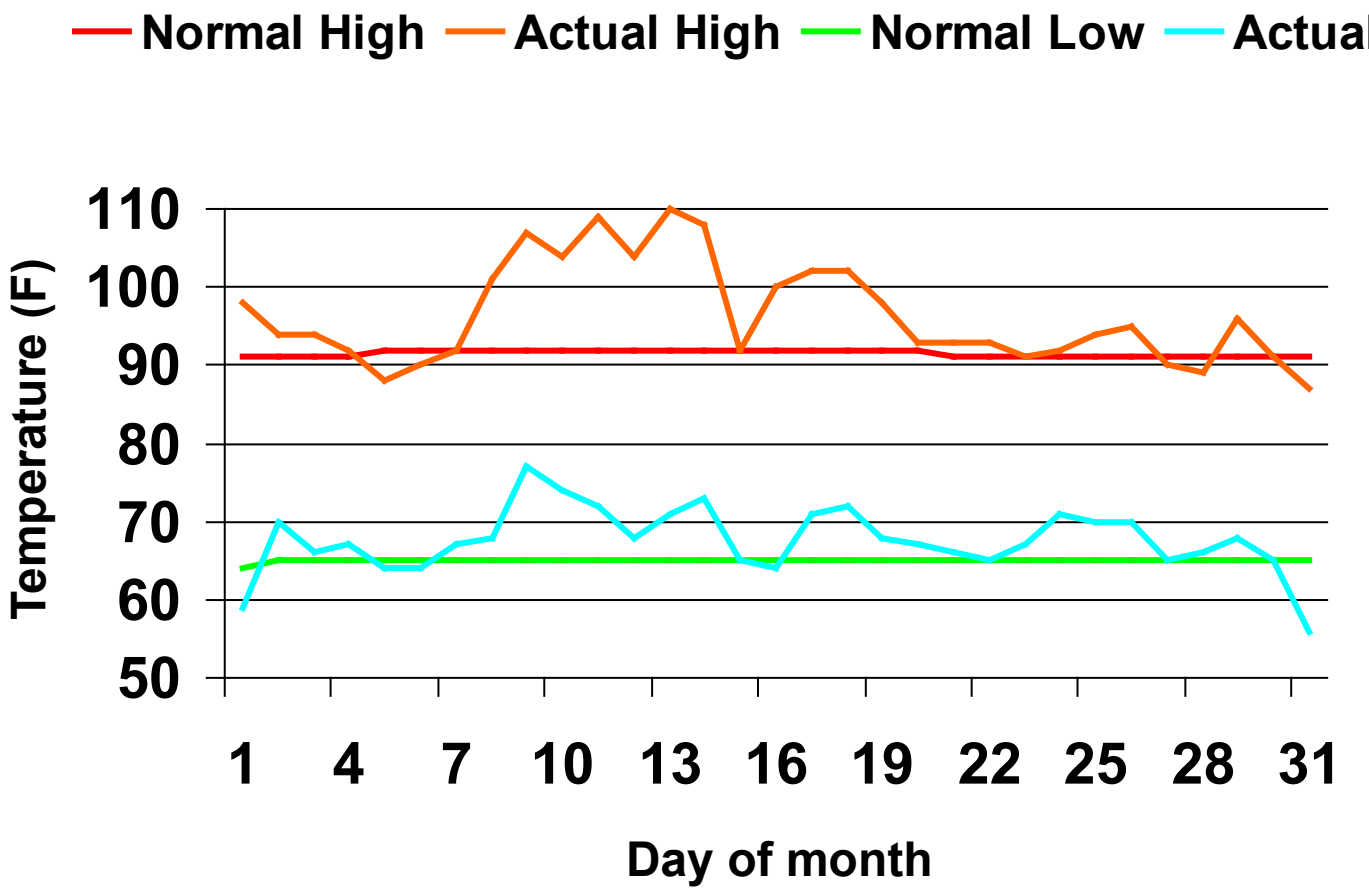
Amarillo
30-Yr Normal (1981-2010) and June 2020 Air Temperatures



Heat Units

Normal total: 433
2020: 548
% of normal: +27

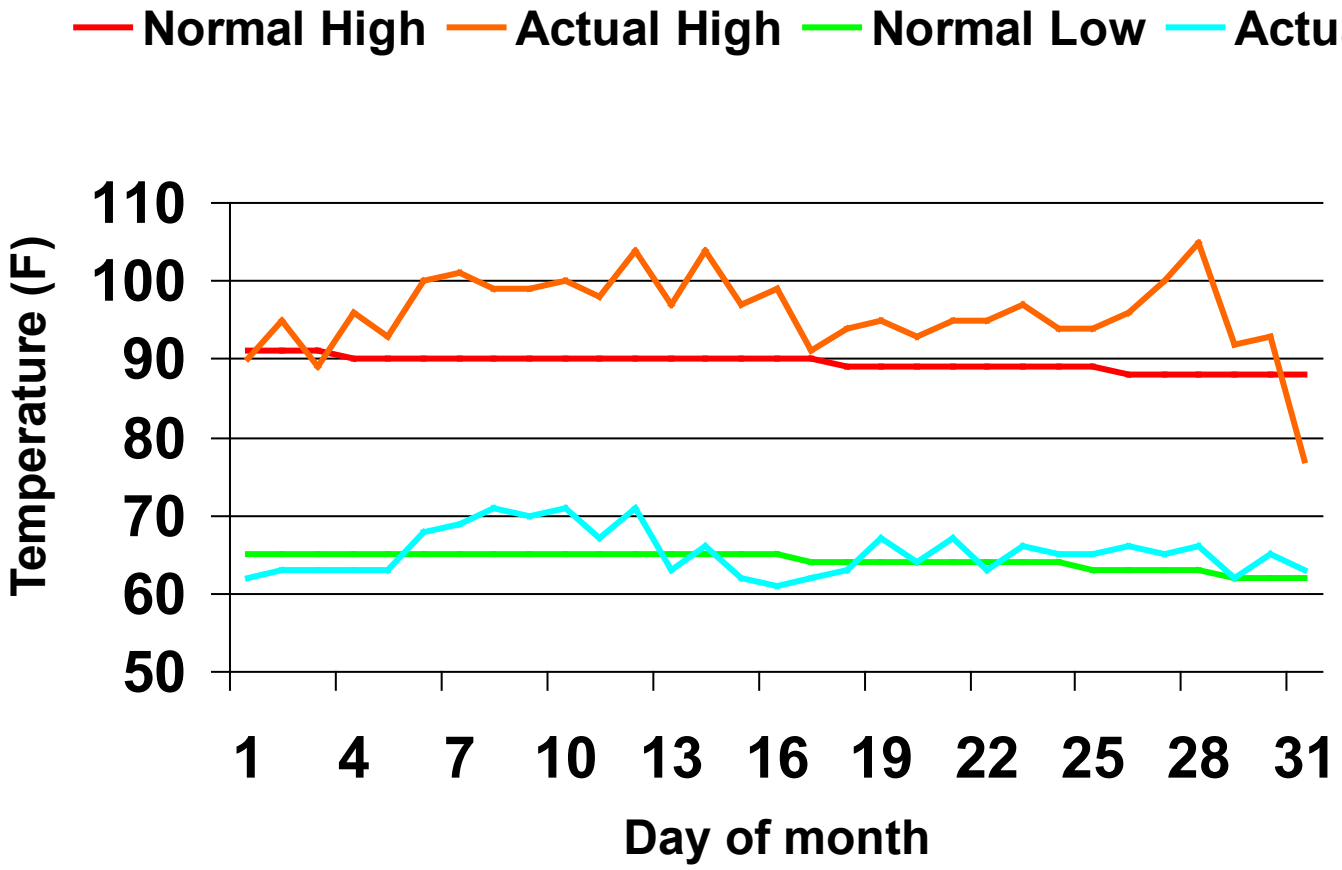
Amarillo
30-Yr Normal (1981-2010) and July 2020 Air Temperatures



Heat Units

Normal total: 566
2020: 683
% of normal: +21

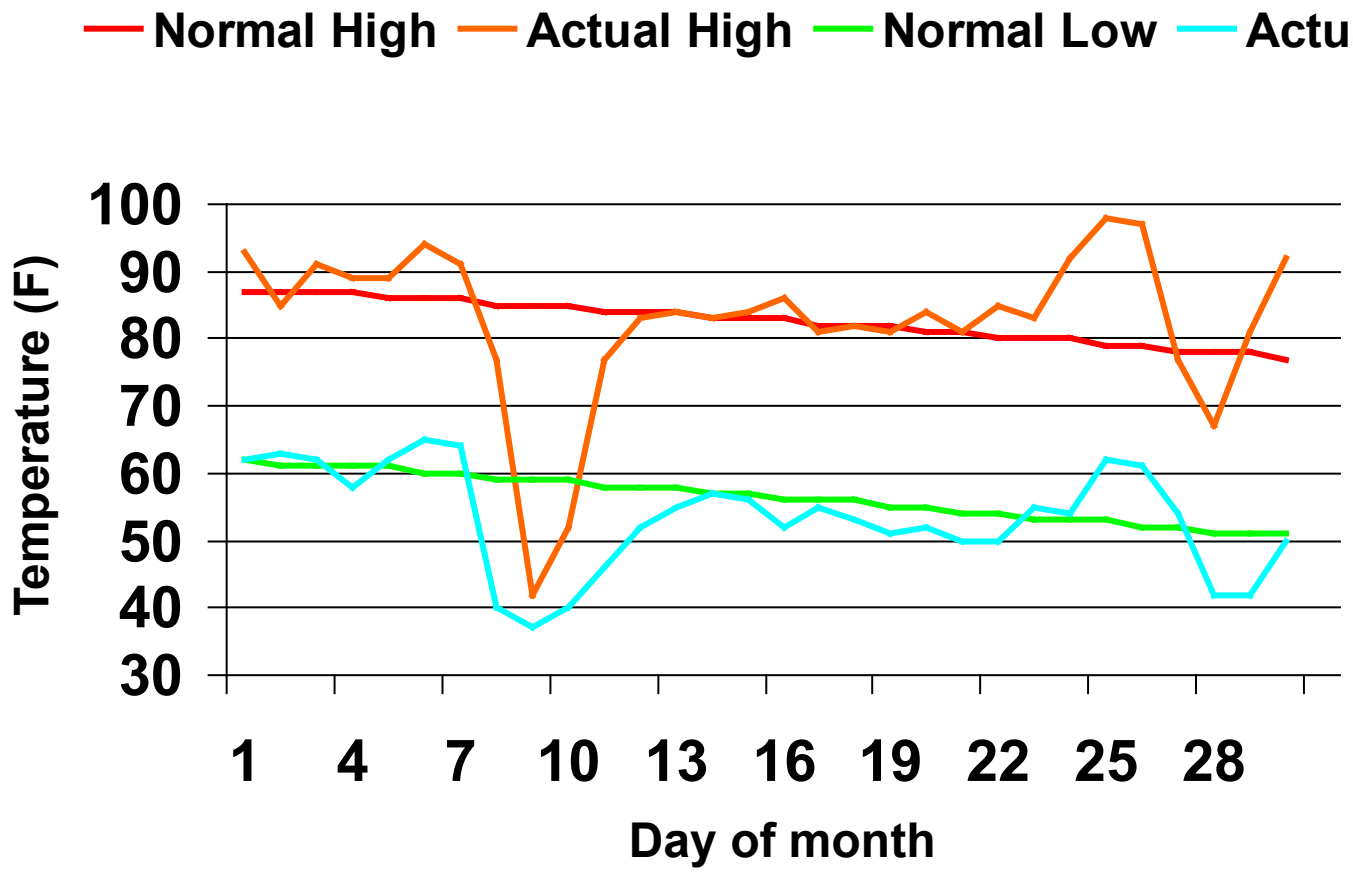
Amarillo
30-Yr Normal (1981-2010) and August 2020 Air Temperatures



Heat Units

Normal for Month: 522
2020: 637
% of normal: +22

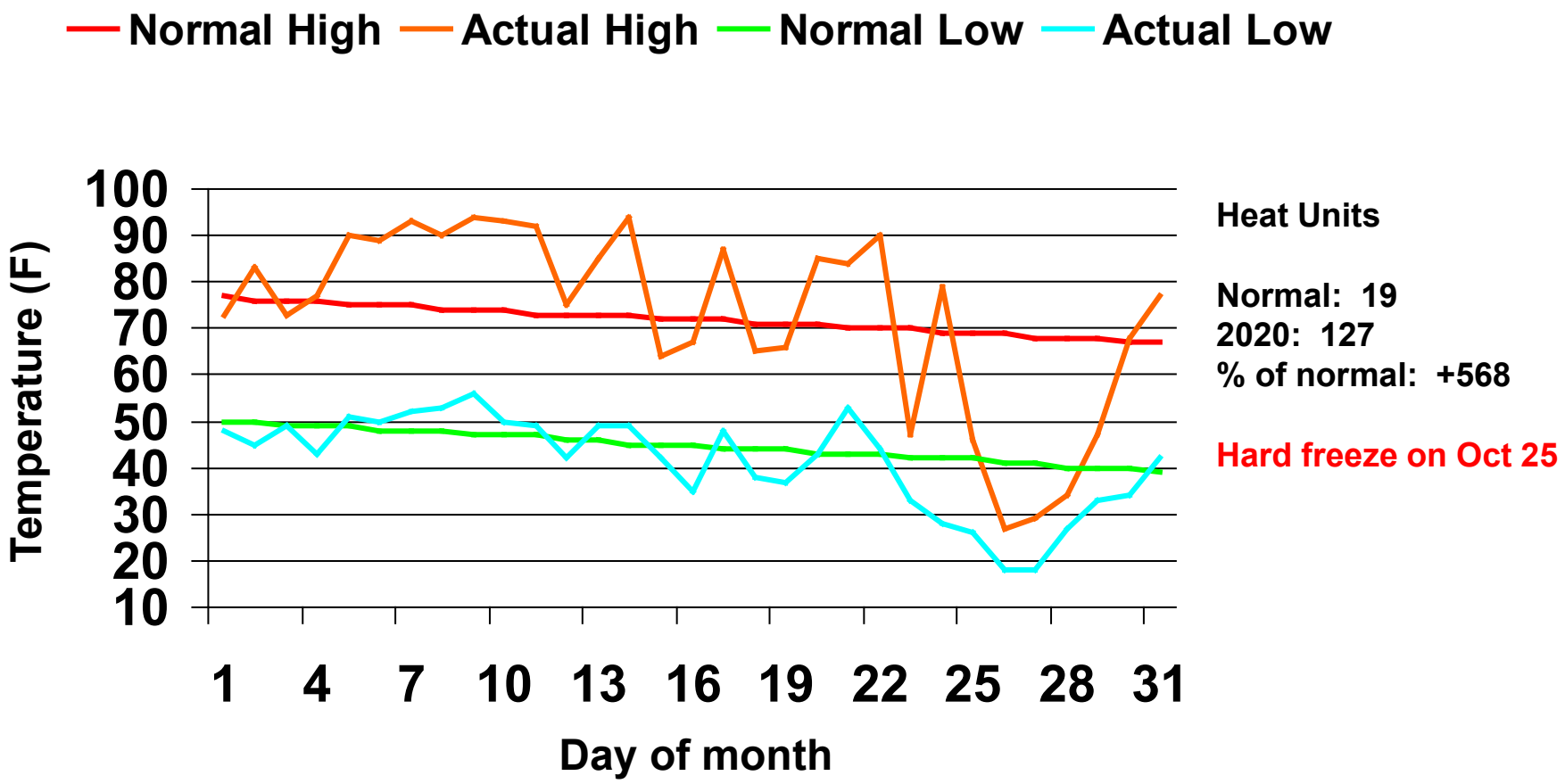
Amarillo
30-Yr Normal (1981-2010) and September 2020 Air Temperatures



Heat Units

Normal for Month: 286
2020: 283
% of normal: -1

Amarillo
30-Yr Normal (1981-2010) and October 2020 Air Temperatures



Heat Units

Normal: 19
2020: 127
% of normal: +568

Hard freeze on Oct 25