

Phenological, growth, and yield responses of sweet corn to elevational air temperatures in the humid tropics

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**Supplementary Table 1.** Weather data recorded during the growing season for the three elevations AUGUST 2021.

Day	Coastland					Midland					Highland				
	Temperature (°C)			Precip. (mm)	Avg. RH (%)	Temperature (°C)			Precip. (mm)	Avg. RH (%)	Temperature (°C)			Precip. (mm)	Avg. RH (%)
	Avg	Max	Min			Avg	Max	Min			Avg	Max	Min		
1	26.4	30.1	23.8	-	85	24.4	29.2	19.6	1.7	72	24.4	29.2	19.6	1.7	72
2	26.8	30.6	23.4	10.0	86	24.7	29.5	19.8	11.0	73	24.7	29.5	19.8	11	73
3	27.4	31.9	24.4	-	86	26.2	31.3	21.0	0.0	74	26.2	31.3	21.0	0	74
4	25.4	29.9	24.7	4.0	92	25.9	29.4	22.4	4.4	80	25.9	29.4	22.4	4.4	80
5	26.2	30.5	23.2	17.0	85	25.1	29.2	21.0	43.9	71	25.1	29.2	21.0	43.9	71
6	26.7	30.8	23.7	-	86	24.5	30.2	19.9	0.0	70	24.5	30.2	19.9	0	70
7	27.7	31.4	24.6	-	85	25.7	30.6	20.8	-	72	25.7	30.6	20.8	-	72
8	27.7	32.6	24.8	0.0	85	25.4	30.8	20.0	-	71	25.4	30.8	20.0	-	71
9	26.7	30.0	24.8	0.0	89	25.5	30.2	20.8	0.0	75	25.5	30.2	20.8	0	75
10	26.8	30.7	24.3	2.0	85	25.9	30.3	21.4	-	73	25.9	30.3	21.4	-	73
11	27.6	32.2	24.5	-	85	25.3	31.2	19.4	6.0	70	25.3	31.2	19.4	6	70
12	27.6	32.2	25.1	-	82	26.0	31.0	21.0	-	74	26.0	31.0	21.0	-	74
13	27.9	32.7	24.7	-	78	26.2	31.2	21.2	-	72	26.2	31.2	21.2	-	72
14	26.7	31.0	24.9	0.0	87	25.6	30.1	21.0	-	78	25.6	30.1	21.0	-	78
15	26.1	30.4	24.8	8.0	87	25.0	29.0	21.0	33.8	73	25.0	29.0	21.0	33.8	73
16	27.9	33.2	24.1	26.0	81	26.4	31.2	21.6	0.4	74	26.4	31.2	21.6	0.4	74
17	27.6	32.6	24.5	-	75	25.4	30.4	20.4	0.0	70	25.4	30.4	20.4	0	70
18	25.6	29.4	23.6	44.0	89	25.7	31.0	20.4	5.0	74	25.7	31.0	20.4	5	74
19	25.8	28.8	23.6	45.0	83	24.7	29.8	19.6	12.1	75	24.7	29.8	19.6	12.1	75
20	24.8	29.4	23.4	3.0	90	26.1	31.1	21.0	4.0	70	26.1	31.1	21.0	4	70
21	25.4	30.0	23.4	21.0	90	24.5	28.9	20.0	12.4	79	24.5	28.9	20.0	12.4	79
22	25.5	30.9	23.4	2.0	88	24.3	29.0	19.6	2.2	73	24.3	29.0	19.6	2.2	73
23	26.2	30.6	23.6	17.0	89	25.7	30.2	21.2	6.5	74	25.7	30.2	21.2	6.5	74
24	26.6	30.4	24.3	0.0	83	25.3	29.4	21.2	10.0	78	25.3	29.4	21.2	10	78
25	26.1	30.6	23.5	0.0	82	25.2	30.2	20.2	-	75	25.2	30.2	20.2	-	75
26	28.3	32.4	23.6	-	72	24.8	29.4	20.2	-	74	24.8	29.4	20.2	-	74
27	27.4	32.8	24.7	-	82	25.6	31.0	20.2	-	68	25.6	31.0	20.2	-	68
28	27.8	32.6	24.7	-	77	26.1	31.2	21.0	-	67	26.1	31.2	21.0	-	67

29	27.1	31.2	25.0	-	83	26.2	31.2	21.2	-	71	26.2	31.2	21.2	-	71
30	27.2	31.3	25.4	0.0	86	26.0	30.1	21.8	-	77	26.0	30.1	21.8	-	77
31	25.7	30.2	24.1	14.0	91	25.5	29.2	21.8	5.6	79	25.5	29.2	21.8	5.6	79
Avg.	26.7	30.9	24.0	213.0	84.6	25.4	30.1	19.9	159.0	73.4	25.4	24.5	18.8	159	73

SEPTEMBER 2021

Day	Coastland				Midland				Highland						
	Temperature (°C)			Precip. (mm)	Avg. RH (%)	Temperature (°C)			Precip. (mm)	Avg. RH (%)	Temperature (°C)			Precip. (mm)	Avg. RH (%)
	Avg	Max	Min			Avg	Max	Min			Avg	Max	Min		
1	24.6	27.5	24.0	28.0	94	25.3	29.8	20.7	8.4	78	21.4	24.7	18.0	32	85
2	25.2	30.4	22.7	51.0	91	24.7	29.8	19.5	14.0	78	21.3	24.3	18.3	0.8	88
3	27	32.1	22.8	13.0	83	26.4	32.5	20.2	0.3	72	22.8	26.4	19.1	2.1	76
4	27.1	31.8	24.5	3.0	83	24.8	29.9	19.7	6.0	73	22.1	23.8	20.4	21.6	81
5	25.9	32.0	24.6	-	87	26.4	31.6	21.1	3.0	70	21.9	23.4	20.3	0	86
6	26.9	32.4	24.7	22.0	85	27.4	32.9	21.9	0.1	68	22.8	26.4	19.1	0	76
7	26.3	30.6	23.4	7.0	83	24.2	27.2	21.1	8.2	76	20.7	22.4	18.9	1.3	93
8	26.4	29.2	23.6	-	84	24.4	28.9	19.8	0.1	77	21.4	22.3	20.5	24	87
9	27.1	32.2	23.9	-	80	25.8	31.6	19.9	4.5	75	23.1	25.9	20.3	0	76
10	27.3	32.4	24.2	-	70	26.4	31.7	21	3.2	70	21.3	24.5	18.1	17.4	86
11	27.1	31.9	24.1	-	81	25.0	31.2	18.7	15.0	69	20.9	24.6	17.2	19.2	81
12	27.6	32.6	24.1	-	84	21.2	24.6	17.7	-	88	22.4	25.6	19.1	44	83
13	26.4	30.0	24.3	13.0	90	21.2	24.1	18.3	3.2	88	20.4	21.7	19.1	33.1	92
14	26.5	30.7	22.6	20.0	85	24.0	27.7	20.3	47.0	81	21.2	23.9	18.5	12.6	85
15	27.3	32.0	24.1	0.0	84	25.3	30.8	19.8	1.0	74	21.7	25.5	17.8	0	87
16	27.8	33.0	24.5	1.0	82	23.4	25.9	20.9	35.6	86	20.7	22.5	18.9	34.2	93
17	28.3	32.9	25.1	-	81	26.4	30.5	22.2	8.2	69	21.8	24.8	18.8	0	84
18	28.3	33.5	25.5	-	82	27.5	32.7	22.3	0.0	66	21.9	25.1	18.6	0	86
19	26.2	28.4	24.8	2.0	82	25.9	30.3	21.5	0.2	77	22.2	25.6	18.7	0	87
20	26.9	30.8	24.0	-	82	27.0	33.1	20.9	3.4	71	23.1	24.3	21.9	1.3	84
21	27.2	31.3	24.6	1.0	84	24.8	30.5	19.1	6.0	79	23.5	26.8	20.1	21.2	78
22	27.9	32.6	24.7	0.0	81	24.8	30	19.6	50.0	78	23.0	25.5	20.4	0	79
23	27.6	31.9	25.3	-	84	25.7	32.1	19.2	5.6	76	23.3	25.5	21.0	0.2	79
24	28.2	32.0	25.1	0.0	81	27.5	32.6	22.4	19.0	66	22.8	25.4	20.1	7.6	78
25	27.9	31.3	25.3	5.0	85	26.4	29.6	23.1	12.0	84	22.5	24.6	20.3	3.6	80
26	26.2	30.4	23.6	21.0	87	26.6	29.9	23.2	57.8	86	22.1	23.7	20.4	4.2	81
27	27.5	30.0	23.6	3.0	84	26.2	32.7	19.6	3.8	75	22.6	24.8	20.4	28.3	84
28	26.3	29.8	25.1	4.0	93	26.2	30.4	22	12.0	81	21.8	23.8	19.8	6.8	89
29	25.7	29.8	24.2	37.0	91	24.7	27.2	22.1	7.8	85	22.1	24.5	19.6	2.5	91
30	26.3	30.0	24.2	31.0	82	24.8	29.4	20.2	8.1	81	22.1	24.4	19.7	27	87
Avg.	26.9	31.2	24.2	262.0	84.2	25.32	30.0	20.6	343.5	76.3	22.0	24.6	19.4	323.8	83.8

## OCTOBER 2021

Coastland				Midland				Highland										
Date	Temperature (°C)			Precip. (mm)	Avg. (%)	RH	Temperature (°C)			Precip. (mm)	Avg. (%)	RH	Temperature (°C)			Precip. (mm)	Avg. (%)	RH
	Avg	Max	Min				Avg	Max	Min				Avg	Max	Min			
1	26.4	30.2	23.7	2.0	84	24.1	28.1	20.0	0.2	80	22.5	25.1	19.8	0.4	86			
2	27.1	32.6	23.7	-	81	26.3	32.9	19.6	1.4	76	21.9	24.8	18.9	0.0	83			
3	26.5	31.8	24.1	-	86	24.8	31.4	18.1	18.0	79	22.5	25.5	19.4	1.5	92			
4	27.3	32.0	24.6	1.0	85	25.4	30.6	20.1	1.2	82	21.4	23.4	19.4	2.1	87			
5	27.5	30.8	24.2	1.0	82	24.2	27.2	21.1	1.8	84	22.5	25.2	19.8	15.2	91			
6	27	30.8	25.0	-	84	24.8	29.4	20.2	19.0	81	22.2	25.6	18.8	0.0	91			
7	24.9	28.0	24.0	-	92	23.8	28.1	19.4	7.0	80	22.0	24.8	19.2	28.8	91			
8	26.6	32.1	23.0	12.0	83	25.1	30.9	19.3	17.0	78	22.5	25.6	19.3	0.0	82			
9	27.6	33.5	23.7	-	79	26.9	33	20.7	0.0	77	21.3	24.5	18.1	3.2	86			
10	27.6	32.2	24.6	-	85	25.2	30.4	19.9	22.0	81	21.2	23.9	18.5	25.4	85			
11	24.1	28.2	23.8	76.0	92	23.5	25.9	21.1	33.0	82	20.7	22.5	18.9	2.4	93			
12	26.8	31.3	23.0	10.0	84	25.0	31.8	18.1	0.5	80	20.7	22.5	18.9	33.1	93			
13	25.5	30.0	24.1	14.0	96	25.5	29.6	21.3	0.4	78	21.2	23.9	18.5	22.1	87			
14	25.4	30.2	22.0	95.0	85	24.8	30.6	19.0	31.2	81	20.5	22.2	18.8	28.3	88			
15	27.4	30.8	22.1	-	79	25.7	32	19.3	1.0	75	20.3	22.5	18.0	12.6	87			
16	27.6	30.7	24.4	10.0	82	25.4	31.5	19.3	0.0	79	22.4	25.6	19.1	2.1	76			
17	26.9	31.1	24.4	1.0	87	25.4	32.5	18.3	6.2	79	21.3	24.8	17.8	20.0	86			
18	26.7	30.3	24.4	15.0	86	25.3	30.8	19.7	66.0	76	21.7	25.2	18.1	2.4	78			
19	26.8	31.0	23.4	69.0	83	26.3	32.2	20.3	51.0	75	22.2	25.3	19.0	3.1	87			
20	27.8	32.6	24.2	-	81	24.3	29.1	19.5	0.0	82	21.8	24.8	18.8	42.0	84			
21	26.4	30.6	24.2	9.0	88	24.8	28.8	20.7	6.5	80	21.9	25.7	18.1	4.8	77			
22	26.6	29.9	24.6	17.0	88	26.8	31.5	22.0	2.8	77	21.8	24.8	18.8	22.0	81			
23	26.5	30.3	23.8	5.0	86	26.2	31.7	20.7	0.4	75	21.9	25.1	18.6	12.3	81			
24	26.3	30.3	24.2	4.0	90	25.0	29.6	20.4	-	79	21.9	25.6	18.2	2.4	77			
25	26.7	29.6	24.3	7.0	87	27.8	27.8	21.5	36.0	84	21.9	25.1	18.6	0.0	81			
26	27	30.4	23.9	6.0	87	24.7	30.1	19.3	-	81	22.2	25.7	18.6	0.4	75			
27	27	30.2	24.4	54.0	81	31.7	31.7	20.1	-	76	21.7	23.9	19.4	2.6	83			
28	27.1	30.7	24.0	0.0	81	25.1	29.8	20.3	-	79	20.9	22.6	19.2	31.2	87			
29	27.9	33.6	24.6	0.0	80	23.3	27.3	19.3	0.4	87	22.0	25.7	18.2	4.2	77			
30	27	32.2	25.2	0.0	86	23.8	26.4	21.2	2.8	87	20.6	22.4	18.8	1.1	87			
31	27	30.4	24.1	13.0	87	25.6	31.4	19.8	6.8	80	21.8	23.8	19.8	22.0	89			
Avg.	26.742	30.9	24.0	421.0	85.1	25.3	30.1	19.9	332.6	79.5	21.6	24.5	18.8	347.7	84.5			

## NOVEMBER 2021

Coastland				Midland				Highland										
Date	Temperature (°C)			Precip. (mm)	Avg. (%)	RH	Temperature (°C)			Precip. (mm)	Avg. (%)	RH	Temperature (°C)			Precip. (mm)	Avg. (%)	RH
	Avg	Max	Min				Avg	Max	Min				Avg	Max	Min			
1	26.6	30.2	24.8	3.0	87	20.7	28.4	20.7	0.8	89	23.0	25.5	20.4	14.2	79			

2	26.9	30.3	24.2	5.0	86	23.2	26.8	19.5	10.0	86	22.1	23.7	20.4	3.1	81
3	27.3	30.3	24.7	0.0	84	24.4	28.0	20.7	28.0	85	22.4	25.6	19.1	-	83
4	27.4	30.2	25.2	9.0	84	24.8	29.7	19.8	1.0	79	20.7	22.5	18.9	2.6	84
5	25.8	29.2	23.7	22.0	92	25.6	31.4	19.8	10.0	80	21.8	24.8	18.8	2.1	82
6	26.8	30.2	24.0	101.0	85	25.2	29.1	21.2	14.6	82	22.2	25.6	18.7	1.6	81
7	26.9	31.0	23.6	10.0	78	26.0	31.2	20.8	20.0	80	21.4	24.5	18.2	-	82
8	27.9	31.2	23.9	-	76	25.7	32.0	19.3	-	76	21.7	24.5	18.8	1.2	82
9	28.1	31.1	25.5	1.0	76	25.9	30.4	21.3	69.6	81	21.9	23.9	19.8	-	83
10	26.8	32.0	24.0	2.0	79	23.8	29.2	18.3	6.0	83	23.1	24.3	21.9	16.3	84
11	26.6	30.7	23.4	0.0	74	23.3	28.9	17.7	-	76	22.1	25.9	18.3	-	74
12	26.9	31.3	23.4	-	81	25.8	31.2	20.3	0.0	79	21.6	25.7	17.4	0.8	77
13	27.3	30.0	24.1	-	85	26.2	31.2	21.1	0.6	78	22.3	25.8	18.8	5.0	76
14	27.3	31.0	24.7	0.0	79	26.0	32.6	19.3	19.4	76	21.6	23.9	19.2	19.5	83
15	27.2	31.4	23.8	3.0	82	23.3	28.9	17.7	1.1	76	22.1	25.2	19.0	3.4	85
16	27.7	31.6	24.2	-	78	25.9	30.4	21.3	0.0	81	21.7	24.8	18.6	12.0	81
17	27.9	31.4	24.5	-	80	25.1	30.0	20.2	-	80	21.5	24.8	18.1	3.2	81
18	26.6	30.2	24.8	1.0	85	24.0	28.3	19.6	-	78	20.6	22.8	18.3	18.8	82
19	26.9	30.8	24.2	6.0	87	25.0	30.9	19.0	47.0	77	21.9	25.2	18.6	6.2	83
20	27.6	31.6	24.5	-	81	25.6	30.1	21.1	-	75	22.4	25.9	18.9	22.0	87
21	27.4	30.4	25.2	6.0	85	25.8	30.3	21.2	-	76	22.3	26.6	18.0	21.0	86
22	27.0	30.9	24.5	-	84	25.3	31.0	19.5	8.6	79	22.0	26.7	17.3	10.0	82
23	27.0	30.6	24.2	6.0	80	24.7	29.4	20.0	15.6	76	22.0	26.2	17.8	26.0	83
24	27.8	31.8	24.3	-	78	25.7	31.5	19.9	-	74	21.9	26.0	17.7	12.6	84
25	28.1	31.8	25.0	-	76	25.7	31.6	19.8	-	74	21.9	26.2	17.6	-	85
26	27.9	31.2	25.6	-	78	24.8	29.8	19.8	0.0	86	22.1	26.6	17.6	-	83
27	26.1	29.6	24.0	32.0	89	25.2	29.4	20.9	1.3	72	22.2	26.2	18.2	15.0	83
28	27.1	31.5	24.4	1.0	83	25.7	31.5	19.9	-	74	22.1	26.5	17.7	20.0	85
29	25.8	31.1	23.0	15.0	86	25.8	31.6	19.9	4.2	74	21.9	26.1	17.7	23.0	84
30	24.6	29.8	23.0	35.0	92	25.2	30.6	19.8	9.2	78	21.9	26.2	17.6	40.0	82
Avg.	27.0	30.8	24.3	258.0	82.3	24.9	30.2	20.0	267	78	21.9	25.3	18.6	299.6	82.0

**Supplementary Table 2.** Soil test results of initial soil samples collected from the three elevations

Sample No.	Location	pH	N	C	P	K	Ca	Mg	Gs	Texture (%)		
			(%)		(ppm)	... me/100 g ...				Sand	Clay	Silt
846	Highland	5.69	0.43	3.37	5.21	0.27	0.96	0.31	2.11	74.48	8.48	17.04
847	Highland	5.74	0.20	2.86	6.64	0.22	0.16	0.11	1.97	73.88	8.68	17.44
848	Highland	5.44	0.17	3.05	2.74	0.25	0.15	0.05	2.03	72.22	8.51	19.27
849	Highland	5.63	0.34	5.10	3.47	0.23	0.10	0.06	2.06	74.52	6.31	19.18
850	Highland	4.88	0.42	2.83	4.55	0.19	0.05	0.03	2.17	69.68	6.42	23.90
851	Highland	4.66	0.38	2.65	6.37	0.19	0.04	0.06	2.72	76.15	6.45	17.40
Average		5.34	0.32	3.31	4.83	0.23	0.24	0.10	2.17	73.49	7.48	19.04
852	Midland	5.63	0.48	2.44	7.38	0.28	0.17	0.07	2.03	76.84	6.26	16.89
853	Midland	5.76	0.49	2.59	5.79	0.26	0.23	0.10	1.91	80.08	8.89	11.04
854	Midland	5.86	0.48	3.00	8.13	0.28	0.18	0.08	1.99	69.57	8.65	21.78
855	Midland	6.20	0.33	2.18	3.81	0.22	0.17	0.10	2.08	80.61	8.65	10.74
856	Midland	5.62	0.43	2.60	5.34	0.30	0.14	0.10	2.43	79.22	8.32	12.46
857	Midland	6.02	0.34	2.44	2.74	0.25	0.15	0.05	2.11	80.91	8.51	10.57
Average		5.85	0.43	2.54	5.53	0.26	0.17	0.08	2.09	77.87	8.21	13.91
858	Coastal	5.30	0.16	1.47	2.90	0.25	0.05	0.11	2.32	32.70	44.29	23.01
859	Coastal	5.62	0.08	0.70	1.52	0.25	0.05	0.08	2.63	25.68	59.22	15.10
860	Coastal	5.56	0.11	1.15	2.77	0.28	0.05	0.09	2.02	28.14	50.24	21.62
861	Coastal	5.15	0.13	0.78	0.76	0.21	0.08	0.04	1.87	20.83	63.98	15.19
862	Coastal	5.14	0.15	1.35	1.94	0.19	0.06	0.06	2.32	32.63	42.22	25.15
863	Coastal	5.30	0.13	0.72	1.78	0.26	0.07	0.07	1.99	25.25	52.92	21.83
Average		5.35	0.12	1.03	1.95	0.24	0.06	0.07	2.19	27.54	52.15	20.32

**Supplementary Table 3.** The pedigree and parental of eight sweet corn inbred lines (S9)

No.	Line	Pedigree	Parental	
			Name	Variety
1	Caps 2	Bs - 1-2-1-1-2	Billy Sweet	Hybrid
2	Caps 3	Gd -2-2-1-1-2	Gendis	Open pollinated
3	Caps 5	Mto C-2-1-1-3	Metro	Open pollinated
4	Caps 15	Sb -1-5-1-4-2	Sweet boy	Hybrid
5	Caps 17A	Sg -2-1-1-2-1	Sweet Gold	Hybrid
6	Caps 17B	Sg -2-4-1-3-1	Sweet Gold	Hybrid
7	Caps 22	Bm -3-3-1-3-2	Bimo	Open pollinated
8	Caps 23	Si -2-1-1-8-1	Saigon	Hybrid