

Maize *Leafy1* 45 ft

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ABSTRACT

The *Leafy1* (*Lfy1*) mutation was placed into maize strain Chiapas 234 and grown in a tall short-night greenhouse (in the tropics). Plant height stopped naturally at **45 ft** (unprotruded tassel) from **98 internodes** (Table 3), the plant dying with **ear** (shoots; no silk) height of 44 ft at node 89, and aerial *roots* at 36 ft from node 62. The **mutation** created 10 ft ($\frac{1}{5}$) of height (*53 internodes*; Table 1; cf MNL 87:2; doubling internode quantity).

CONCLUSION

Lfy1 is **synergistic** with the night length reaction (30 internodes, read further), and the addition can happen above or, heterodoxically, below the (top) ear (wild type vs mutant: internode quantity Table 1, internode pattern Figure 1, 2). *Heterosis* determines whether it is above or below (Table 2). *Lfy1* (ear placement in the subspecies) is now proven further *relative*, as it has been **unpegged** from ear position (cf Gaspe, node 5 v 90). **25 internodes come from the wild type under long night, 20 from night length reaction, 20 from Lfy1, and 30 from synergy**. It appears that *Lfy1* will not grow more than 45 ft (<55 ft good environment), in general. Without short night, healthy tropical *Lfy1* plants usually have 18-23 internodes below the ear and 12-25 above (cf Table 6).

MATERIALS AND METHODS

The maize was cultivated at 10°N **latitude** and 4,000 ft **altitude**. Short night length was created by mid-**night light** for 3 h, and through dusk and dawn (darkness 7p-10p, 1a-4a). It was done using compact Fluorescent (CFL) bulbs (100w equivalent) suspended 1 m above plants at 1 m apart.

All leaves were removed from their nodes on the 40 ft plants, permitting measurement, which was from the scutellar (kernel) node to tassel top.

APPENDIX

LFY - SHORT NIGHT: Internode quantity, length, and background**Table 1. Organ position and reproductive time in late tropical background with and without *Lfy1*^a**

	<i>Lfy1</i>					wild type			
	44ft10	43ft7	42ft9	36ft9	35ft5	35ft	34ft11	34ft	33ft ^f
Plant Height	44ft10	43ft7	42ft9	36ft9	35ft5	35ft	34ft11	34ft	33ft ^f
Ear Height	44	23	21	23	25	25	-	25	-
Root Height	36	18	14	6	25	-	26	18	29
Total Nodes	98	>80	71	61	45	39	46	36	57
Above Ear	9	>46	[37]	28	10	8	-	6	-
Below Ear	89	34	[34]	33	35	31	-	30	-
Root Node	62	29	26	15	35	-	36	24	45
Max Inde Lgth (MIL) ^c	14	13.3	13.2	13	14	16	14.5	16	15
MIL Height	16	15	10	7	11	8	6	8	11
MIL Node	30	24	22	15	21	18	16	15	21
Transition ^d	40	38	43	33	[43]	[38]	[41]	[35]	
	[10m0w]								
Pollen ^e	-	-	7m1w	6m3w	5m3w	-	6m0w	4m2w	-
Silk	-	7m1w	-	6m0w	-	-	-	5m3w	-
Planting	Fb 1	Ja 15	Ja 15	Fb 1	Ja 15	Fb 1	Fb 1	Ja 15	Ja 15

Reference points in brackets. ^ashort-night greenhouse ^bheight ^cmaximum internode length ^dchange from wild type to *Lfy1* internode pattern ^emonths/weeks ^fChs 234 x Huehuetenango F2

Table 2. Putative genetic constituents of individuals (%)

	<i>Lfy1</i>				wild type			
	44ft10	43ft7	42ft9	36ft9	35ft5	35ft	34ft11	34ft
Chiapas 234	92(.96875)	47(.65625)	75	71(.6796875)	100	75	75	50
Veracruz 406		50		25				
Ecuador 689	4(.6875)	1(.5625)		2(.34375)		25	25	31(.25)
Guatemala 863	1(.171875)	(.390625)	12(.5)	(.1953125)				
Ecuador 573								6(.25)
Ecuador 876								12(.5)
tropical above temperate	1(.171875)	(.390625)	12(.5)	(.09765625) (.68359375)				
	44ft10 (L67); 43ft7 (L8); 42ft9 (L3); 36ft9 (TL68); 35ft5 (84); 35ft (UCR14); 34ft11 (TYJA); 34ft (58G)							

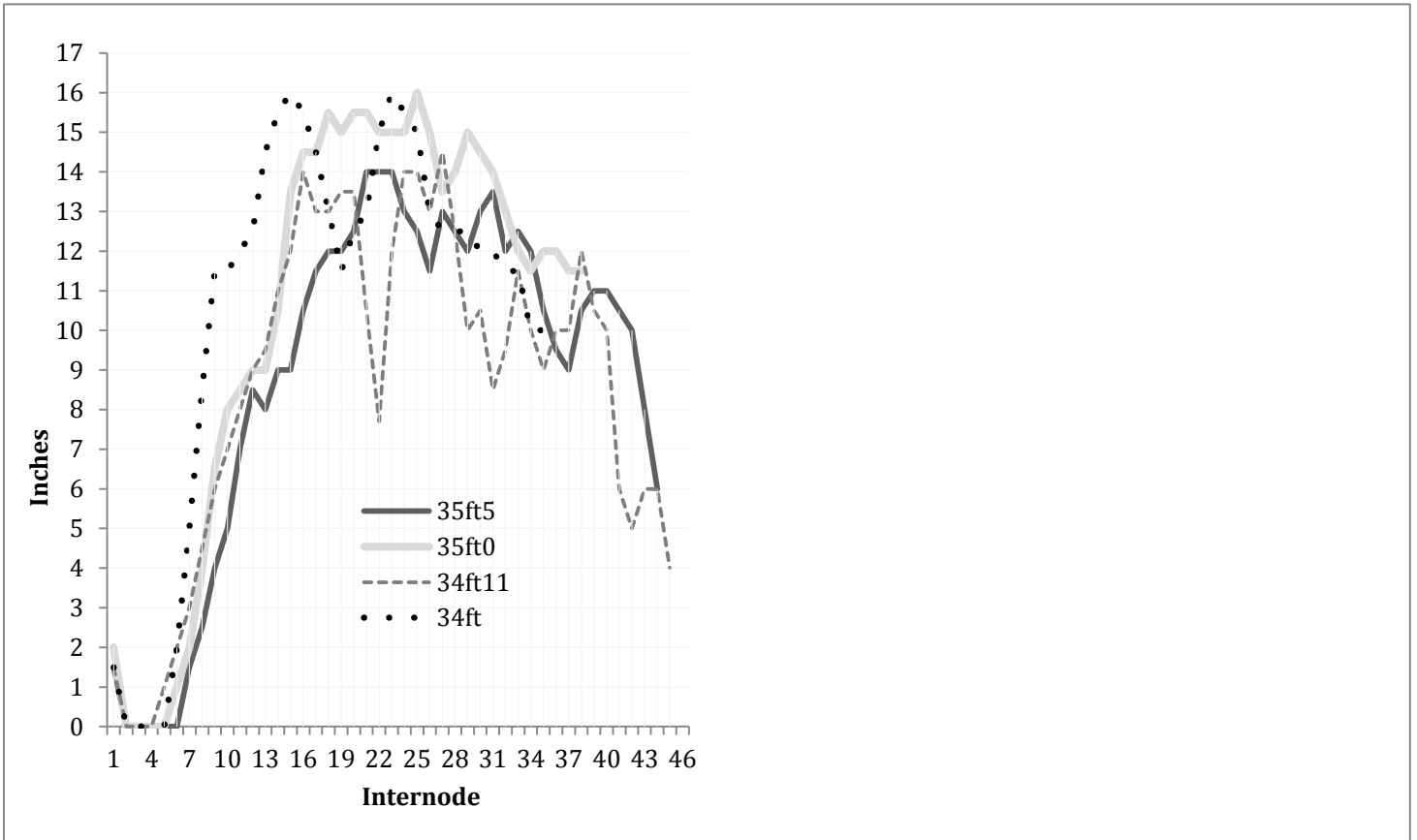


Figure 1. Internode length of wild type. Internode 1 is the total of the first several internodes that each have negligible length.

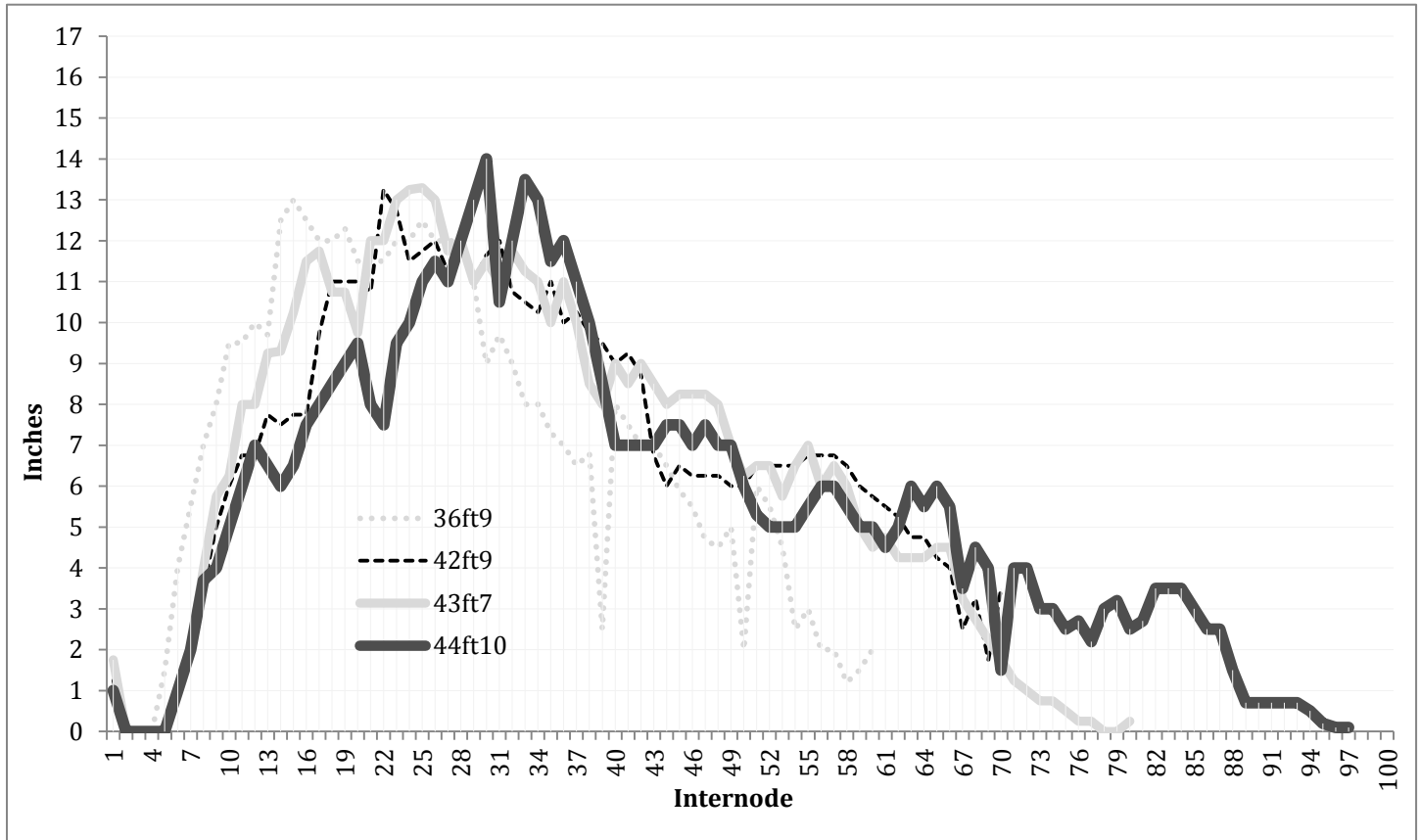


Figure 2. Internode length of *Lfy1* segregates

Table 3. Internode length of *Lfy1* and wild type segregates (inches)

Internode*	<i>Lfy1</i>				wild type			
	44ft10	43ft7	42ft9	36ft9	35ft5	35ft	34ft11	34ft
1	1	1.75	1.25	1	1.5	2	1.5	1.5
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	1.5	0	0	1	0
6	1	1	1	4	0	1	2	2
7	2	2	2	5.5	1.5	2	3	5
8	3.7	4	3.5	7	2.5	4	4.5	8.5
9	4.5	5.75	5	8	4	6.5	6	11.5
10	5.2	6.25	6	9.5	5	8	7	11.5
11	6.5	8	6.75	9.5	7	8.5	8	12
12	7	8	6.75	10	8.5	9	9	12.5
13	6.5	9.25	7.75	9.7 [5ft]	8	9	9.5	14.5
14	6.2	9.3	7.5	12.5	9	10.5	11	15.5
15	6.5	10.25 [5ft]	7.75	13	9	13.5	12	16
16	7.5	11.5	7.75 [5ft]	12.5	10.5	14.5	14	15.5
17	8.5	11.75	9.75	12	11.5	14.5	13	14.5
18	8.5	10.75	11	12 [10ft]	12	15.5	13	13
19	9	10.75	11	12.3	12	15 [rts]	13.5	11.5

20	9.5	9.75	11	11.5	12.5	15.5	13.5	12.5
21	8	12 [10ft]	10.75	11.5	14	15.5	10.5	13
22	7.5	12	13.25 [10ft]	11.5	14	15	7.7	15
23	9.5	13	12.75	12 [15ft]	14	15	12	16
24	10 [10ft]	13.25	11.5	12	13	15	14	15.5
25	11.5	13.3 [15ft]	11.75	12.5	12.5	16	14	15
26	11.5	13	12	12	11.5	15	13	13
27	11	11.75	11.25 [15ft]	12	13	13.5	14.5	12.5
28	12	12	12	12 [20ft]	12.5	14	12.5	12.5
29	13 [15ft]	11	11	11	12	15 [ear]	10	12.5
30	14	11.5 [20ft]	11.65	9	13	14.5	10.5	12
31	10.5	11	12	9.7	13.5	14	8.5	12
32	12	11.75	10.75 [20ft]	9 [23ft]	12	13	9.5	11.5
33	13.5	11.25	10.5	8 [ear23ft6]	12.5	12	11.5	11.5
34	13 [20ft]	11[ear23ft0]	10.25	8	12	11.5	10	10
35	11.5	10	11	7.3 [25ft]	10.5	12	9	10
36	12	11 [25ft]	10	7	9.5	12	10	13 [pdncl]
37	11	10	10.25	6.5	9	11.5	10	>24[brchs]
38	10	8.5	9.75 [25ft]	6.8	10.5	11.5	12	
39	8.7 [25ft]	8	9.5	2.5	11	[tsl.mutln]	10.5	
40	7	9	9	8	11		10	
41	7	8.5	9.25	7.5	10.5		6	
42	7	9 [30ft]	8.75	7	10		5	
43	7	8.5	6.75	7	8		6	
44	7.5	8	6	6.5 [30ft]	6		6	
45	7.5	8.25	6.5 [30ft]	5.9	5 [pdncl]		4	
46	7	8.25	6.25	5.5	28[brchs]		28.5[tsl]	
47	7.5 [30ft]	8.25	6.25	4.7				
48	7	8	6.25	4.5				
49	7	7	6	5				
50	6	6.25 [35ft]	6	2				
51	5.3	6.5	6.5	6				
52	5	6.5	6.5	5.5				
53	5	5.75	6.5	4.5				
54	5.5	6.5	6.5	2.5				
55	5.5	7	6.75 [35ft]	3				
56	6	6	6.75	2				
57	6	6.5	6.75	2				
58	5.5 [35ft]	6	6.5	[35ft+1ft9]				
59	5	5	6	1.2				
60	5 [rts35ft8]	4.5 [40ft]	5.75	1.5				
61	4.5	4.75	5.5	2				
62	5[intls36ft6]	4.25	5.25	4 [pdncl]				
63	6	4.25	4.75	12 [brchs]				
64	5.5	4.25	4.75					
65	6	4.5	4.25 [40ft]					
66	5.5	4.5	4					
67	3.5	3.25	2.5					
68	5	2.75	3.25					
69	4	2.25	1.75					
70	1.5	1.75	3.5					
71	4 [40ft]	1.25	3.75 [pdncl]					
72	4	1	13.5[brchs]					
73	3	.75						
74	3	.75						
75	2.5	.5						

76	2.7	.25
77	2.2	.25
78	3	0
79	3.2	0
80	2.5	.25 [multpl]
81	2.7	0.3 [tsl]
82	3.5	
83	3.5	
84	3.5	
85	3	
86	2.5	
87	2.5	
88	1.5	
89	.7 [ear44ft2]	
90	.7	
91	.7	
92	.7	
93	.7	
94	.5	
95	.2	
96	.1	
97	.1	
98	3 [tsl]	

* Internode named after preceding leaf node. The first several nodes are of negligible length and therefore combined and represented as internode 1.

rts: roots *intls*: root initials *pdncl*: peduncle *mutln*: mutilation *brchs*: branches *tsl*: tassel *multpl*: multiple internodes represented as one



Figure 3. Apical topography of *Lfy1* segregates permitted to grow to completion; 44 ft 10, 43 ft 7, 42 ft 9

LONG NIGHT

Table 4. 2nd Generation *Lfy1*

Plant Height	[7]	23	28	32	42
Total Nodes	34	31	50	44	71
Above Ear	12	-	24	18	37
Below Ear	22	-	26	26	34
Root Node	-	-	13	-	26
Ear Height	[3]	-	12	16	21
Root Height	-	1	4	-	14
Max IN Length	[6]	13	9.5	13	13.2
<i>Lfy1</i>	+	-	+	+	+
Night Length	L	S	S	S	S
Environment	FLD	GH	GH	GH	GH
Pollen	3m1w	3m1w	5m0	4m0w	7m1w
Silk	3m1w	-	4m0w	4m0w	-
Planted	Fb15	Ja15	Ja15	Ja15	Ja15

[] - reference point IN - internode GH - greenhouse FLD - field L - long S - short

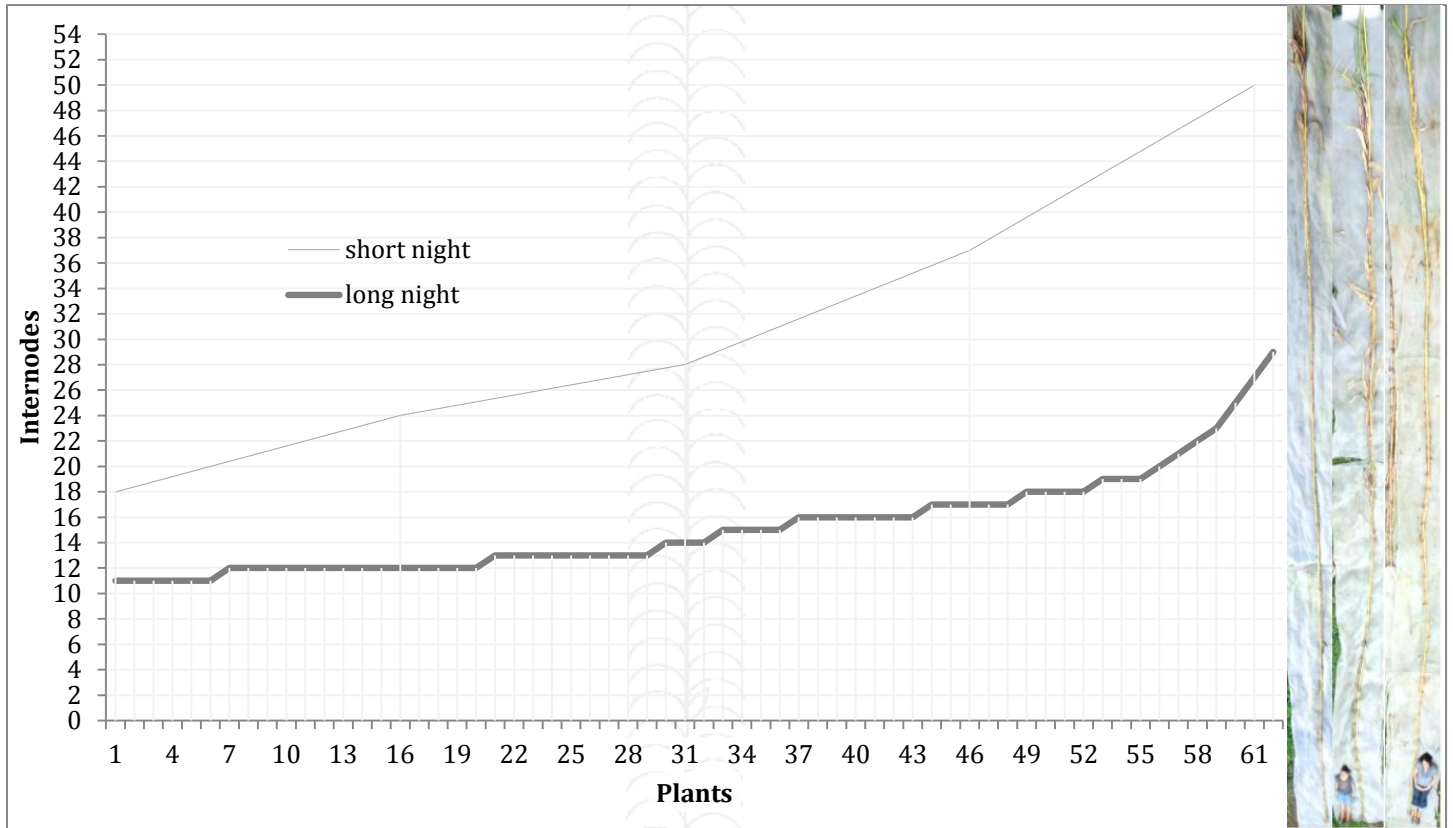


Figure 4. Internode quantity above ear in *Lfy1*: long night vs. short night. Data of 5 short night plants and 62 long night plants.

Table 5. Internode quantity above ear in *Lfy1* plants in long and short night

Internodes	Long	Short
11	6	
12	14	
13	9	
14	3	
15	4	
16	7	
17	5	
18	4	1
19	3	
20	1	
21	1	
22	1	
23	1	
24		1
25	1	
27	1	
28		1
29	1	
37		1
50		1

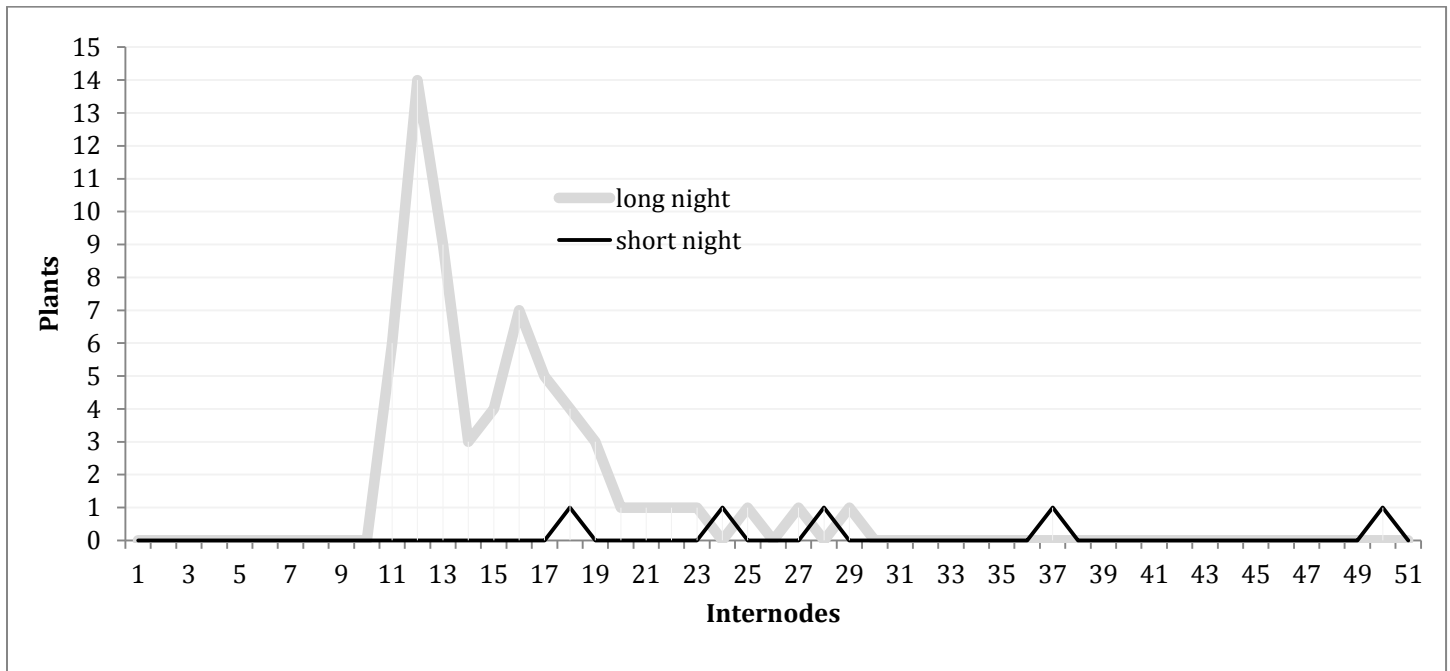


Figure 5. Internode quantity above the ear in *Lfy1*+ plants in long vs. short night.

Table 6. *Lfy1* and wild type: long night

Strain	Nodes		Pollen	Date Plntg-Plln	Height (feet) Blw+Abv	Longest Internode (inches)
	Blw	Abv Tot				
Nsea.L7 trp fld		19726		Fb15-My7	4.5+4	
L8 trp gh		161228	3m2w	Nv27-Mr11	3+5	
		181735	3m3w	Nv1-Fb21	8+6	
		171633	3m3w	Nv1-Fb25	7+5	9
		202040	4m0w	Ag2-Dc3	10+4	11
		191736		Ag2-	11+4	11
		191332	3m0w	Ag2-Nv5	10+3	12
		18725	2m2w	Ag2-Oc18	9+3	
		181533		-Mr26	3+3.5	
L8 trp fld		20727	3m0w	Ja2-Mr28	3.5+3.5	
L8.L87.WKEK trp fld		23+id			7'5+6w	
		212950	5m0w	Mr21-Ag18	7+4.5	
		201737	4m1w	Mr15-eJy21	5'4+6'6	
		201131		-eJe29	5'8+4'6	
		191635		Mr16-		
		161127		-Ag19		
		15823		-eAg11		
L8.L78.MVER trp fld		-- 48	4m2w	Ap8-Ag25	=12.5	
		-- 47				
		222547		-eSp7		
		211738	3m2w	My16-eSp2		
		211738		Ap28-		
		182341	4m2w	Je6-Oc24	7+10	
		-- 34		-pAg20		
		16521		My16-		
L7.L8.CHLQ trp fld		id				
		232750+.SN				
		-- 39		Fb8-		
		221537	3m1w	Mr7-Je18	7'11+3'9	
		191635		-Ag27		
		-- 34		Mr7-		
		21728	3m1w	Fb22-My28	5+4.5	
		17724		Fb8-		
L7 trp gh		14721	3m1w	My10-eAg14		
		211435	3m2w	Sp1-Dc11	9+3	10
		241640		Ag3-	10+4	
		221234	3m0w	Ag3-Nv4	10+3	9
		21829	2m3w	Ag3-Oc28	10+4	
		22830	3m0w	Ag3-Nv3	10+2	11
		19827	3m0w	Ja7-Ap9	4+4	
		17623	2m2w	Sp1-Nv14	8+3	10
		17522	3m2w	Nv27-Mr7		
		16622	3m1w	Ag18-Nv27	4+3	
L7 trp fld		16521	3m1w	Ag18-Nv27	4+2	
		231540+	4m3w	Ja20-eJe11		
		221335	3m2w	Dc15-Ap1	3+4	
		211132	3m3w	Ja1-Ap20	3'3+4'5	
		201232	3m3w	Ja1-Ap20		
		181836	4m1w	Ja2-eMy7	2'5+5'8	
		22931		-eJe8	5+3	
		21728		-Ap27		
		21728	3m0w	Fb15-My17	5.5+4	

	21728		-eMy26	4'6+4'2	
	20626	3m2w	Ja14-Ap29		
	20626	3m3w	Ja1-Ap24		
	20626	2m3w	Dc15-Mr10	3+3	
	19524		-Ap17		
L7 art	161228	5m			
	-- 23	3m2w	Nv4-Fb21		
L7.pcto trp gh	-- 35				
	181634	3m3w	Oc1-Ja23	8+5.5	10
	181634+	2m3w	Mr7-My27		
L7.pcto art	181331+	4m3w			
TL68 trp fld	221941	3m2w	Mr15-eJe27	8'2+5'5	
	221335		-Je6		
	211637		-eAg8	7+3	
	201434	4m2w	Mr22-eAg9		
	192342	4m1w	Ap8-Ag14		
	191433	4m0w	Mr22-eJy20	7+4	
	191231	3m1w	Mr15-Je23	7+3.5	
	-- 28		-tsL.sk.My12	=7	
	16925	3m2w	My10-eAg25		
	18624	3m0w	Mr15-eJe14	6.5+3	
	16622	3m1w	Ap15-Jy26		
L6.8d trp gh	181028		-Dc13	7.5+5	
	17623			6+4	
L6.8d art	14721	4m0w			
L67 trp gh	231134		-My19	7'8+3'4	
	221234fg				
	201232fg				
	20828fg				
L67 trp fld	221234	4m0w	Fb8-Je4	4'10+4'4	
	20929		-Je4		
	20828		-eJe21	5'9+2	
	19726		Fb8-		
	19625	4m2w	Fb17-eJy1		
L6 trp fld	221234	4m0w	Ja1-Ap28	3'8+3'4	
	21930		-My6		
	21728	3m3w	Ja1-Ap19		
	20929		Ja1-		
	171027		-Ap16		
L6 tmp fld	-- 42				
	221133				
TL2416.5.7 trp fld	221537	4m1w	Fb22-Je29	5'7+5	
	201939	4m2w	Mr7-eJy22		
	201838		-Jy1	6+4	
	201232	4m0w	Fb15-Je15	3'10+4'7	
	191027	4m0w	Mr31-Ag2		
	181129		-eJe17	4+4	
	20727	3m0w	Mr17-eJe20	6'6+2'6	
	19625	3m0w	Mr31-Je29	5+3	
	16925	4m0w	Fb15-eJe14	4+4	
	18624		-eMy19	4.5-3.5	
	-- 24	2m2w	Fb22-tsL.sk.My5	=5.5	
	18523	3m1w	Fb22-eMy29		
	13619	3m1w	My23-Ag31		
TL.PCTO.5.7 trp fld	17623	3m1w	Mr22-eJe28	6+2	
	14519	3m0w	My16-Ag19		

L5 art	201027				
	-- 33				
L4 tmp fld	181331				
	191332				
D3.4.L8 trp gh	211940	3m3w	Je8-Sp29	10+8'7	
D3.4.L7 trp gh	18927		-Sp5		
D3.3.L8 trp gh	212142	3m3w	Mr19-eJy[11]	8'8+7'8	
	182745	3m0w	Ja5-Ap9	8+7	
	171835	4m0w	Ja5-My6	6'9+6'6	
	19827	3m1w	Mr19-Je25	8'3+7'6	
	19827		Mr19	6'5+7'5	
	15823	2m2w	Ja5-Mr22	6+6'9	
D3.3.L8 trp fld	192241	4m1w	Ja5-My13	5'4+4	
	201232	3m3w	Ja5-Ap26		
	161329	4m1w	Mr19-eJy28		
	15823	2m3w	Ja5-Mr31	2+4'8	
D3.3.L7 trp fld	181028	3m2w	Ja5-Ap17		
	211031		Ja5-		
	201030	3m2w	Ja5-Ap17		
	16521		-Ap27		
D3.3.L7 trp gh	-- 32	3m3w	Ja5-Ap26		
	-- 21	3m2w	Ja5-Ap22		
	-- 23	3m2w	Ja5-Ap22		
D4.3.L8 trp gh	18927		Je8-Ag30	8+4	
	15520		Dc6-Fb22	3+3	
D4.3.L8 trp fld	141024		My27-eOc8		
	14721		My27-Sp11		
	14418		My27-Ag30		
	13518		My27-Sp1		
			My27-Sp1		
D4.3.L7 trp gh	191323		Je28-eSp15		
D4.3.L7 trp fld	16622		-Sp21		
	16521		Ja18-Ap9		
L3 trp fld	221234		Fb15-My23	=7	
D4.2.L7 trp fld	191029		Ja8-Ap27	3'9+4'2	
	-- 22		Ja8-Ap10		
D3.2 noL	201030		-Nv7	8+4	10
	20830		-Nv4	10+4	12
Hke1.L8 fld	151328	3m0w	My6-Ag5	3'7+4	
	141226	3m1w	My6-Ag13		
	14923	2m2w	My6-eJy22		
	15722	3m0w	My6-Ag3		
	12618	2m2w	My6-eJy21		
Hke0 sn trp gh	-- 26	3m2w	Ja17-My1	=12	
Hke0 trp gh	-- 24	3m0w	Oc28-no p, no e	=3	
	11516	1m3w	Ja23-Mr14	2'9+3	
	11516	1m3w	Oc28-Dc24	2'6+4'6	
Hke0 trp fld	-- 17	2m0w	Ja28-Mr29	=2	
Joe0 sn trp gh	-- 29	3m3w	Ja17-My10	=12	
Joe0 trp gh	12618	2m1w	Ja17-Mr25	2+2.5	
	12517	2m1w	Ja17-Mr24	2+2.5	
	-- 17		Ja17-x		
Joe0 trp fld	-- 18			=2	
	-- 17			=2	

Missing data may be available upon inquiry. *Blw* - below *Abv* - above *Tot* - total *Plntg* - planting *Plln (p)* - pollen; *trp* - tropical *tmp* - temperate *fld* - field *gh* - greenhouse *e* - ear (silk) *sn* - short night *Hke* - *id1*

GROWTH CORRELATIONS

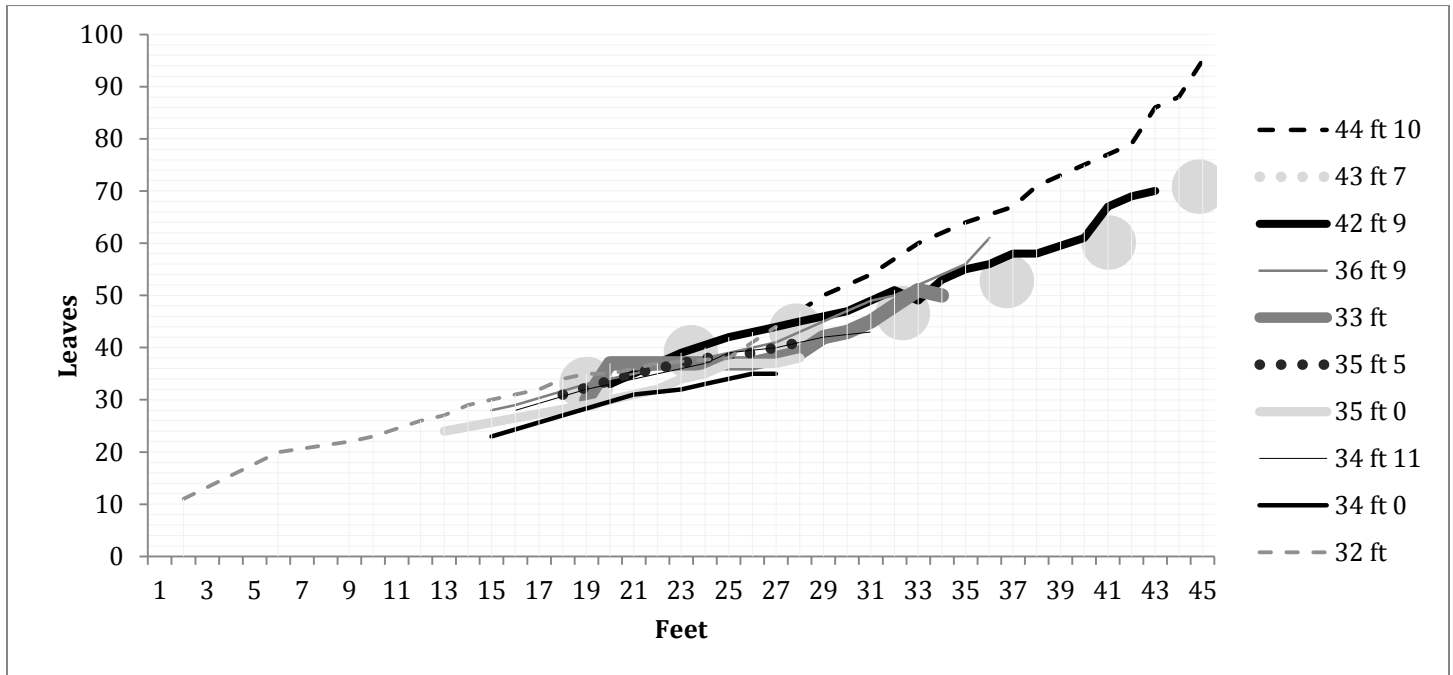


Figure 6. Maize plant height vs. quantity of leaf tips protruded from the whorl

Table 7. Growth rate

mo	ft	collars	leaves
1	3	7	12
2	10	16	22
3	20	28	34
4	30	39	45
5	35	46	52
6	40	52	58
7	45	64	70