Monitoring Cotton Growth and Development in the Texas Panhandle

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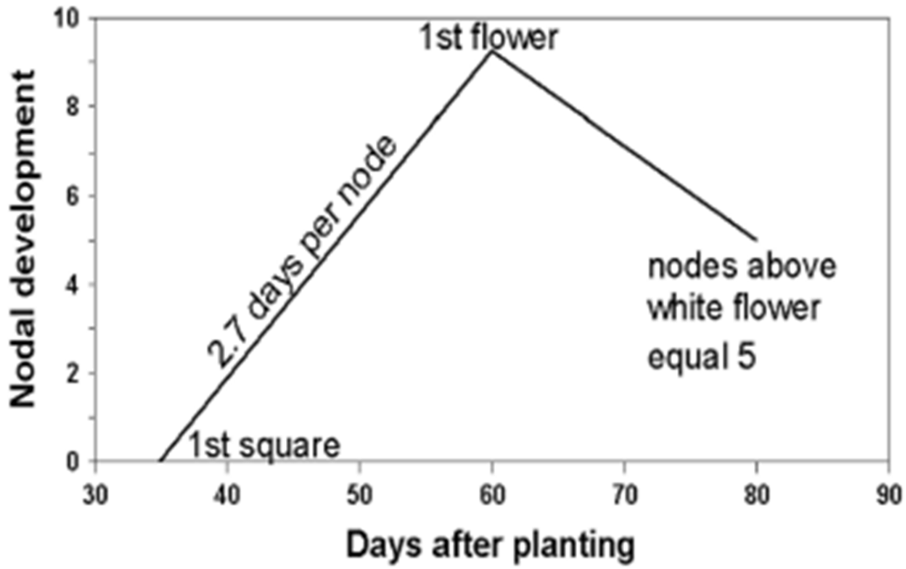
Objective

To recalibrate the Target Development Curve to better fit cropping systems representative of modern cultivars in the semi-arid climate of the Texas Panhandle.

Target Development Curve

- Representative of a hypothetical normal non-stressed cotton crop (Bourland et al., 2008).
- TDC is not an accurate model for cultivars under stress (Oosterhuis et al., 2008b).
- Monitoring main stem nodal development is a proven appraisal of the status of growth – specifically early season vegetative growth (Bourland et al., 2008, 1992).
- Current standard for identifying the flowering date for cutout is NAWF=5 (Bourland et al., 1992).



Methodology

Nodal Development

Nodes above first square and first flower are collected from 10 randomly sampled plants. 5 ft of row is tagged for NAWF values.

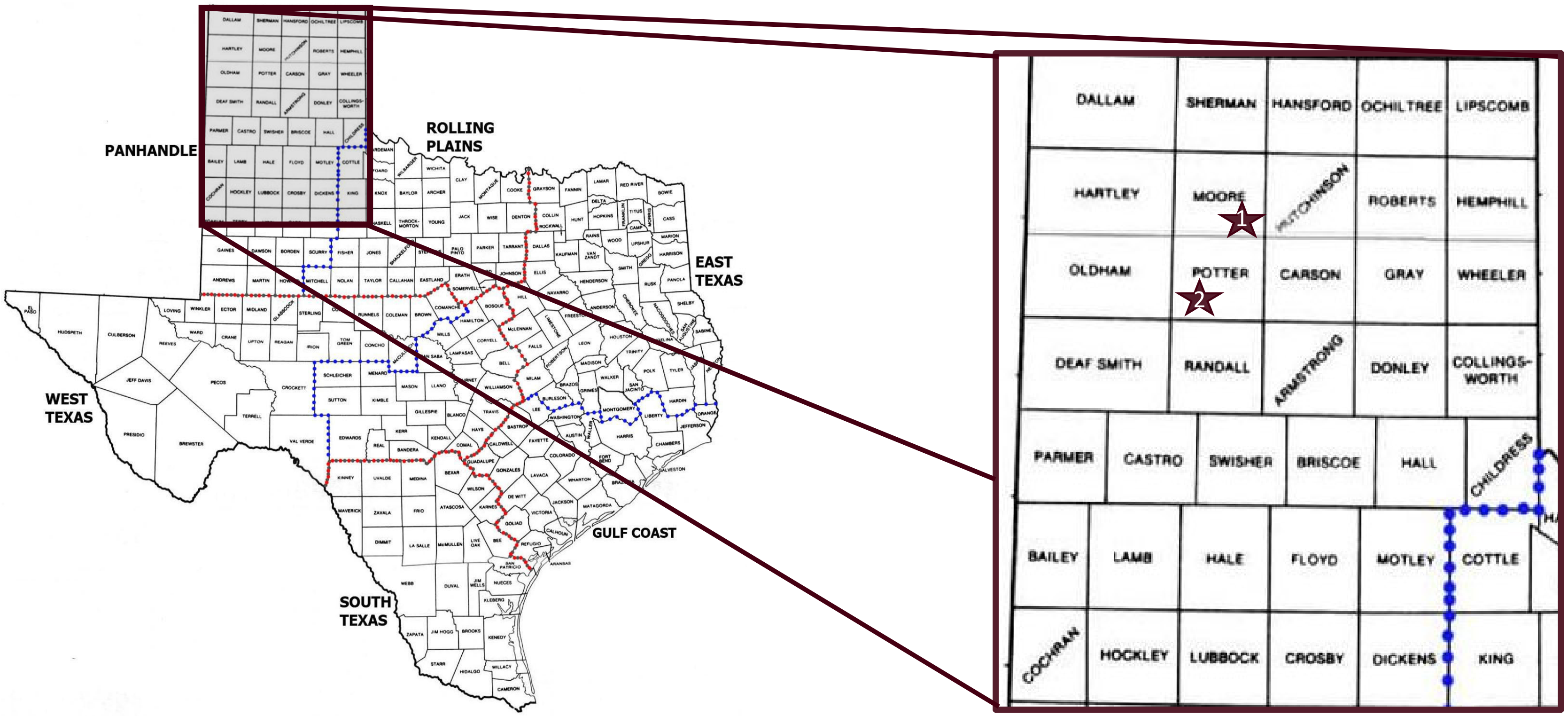
Lint Accumulation

Plants are hand harvested and box picked. Boll counts and lint weight is collected by fruiting position.

Heat Unit Accumulation

Heat units at major developmental stages are referenced from weather station data at each trial location.

Trial Locations



1 WCC

2 OAP

Water Conservation Center (WCC) Trial

Etter, Texas

2022

Plant Date: May 13th

Rep 3

301	302	303	304	305	306	307	308
DP2127	DP1820	ST4993	NG3195	DP1908	DG3469	DP2115	NG3299

Rep 4

401	402	403	404	405	406	407	408
DG3469	DP2127	DP1908	DP2115	DP1820	NG3299	NG3195	ST4993

Rep 2

208	207	206	205	204	203	202	201
DP2127	DP1820	ST4993	NG3195	DP1908	DG3469	DP2115	NG3299

Rep 1

108	107	106	105	104	103	102	101
DG3469	DP2127	DP1908	DP2115	DP1820	NG3299	NG3195	ST4993

2023

Plant Date: May 14th

Rep 4

408	407	406	405	404	403	402	401
ST4993	NG3299	NG3195	DP2127	DP2115	DP1908	DP1820	DG3469

Rep 3

301	302	303	304	305	306	307	308
DG3469	DP1820	DP1908	DP2115	DP2127	NG3195	NG3299	ST4993

Rep 1

108	107	106	105	104	103	102	101
ST4993	NG3299	NG3195	DP2127	DP2115	DP1908	DP1820	DG3469

Rep 2

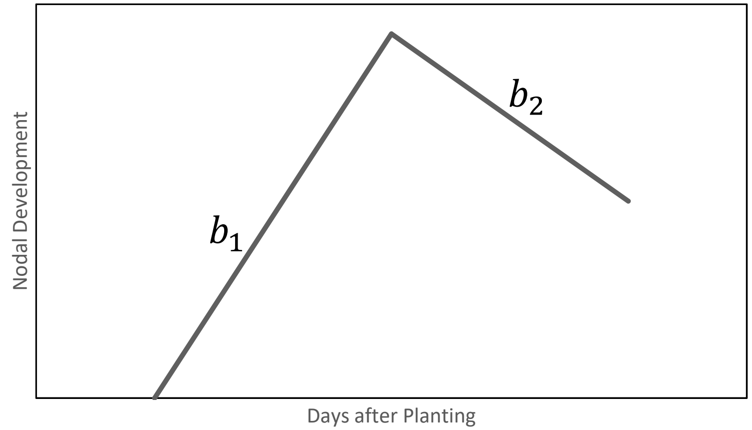
201	202	203	204	205	206	207	208
DG3469	DP1820	DP1908	DP2115	DP2127	NG3195	NG3299	ST4993

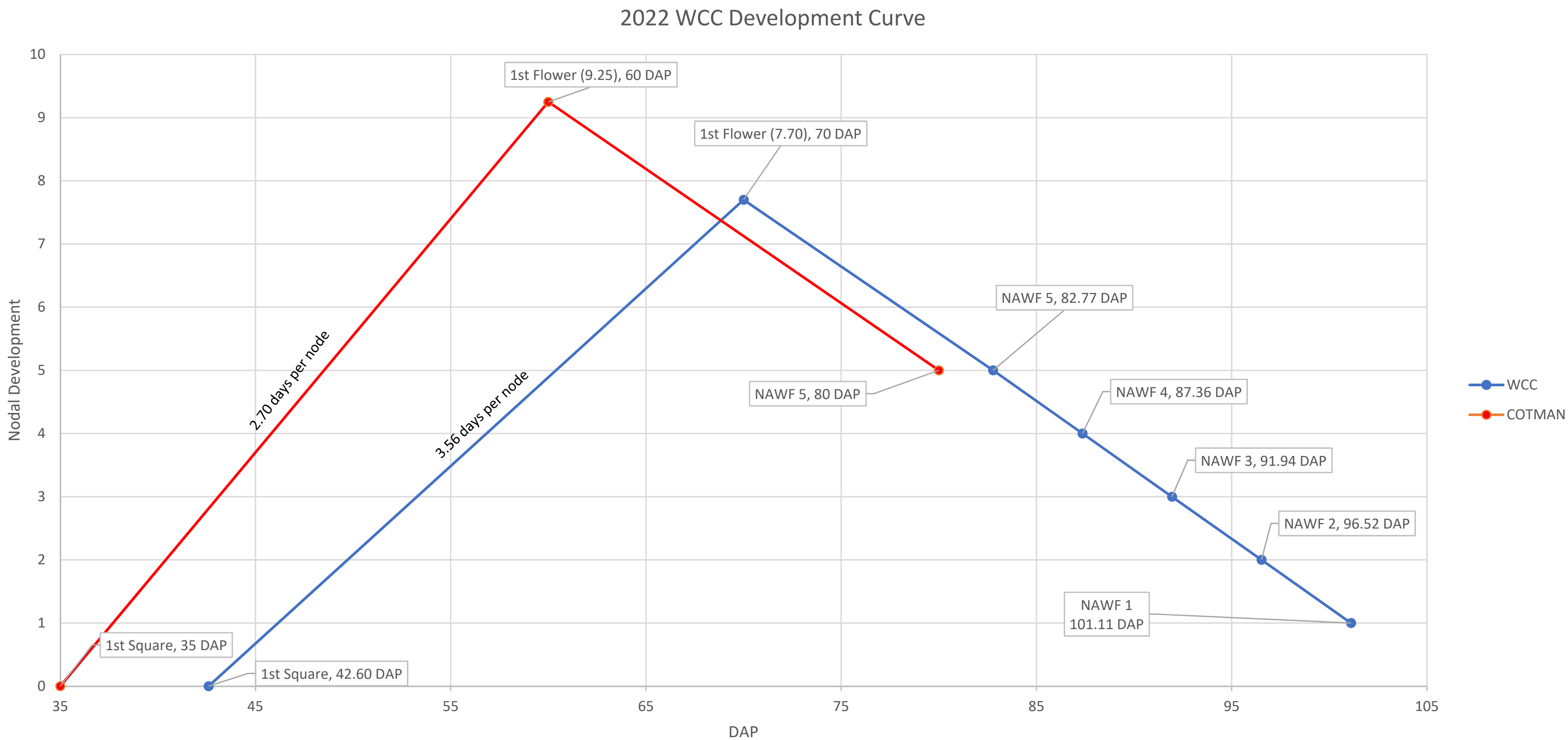
2022 WCC Analysis

General Equation: $NAWF = b_0 \pm b_1(DAP)$

$$\text{NAWF}=\begin{cases} f(DAP)b_1 + \epsilon \\ f(DAP)b_2 + \epsilon \end{cases}$$

Slope	Inflection Point (DAP)	Intercept	DAP	Nodal Development (days/node)	1st Square (DAP)	1st Flower (DAP)	1st Flower (NAWF)	NAWF=5 (DAP)	NAWF=4 (DAP)	NAWF=3 (DAP)	NAWF=2 (DAP)	NAWF=1 (DAP)
b1	<70	-11.97	0.28	3.56	42.60	70	7.70	82.77	87.36	91.94	96.52	101.11
b2	>=70	23.06	-0.22	-4.58								





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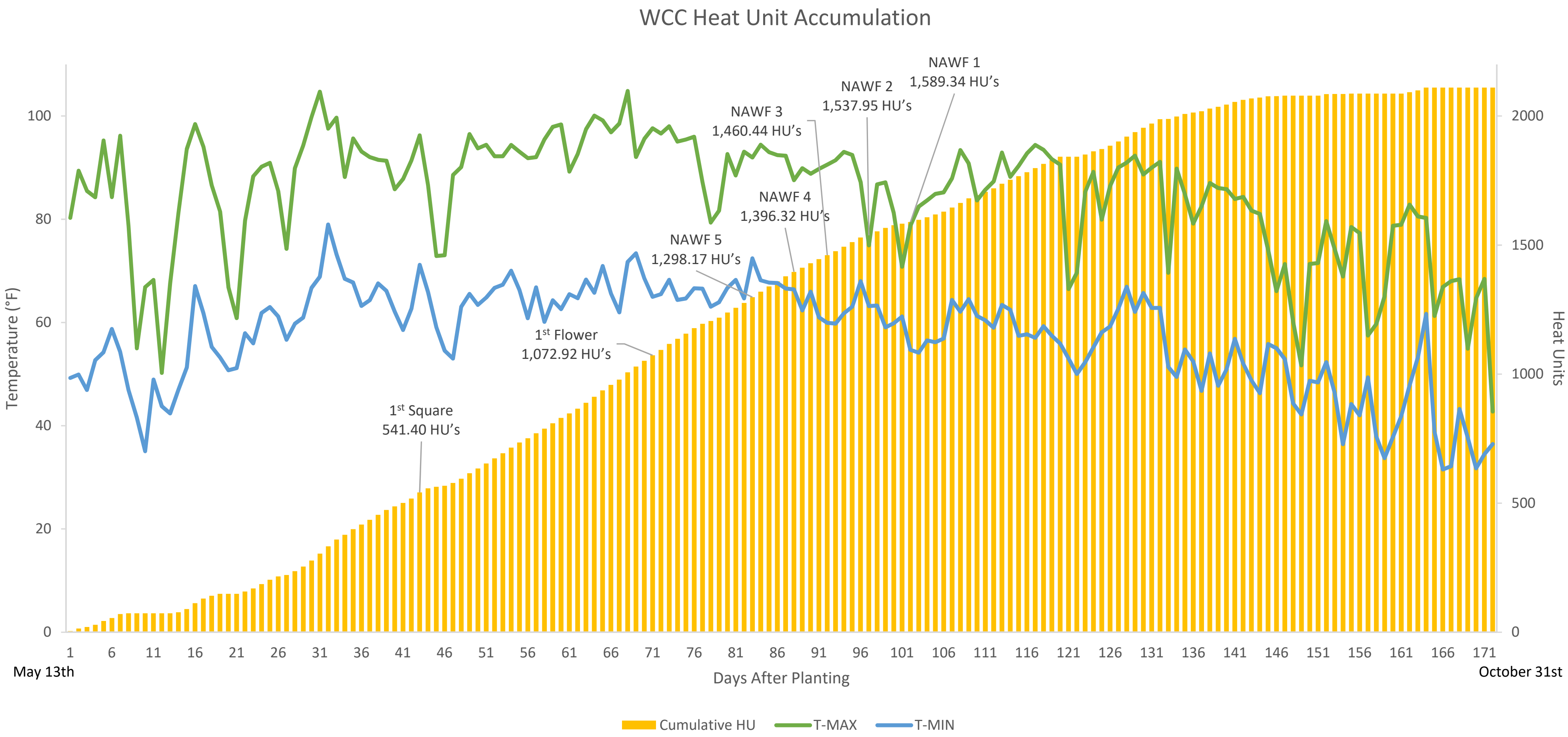

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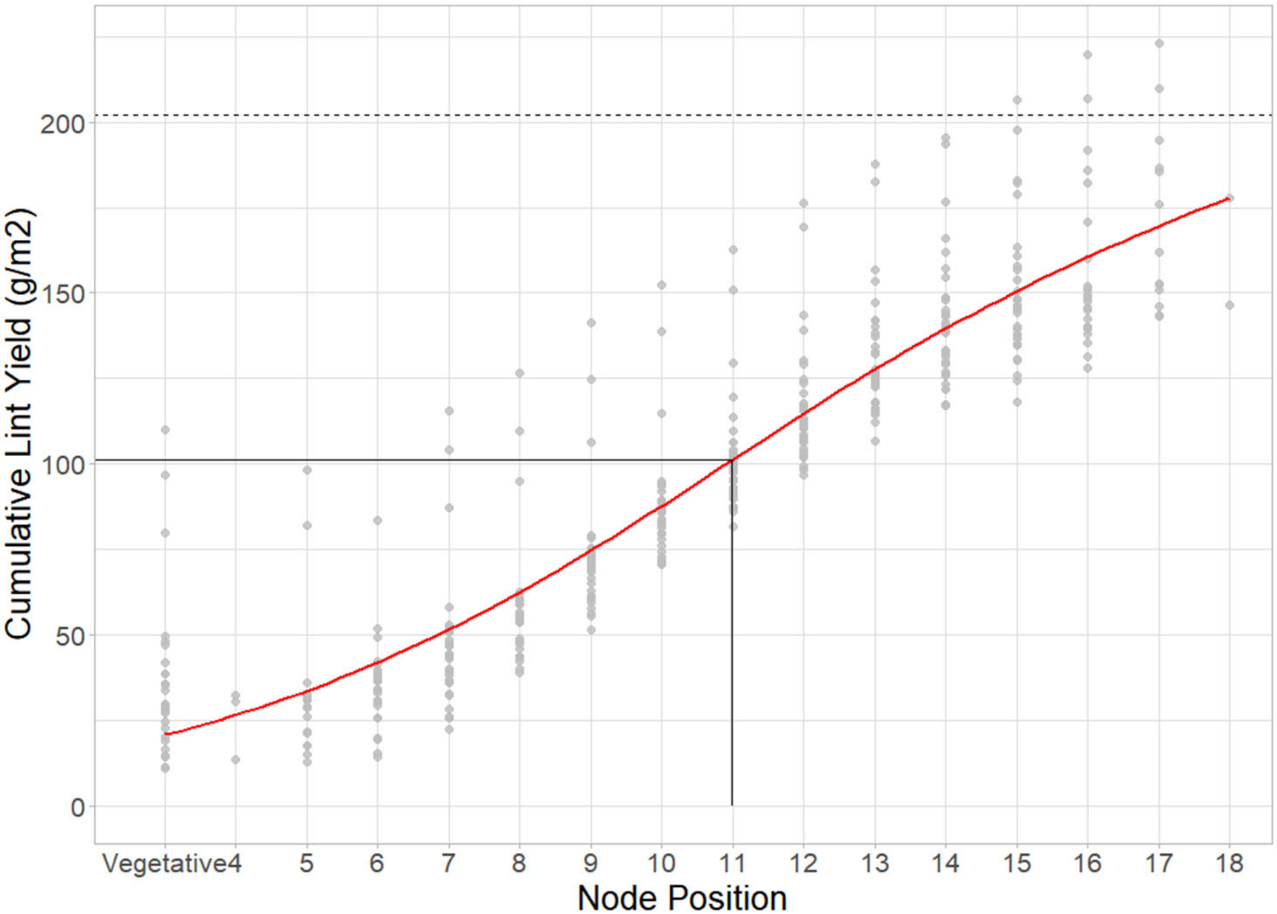
2022 WCC Lint Accumulation



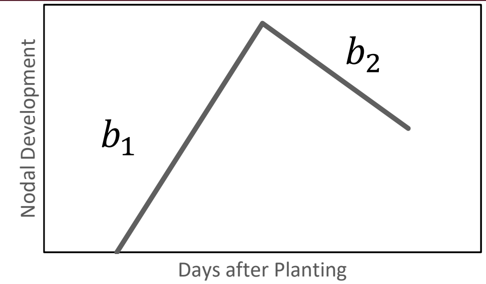
$$Y = \frac{Y_{max}}{1 + e^{-K(node - node_o)}}$$

Parameter	Estimate	Confidence Interval
Y_{max}	201.98 g/m^2	[180.67, 223.29]
$Node_0$	8.98	[8.04, 9.91]
K	0.27	[0.23, 0.31]

NAWF	Average Node	Yield (g/m^2)
5	11.37	132.53
4	12.80	148.94
3	13.71	157.94
2	14.73	166.72
1	N/A	N/A

2023 WCC Analysis

General Equation: $NAWF = b_0 \pm b_1(DAP)$



DG3469 NAWF= $\begin{cases} f(DAP)b_{11} + \epsilon \\ f(DAP)b_{21} + \epsilon \end{cases}$

DP2115 NAWF= $\begin{cases} f(DAP)b_{14} + \epsilon \\ f(DAP)b_{24} + \epsilon \end{cases}$

NG3299 NAWF= $\begin{cases} f(DAP)b_{17} + \epsilon \\ f(DAP)b_{27} + \epsilon \end{cases}$

DP1820 NAWF= $\begin{cases} f(DAP)b_{12} + \epsilon \\ f(DAP)b_{22} + \epsilon \end{cases}$

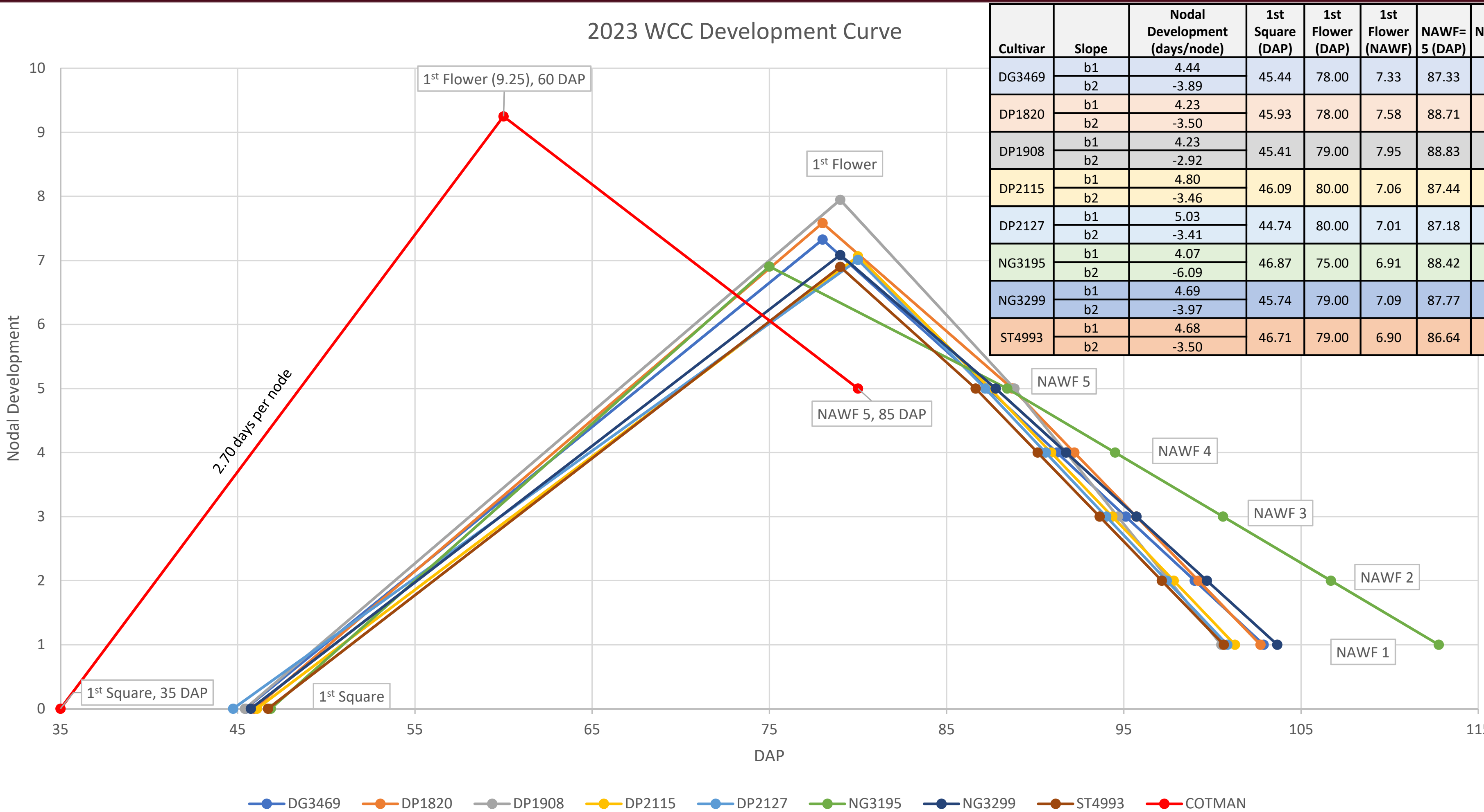
DP2127 NAWF= $\begin{cases} f(DAP)b_{15} + \epsilon \\ f(DAP)b_{25} + \epsilon \end{cases}$

ST4993 NAWF= $\begin{cases} f(DAP)b_{18} + \epsilon \\ f(DAP)b_{28} + \epsilon \end{cases}$

DP1908 NAWF= $\begin{cases} f(DAP)b_{13} + \epsilon \\ f(DAP)b_{23} + \epsilon \end{cases}$

NG3195 NAWF= $\begin{cases} f(DAP)b_{16} + \epsilon \\ f(DAP)b_{26} + \epsilon \end{cases}$

Cultivar	Slope	Inflection Point (DAP)	Intercept	DAP	Nodal Development (days/node)	1st Square (DAP)	1st Flower (DAP)	1st Flower (NAWF)	NAWF=5 (DAP)	NAWF=4 (DAP)	NAWF=3 (DAP)	NAWF=2 (DAP)	NAWF=1 (DAP)
DG3469	b1	<78	-10.22	0.22	4.44	45.44	78.00	7.33	87.33	91.22	95.11	99.00	102.89
	b2	>=78	27.46	-0.26	-3.89								
DP1820	b1	<78	-10.86	0.24	4.23	45.93	78.00	7.58	88.71	92.21	95.71	99.21	102.71
	b2	>=78	30.35	-0.29	-3.50								
DP1908	b1	<79	-10.74	0.24	4.23	45.41	79.00	7.95	88.83	91.75	94.66	97.58	100.50
	b2	>=79	35.46	-0.34	-2.92								
DP2115	b1	<80	-9.60	0.21	4.80	46.09	80.00	7.06	87.44	90.90	94.36	97.81	101.27
	b2	>=80	30.30	-0.29	-3.46								
DP2127	b1	<80	-8.89	0.20	5.03	44.74	80.00	7.01	87.18	90.59	94.01	97.42	100.84
	b2	>=80	30.53	-0.29	-3.41								
NG3195	b1	<75	-11.51	0.25	4.07	46.87	75.00	6.91	88.42	94.51	100.60	106.68	112.77
	b2	>=75	19.53	-0.16	-6.09								
NG3299	b1	<79	-9.74	0.21	4.69	45.74	79.00	7.09	87.77	91.75	95.72	99.69	103.66
	b2	>=79	27.10	-0.25	-3.97								
ST4993	b1	<79	-9.98	0.21	4.68	46.71	79.00	6.90	86.64	90.14	93.64	97.14	100.64
	b2	>=79	29.75	-0.29	-3.50								



Cultivar	Slope	Nodal Development (days/node)	1st Square (DAP)	1st Flower (DAP)	1st Flower (NAWF)	NAWF= 5 (DAP)	NAWF=4 (DAP)	NAWF=3 (DAP)	NAWF=2 (DAP)	NAWF=1 (DAP)
DG3469	b1	4.44	45.44	78.00	7.33	87.33	91.22	95.11	99.00	102.89
	b2	-3.89								
DP1820	b1	4.23	45.93	78.00	7.58	88.71	92.21	95.71	99.21	102.71
	b2	-3.50								
DP1908	b1	4.23	45.41	79.00	7.95	88.83	91.75	94.66	97.58	100.50
	b2	-2.92								
DP2115	b1	4.80	46.09	80.00	7.06	87.44	90.90	94.36	97.81	101.27
	b2	-3.46								
DP2127	b1	5.03	44.74	80.00	7.01	87.18	90.59	94.01	97.42	100.84
	b2	-3.41								
NG3195	b1	4.07	46.87	75.00	6.91	88.42	94.51	100.60	106.68	112.77
	b2	-6.09								
NG3299	b1	4.69	45.74	79.00	7.09	87.77	91.75	95.72	99.69	103.66
	b2	-3.97								
ST4993	b1	4.68	46.71	79.00	6.90	86.64	90.14	93.64	97.14	100.64
	b2	-3.50								

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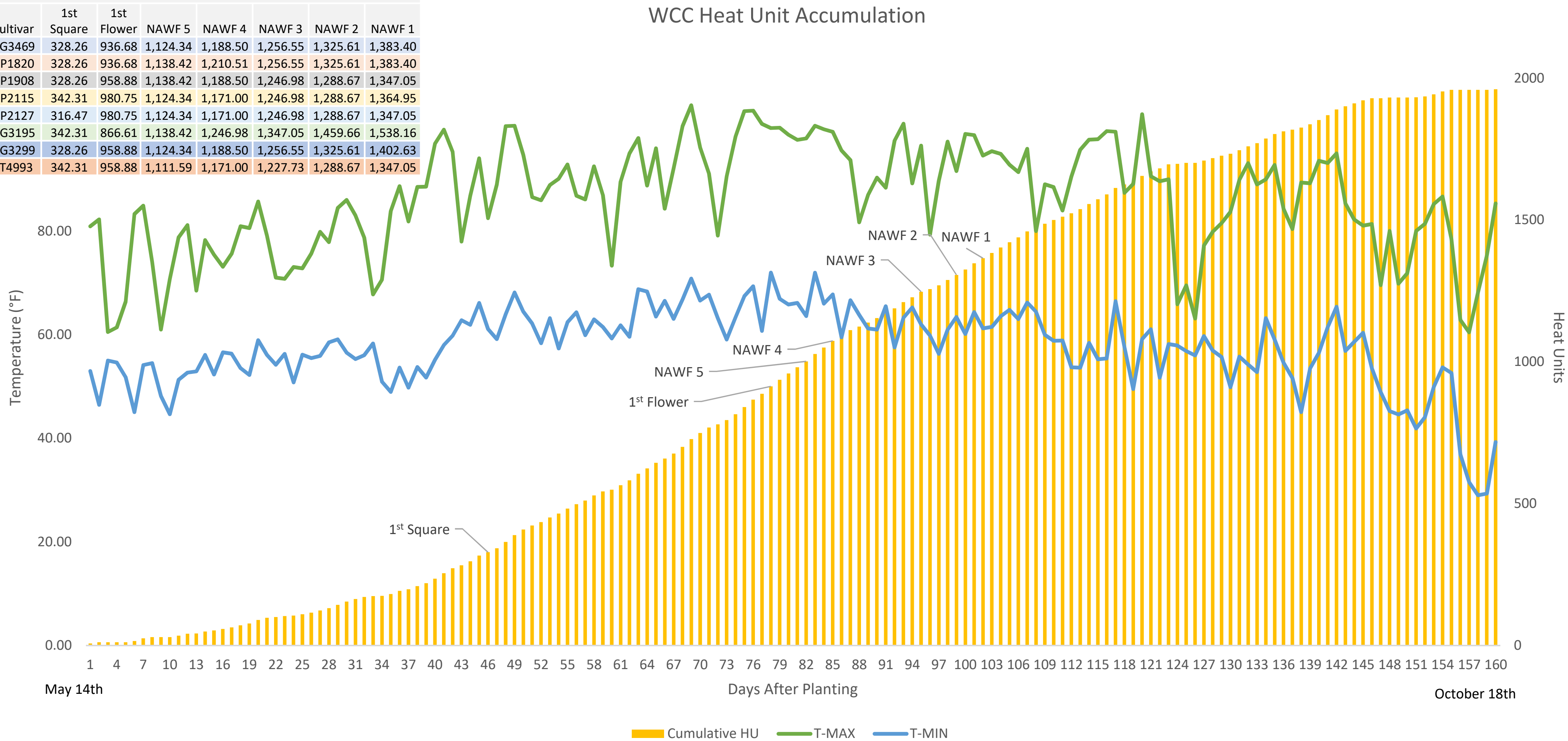
Heat Units							
Cultivar	1st Square	1st Flower	NAWF 5	NAWF 4	NAWF 3	NAWF 2	NAWF 1
DG3469	328.26	936.68	1,124.34	1,188.50	1,256.55	1,325.61	1,383.40
DP1820	328.26	936.68	1,138.42	1,210.51	1,256.55	1,325.61	1,383.40
DP1908	328.26	958.88	1,138.42	1,188.50	1,246.98	1,288.67	1,347.05
DP2115	342.31	980.75	1,124.34	1,171.00	1,246.98	1,288.67	1,364.95
DP2127	316.47	980.75	1,124.34	1,171.00	1,246.98	1,288.67	1,347.05
NG3195	342.31	866.61	1,138.42	1,246.98	1,347.05	1,459.66	1,538.16
NG3299	328.26	958.88	1,124.34	1,188.50	1,256.55	1,325.61	1,402.63
ST4993	342.31	958.88	1,111.59	1,171.00	1,227.73	1,288.67	1,347.05



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Preliminary Findings for Cotton Production in the Texas Panhandle

	WCC	**TDC**	**Δ**
First Square (DAP)	42-45 DAP	35 DAP	7-10 d
Vertical Fruiting Interval (days per node)	3.5-4.5 days/node	2.7 days/node	0.8-1.8 days/node
First Flower	70-78 DAP	60 DAP	10-18 d
Node	7.2-7.7	9.25	1.55-2.05
Cutout	TBD	NAWF 5	TBD

Acknowledgements

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Questions?

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