

Maize Plant Height from Delayed Flowering Time and Indeterminance: Leaf Number and Internode Length from Phytochrome and Day Length/Photoperiod, Greenhouse, Teosinte, Short Day/Tropical Day Length, Gibberellin, Polyploidy, *Leafy1*, *lazy plant1*, *indeterminant1*, *delayed flowering1*, *Tassel seed5*, and *elongated mesocotyl1*

2017

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PHYTOCHROME

Maize plant height is constituted by internode *length* and *quantity*, primarily dictated by phytochrome, a protein shaped to active form by normal light, to extend phytochrome production but inhibit internode elongation, to generally make plants taller. This delay of flowering is finite, unlike in teosinte. Mutual **exclusivity** of leafing and elongation is seen in short strains with long internodes and tall strains with short internodes (both within population and between races eg Tehua v Tabloncillo). Light means phytochrome (Pfr), and phytochrome means leaves. Darkness (Pr) means elongation and flowering. However, a greenhouse with night light maximizes plant height by perhaps optimizing the interplay of both (image below, cf nightlength v greenhouse data MNL 90:e6). Figuratively, internode quantity is capitalized at *night* from night light, whereas length is capitalized at *day* via greenhouse (see further). Yet, maximum internode length is unapproachable apart from the short-night reaction (eg 14 v 17 inches) and thus ostensibly active phytochrome. Demonstrably, this can set internode length at seedling stage.

GREENHOUSE

Internode length is ostensibly affected by *sun*, *heat*, and *wind* ... all of which become highly reactive via *greenhouse*.

Light is reduced by greenhouse coverings, and greenhouse plants are in closer proximity to objects that block or reduce light and reflect longer wavelengths. Border effect is absent (cf J Exp Bot 58:3071). A greenhouse thus shifts the ratio into long wavelength. There is less blue versus red, and red versus far-red. Long wavelengths deactivate phytochrome; the active conformation is labile to long (far red) wavelengths. Reflexively, phytochrome inhibits (internode) elongation. Basically, *long* light wavelength makes *long* internodes because it deactivates phytochrome. A shift in the ratio translates to a shift in elongation.

Elongation in plants happens primarily in morning (cf RC Pratt, pers comm 1998). Greenhouses **heat** quickly with *morning* sun. Greater morning heat directly translates to greater elongation before developmental elongation windows close.

Greenhouses increase the difference between day and night temperature, because sunlight **heat** cannot readily dissipate as it does outdoors. This *divergence* causes an increase of maize internode length (qv Hort Sci 30:940).

Wind is drastically reduced by greenhouse covering. *Touch-response* is noted in maize, reducing internode length (Aust J Plant Physiol 4:857, courtesy A Lang). There is decreased rubbing in a greenhouse, and thus longer internodes.

Secondly, **wind** elimination increases humidity, which reduces stress. This removes constraint on internode elongation.

ELONGATED MESOCOTYL1

The mutant *elm* drastically reduces active phytochrome (cf Brutnell). It might thus be expected to disable **nightlength-reaction** production of extra internodes whereas enable internode **elongation**. Conversely, no difference might be expected in long night, because long night already disables phytochrome (see similar potential identification in Huehuetenango within long-night table in 'Daylength' section). Tellingly, when the mutation is placed into the Corn Belt Dent, mutant plants are taller than wild type regardless of whether development is in short (op cit) or long (2016 observation) nightlength, showing (perhaps among other things) the elongation effect from the mutation to be greater than the addition effect from nightlength reaction, in this particular race. Unless the author is mistaken, no leaf counts exist for the comparison. Also in bank-sample observation, the mutation effect is overt in greenhouse (long-night, tropical) and thus greater than the elongation effect of greenhouse, though mutant elongation is effectively absent in the F2 generation of 75% tropical (long-night, *Lfy*/non-*Lfy*) stocks derived with the mutation, at least basically inseparable from reasonable range from diversity in background static.

PATHWAY

Internode quantity is determined by flowering, which is inhibited or eliminated by any of many (*Cg, Gl, Tp, an, d, vp*, Plant Physiol 108:475 etc) **elements** acting on the pathway ending by *differentiation* of the apical meristem stem cells into the tassel (qv **Nat Genet 49:476**). Even *tassel seed* (environmentally induced, or *Ts5* chrom4) affects leaf quantity, though reducing it, by approximately 5 (quantity above ear coincidentally).

GIBBERELLIN

Gibberellin deficiency **resembles phytochrome** preponderance with respect to 1) flowering delay, 2) inverse relationship with internode length, and 3) flowering abnormalities. Though phytochrome in maize may not reduce internode length as classically as gibberellin absence, it may be seen, perhaps in concert with the thigmotropic response, in excessive brachysm of eg Tehua outdoors in short night.

To recapitulate, both old literature as well as symptomatically unpublished experience established that extra gibberellin **does not affect internode elongation nor induce flowering in normal maize**. What was likewise well established was that gibberellin has, however, recovered elongation in gibberellin-deficient brachytic maize (recent eg Plant Physiol 108:475).

1-10 mg GA / 1 L water are facily dissolved with drops of higher-percentage alcohol. 100 mg GA may appear the common stock solution for inter-species use, but noted as at best unnecessary (cf between the two maize sources noted here, pers comm both). 1 g of ammonium sulphate might enhance the phenomenon (RP Pharis, pers comm 2010), and is highly water soluble. The solution is hypothetically poured into the whorl, sprayed on the plant, or poured onto the roots/soil. Claim exists that such soak builds a store of gibberellin with availability beyond just one week.

By the author, this was used re flowering/elongation in maize from **all latitudes** as well as teosinte, all under long to subtropical night length over the previous decade. Also tested was short-night Chiapas 234, which is brachytic compared to other maizes, in tall greenhouse when plant height was **25 ft** (2010 observation). Likewise, attempt was made on **40-ft *Lfy*** maize (brachysm especially above ear) of similar background in tall greenhouse. Fourthly, test was made on the paralytic dwarfism chained to the *id* mutation elaborated in the 'Indeterminance' section below.

Of all these subjects, there may **only** be a meaningful cause and effect in the last case, which is of presumed actual dwarfism. A 1-ft vegetative dwarf whorl is doused with the gibberellin solution, as well as the soil at its base, a single time, which surprisingly is followed by the wild-type elongation of (beginning with) the internode corresponding with the newest collar.

A corresponding surge was also logged in the growth of **45-ft *Lfy*** maize (table below), but not outside normal range. From <12 inches per week, height of the highest leaves increased by 15 inches the week ensuing application, before returning to the previous growth rate. This was despite soaks of soil at the base of the plant and container (potting soil in punctured common shopping bags with appropriate opacity against algal generation) soil into which aerial nodes were rooted midway up the plant, additional to a douse into the whorl that drains down the plant. Such application was made a second time with definitely no particular positive effect, as weekly rate declined to normal or less.

Maize plant height increase per week (planting March 4, 2017):

Date	jy22	-	sp1	sp9	sp16	sp23	oc1	oc7	oc14	oc21	oc28	nv4	nv11	nv18	nv25	dc2	dc9	dc16
NC			44c	46c		50c	52c	53c	55c	57c	c59	61c	63c	65c	67c	69c	73c	75c
SH	23ft		33ft	34ft		35ft	38ft		40ft	41ft	42ft	43ft	44ft	45ft	46ft	47ft	47'7"	48'5"
CH										37c	39c	40c		41'6"	42'8"	43'8"	44'10"	45'11"
NL	30L		48L	50L		52L												75L
WG									~12"	16"		~12"	<12"	10"	15"	10"	8"	

Gibberellin application dates highlighted; (NC) Newest Collar - quantity of protruded leaf collars; (SH) Standing Height - plant height in feet; (CH) Collar Height - height of newest protruded leaf collar; (NL) Newest Leaf - newest leaf protruded from whorl; (WG) Weekly Growth - increase in plant height in inches since previous week

Recollection of conceivable **teosinte** effect entailed a stark thinning (without lengthening) of Huehuetenango internodes.

POLYPLOIDY

Three of many means of polyploid induction are field strategies such as 1) 125 μm pollen-size **screen** 2) finding $\leq 1\%$ **plump** kernels of spontaneous egg conversions on an ear of otherwise shrunken triploid kernels 3) just working with triploid **shrunken** kernels. None of these three worked for the author using temperate tetraploids as the induction source for late tropical races, as shrinkage is not qualitative particularly in advancing generations (screen, Shaver MNL 38:20 and pers comm 2006; spontaneous, Kutka pers comm 2011; unrivalled strong temperate tetraploid, Cornell Composite obtained from Ames in 2009; critical context, Birchler pers comm 2010). These attempts were additional to colchicine treatment (2000) of diverse racial sprouts, which despite fantastic enlargement did not survive, ostensibly due to inadequate experimental resources. Polyploidy would be valuable to confirm no revelations re any direct or indirect dosage effects on egg nightlength reaction.

INITIATION

A major point of confluence occurs at the 3rd histone core of the 10 nm fiber at the **ZCN8** etc. gene preceding ZMM4 (cf Plant Physiol 168:1351; Vgt2 is chromosome 8, Plant Cell 23:942). The protein of the ZCN8 gene is florigen, which moves from the leaves of the maize plant to the meristem site of ZMM4 action. Both nightlength and *id* act at the 3rd histone core. Fortunately, the two are distant on chromosome 1, except a secondary area (gratitude J Holland, pers comm).

DAYLENGTH

Points throughout the pathway (one eg **zmCCT10**, PNAS 110:16969) have been historically deactivated by **transposon** action, attenuating the flowering delay observed of backgrounds that reached the *temperates*. Simultaneously, their functions were only changed (Plant Cell Environ 38:1479).

The nightlength reaction is basically represented by **zmCCT10**, conferring 40% of the common effect (whereas the others are 10%, Genetics 184:799) and undoubtedly most of the exorbitant effect witnessed of the latest Tehua accessions and obligate long-night teosinte such as (Balsas) Parviglumis and Huehuetenango (both gratitude J Holland, pers comm).

Maize, the **Cornbelt Dent**, is extremely reactive to nightlength, in contradiction of mimicked statement and troubled experimental designs or negligent report thereof. It differs by at least 3 leaves between legitimate long and short nightlength (≤ 12 v 16 h, range from equator to temperate daylength), and apparently by at least 7 leaves *between short nightlength* of 8 h (16 h daylength) and 3 h (21 h daylength) (data in MNL 90:e6, and below), leaving a detailed long versus short-night difference of at least 9-11. Tropical (Tuxpeno) reaction has been alleged to end at 16 h daylength whereas temperate continues reacting to 18 (cf GO Edmeades, pers comm 2000).

Leaf Number in Cornbelt Dent Materials:

'Daylength' (h)	12	14	16	21
B73	17.5	[20]	[21]	29
B73xMo17	16.5		[19]	26

Original data;

bracketed quantities from Coles (14 h) Genetics 184:799

and Padilla (16 h) Ann Bot 96:997;

gratitude to J Colasanti for the stocks and their identities

Furthermore, tropical maize is *not* reactive to **change in long** nightlength, a second contradiction to ex nihilo statement (cf USDA Ag Res Mag Sept 2010:5) - whereas its predecessor teosinte can be. In maize, silking (not tasseling) is disturbed in extreme strains (cf MNL 82:18) whereas Huehuetenango teosinte may not just add internodes from decreasing long nightlength but from long nightlength within a minimum threshold meaning that it indeed demonstrably adds internodes even for a short time eg after summer solstice.

Data of Huehuetenango in greenhouse at 10° N latitude and 5,400 ft altitude, 2017; **internode quantity** per planting date:

<i>June 7-10</i> (4 plants) 33 34 35 37 <i>flowering Dc 5 = 6 mo</i> <i>transplanted</i> <i>longest internode: 8 inches</i> <i>leaf collar 15: <1 ft up</i> <i>collar 20 <2.5 ft</i>	<i>August 16</i> (2 plants) 24 26 <i>flowering Dc 10 = 4 mo</i> <i>in situ</i> <i>longest internode: 13 inches</i> <i>leaf collar 15: 4-6 ft up</i> <i>collar 20 9.5 ft</i>
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This of course neglects a third false statement, semantic at best, about flowering of tropical maize, which in a current example is attributed to an entity that does not work with it (Plant Physiol 172:389).

INDETERMINANCE

Maize flowering can be **eliminated** by introgression of particularly reactive teosintes (MNL 90:e5) as well as by the mutations *id*, *Lfy*, and per chance *dlf*.

A plant from a double-mutant *Lfy-dlf* stock (87% tall tropical background, selfed; data below) in winter solstice planting of 10° N latitude (**long night**) **greenhouse** at 4,000 ft grows indefinitely, without particular dwarfism (2017 data). The plant was dissected when its indeterminate meristem was 10 ft with 50 leaves (30 collars; 19 below top ear). As always (MNL 87:2 ISBN 9781512074567, 90:e5, cf 89:e4), frequency is ~1/8:

Parent: 19_a13_b32_c x self (a) leaves below top ear (b) above (c) total; 8 progeny

1. -- 20
2. 15520
3. -- 26
4. -- 28+
5. -- 30
6. -- 30+
7. 191231
8. 19 -- 10 ft indet mrstm >50 L; ca 30 protr collars

It seems that an element is available in the flowering cascade that does not complement itself but *id* and *Lfy*.

Lfy excludes dwarfism, granted involving detectable brachysm like the *dlf*; however, *id* is **dwarf**, **regardless of allelic version** (Neuffer's, Hake's, Colasanti's), when in late tropical background at any level of backcross (2017 analyses of each). *id* plants have not happened without it, though it happens without *id*.

Leaf number is not plant height, and thus indeterminance is not indeterminate **height**, in spite of perennial conclusion from *Homo sapiens*. Evidently ... teosinte, *id*, *dlf*, and other mutated genes, leave only *Lfy* to make some height. They make leaves without internodes, essentially. In short night, supposedly segregating *dlf* stock (2016-2017, 87% tall tropical, from sibs) and teosinte-maize F2 (MNL 90:e5) can appear as a 30 ft plant of 50 internodes with a wad containing 50-more leaves spiraling within a node or so above, often to an indeterminate meristem. *dlf-Lfy* double mutant stock labors its way between 40-45 ft plant height, apparently courtesy *Lfy*, the take-home message (if not mistaken) being the superficial idea that the two mutants are in the same stream of molecular development ... and *id* in tallest tropical background and short night awaits the cumbersome treatment with GA etc. MNL 90:e6 already showed **separate**, **compoundable**, and **synergistic**, molecular systems between *Lfy* and nightlength, similar to the separation of *id* from nightlength recently molecularly described (also cf MNL 89:e17, 88:e14).

Maize is not an '**inferior** teosinte' in this attribute. Maize is actually larger. Tall tropical maize features **internode length**, girth, and growth rate alien to teosinte. If an inclination is seen in teosinte, it came from maize, perhaps counterintuitively (cf MNL 62:76).

To date, the greatest height seen in the history of the maize subspecies has ostensibly been a *Lfy* segregate (2017; cf 'Gibberellin' section above and photos below) of **48 ft 5 inches** standing height (from scutellar node) with the newest protruded leaf collar at 45 ft 11 inches (parents 191736 x 182341 long night, see below). As the plant was somewhat genetically/statistically marginal (whereas a deliberate, appreciable-size analysis/data set has yet been uninitiated), it establishes that height from a population of this mutant can be 60 ft if the typical quantity of 25 plants were seen, and in a good environment of good soil and possibly HPS light input at seedling stage, etc.

EAR POSITION

Supposedly, internode quantity implicates ear placement. *Lfy*, *dlf*, and *id* (ie maize) demonstrably add internodes both below and above the (top) ear, whereas teosinte adds 'below' (*dlf* author data 2003-2017; determinate *id* below, MNL 88:e14; teosinte cf below and also included with indeterminate *Lfy* and *id*, 90:e5). Quantity below and above are noted to be genetically separate with slight **dual control** (New Phytol 210:256); however, it is now proven how parochial the discrete control is (also MNL 90:e6).

Indeterminance happens *below* the ear (reproductive nodes ie fruiting branches) from teosinte (long-night obligacy) whereas *above* in *id* and *Lfy*. Teosinte is either 'indeterminant' or not, determined by **nightlength**, whereas maize - *Lfy* and *id* - either *does* or *does not* possess the (demonstrable) genetic **element** for indeterminance, decided by segregation. In *determinant id*, addition is below.

Enriching high quantities above and below courtesy congenial *Lfy* is done by crossing plants with eg 20 internodes or more *both* above and below. Plants of 2-6 backcrosses of *Lfy* into Chiapas 234/late tropical background developing in long night (field or greenhouse) can repeatedly and heritably have **26** internodes **below** ear (2017) whereas wild type can repeatedly and likewise heritably have 24. This is upon 18 being the default below-ear quantity in the wild type.

Leaves added *below* are **full internodes**, which does not happen *above*. As addressed above, nothing yet (gibberellin, *elm1*) elongates internodes above.

Above-ear quantity is not just to **30** but beyond, to the extreme above-ear cases appearing to be indeterminate. Said cases are at minimum finite doses of **50-60** leaves (total above ear; 2017 dissection extreme case), in that Super *Leafy* (MNL 87:2 ISBN 9781512074567) cases by chance imply an exorbitantly late tassel. Whereas the extreme cases track 1/8 frequency, the phenomenon of high dual additions might look classically recessive.

Data of high internode quantity in *Lfy*:

(a) internodes below top ear (b) above (c) total (+) more unprotruded internodes

<u>20, 19, 39, x 221941</u>	<u>43 ft x 42 ft MNL 90:e6</u>	<u>201838 x 192140</u>	<u>171835 x 182341</u>	<u>191736 x 182341</u>
1 265480+ 5 mo fld	1 232447 3.5 mo gh	1 242650+	1 222345	1 271744
2 262450+ 5 mo fld	2 211839 gh	2 212647	2 222244	2 241741 5 mo gh
3 221840+	3 171633	3 211435	3 211435	3 211536
4 212950+	4 -- 30 4 mo gh		4 21 --	4 211435
5 201939 4 mo gh		4 21930	5 191332 3 mo fld	5 182139
6 201232 3.5 mo gh	<u>221234 x 19625</u>	5 21627 4 m fld	6 181432	6 161632
	253055+	6 20828	7 161430	7 161531+
		7 20525		
			8 19726	

This calls attention to the mysterious cannon (Shaver 1983, Corn Sorgum Res Conf) that *Lfy* expression is the same regardless of **homo- versus heterozygosity**.

In another phenomenon, the genetic *Lfy* **disappears** in the majority of instances. The disappearance has also extended to a full race, Montana, which was consequently abandoned for the *Lfy*-competent race Coscomatepec, when heterosis was sought. A return attempt to Montana has been successful, currently to ostensibly 50%, in which a plant in long-night greenhouse had 23 very nicely elongated (characteristically Montana) internodes totaling 8 ft below ear, with a classical 12 above.

Analysis of the presence/frequency of *Lfy* expression in **long versus short nightlength** should be conducted. For example, an ostensibly heterozygous mutant stock immediately threw a mutant plant in short nightlength (44 ft 10 inch tassel, 2016) whereas obtaining one in a long-night growout amidst a substantial quantity of siblings can be starkly rare, which also implicates a phenomenon in which *Lfy* expression is curtailed by environmental stress, which itself is extensively established per author observation over locations, leading to the next point.

A yet third issue concerns **Quasi-Leafy** events of **10 internodes**, which genetically proved vacant the mutation and are mere high quantity above, in which such high quantity is another strange above-ear phenomenon.

In sum, besides *Lfy*, there are two other phenomena that add leaves above the ear. One, believed/formerly to be 'Daylength Leafy' (MNL 89:e4; best renamed **Native Leafy**) impersonates *Lfy*, except that *Lfy* was a mutation and alleged to be generally classically dominant whereas the Native Leafy, as stated in the noted source, is wild type/'native' and seems generally classically recessive though dominance subject to epistasis seems a reality and such is established in literature re the canonical mutant. The other phenomenon is **Super Leafy**, noted above, and different than Native Leafy by adding very many more leaves, as Native Leafy identically mimics classical *Lfy* in quantity and presumably phenotype/morphology.

Of course, there is a third phenomenon not described before the author did so passingly (MNL 89:e17), which conversely adds leaves below the ear, like/or a **natural *dlf***, it is presumed. It seems to appear naturally at least in the Chs 234 etc population, definitely handled genetically upon inbreeding, and too can be transferred easily into other races. Clarity of its exact genetic characteristics remains defiant of a responsible study, probably because of its slight subtlety. Presumably, this, and something like it above ear, probably the Quasi-Leafy and Native Leafy both noted above, are the elements creating the enhanced, high internode quantities above and below ear in the enhanced *Lfy* dialogued above.

Leaf number increases by **36** when *Lfy* is placed into **Huehuetenango** teosinte. Incidentally, Huehuetenango contributes dramatic resistance to stalk breakage (author observations 2003-). When tall tropical maize (36 ft plant MNL 90:e6) heterozygously carrying *Lfy* is maternally crossed to Huehuetenango, F1 wild type has **28** leaves and mutants have **64** (data below). Plants had 2 leaf internodes between the highest axillary growth and the apical tassel. Growth was under spring equinox field planting at 10° N latitude and 4,000 ft altitude. Reproduction (protogyny) began in mutants 6 mo later, after seed was harvested from wild type.

Data: (a) internodes below top axillary growth (b) above (c) total

plant	internodes
1	24 _a 2 _b 26 _c
2	26228
3	26329
4	-- 38
5	61263
6	62264
7	-- 65

The data is impressively **qualitative**. In *maize*, 24 total leaves are typical for wild type versus 32 for a mutant plant with the dominant *Lfy* gene, compared to 28 versus 64 for the *maize-teosinte* hybrid. Comparing the mutation in *maize* versus *teosinte*, the magnitude of the difference of *Lfy* expression is a staggering 25, which is **alien** regardless of the heterosis. If a theoretical *Lfy* *maize* strain existed that had a minimum of 60 total leaves from long night, its mere default presence would still inherently be alien even to the quite-atypical real-world meristems with 50 or indeterminate quantity of leaves. Analyzing *Lfy* with a simultaneous *maize* and *teosinte* genome in short night - unexpectedly could offer an alternative to the obscure, unpromising option of elucting height from an obligate long-night segregate in an F2.

LAZY

An ostensible **miracle mutant** has existed for tall *maize* for 86 years (1931 cf MGDB). It confers peril, freeze, wind, desiccation, etc resistance. Preliminary observations propound that *lal* potentially solves all of the problems of tall *maize* without causing side effects, perhaps even commercially. A question exists as to its possible negative affect on internode length and reproduction. Without it, measures taken to grow *maize* horizontally by using light to dominate the anti-gravity inclination of *maize* demonstrate no promise.

Tall *maize* **lodges**, preventing access by machinery. A predictable lodging *maize* could perchance be farmed with modified machinery. In particular, this could entail a genetic background with increased aerial rooting, a cultivator to tip seedlings an effective number of degrees in the same direction, and a chopper turned 90° like a thread picker with the typical gear-like conveyor to collect the stalks.

Use of tall *maize* is precluded by **freezing** temperature because of its protracted development. When *maize* is near groundlevel in a greenhouse, it does not freeze as when standing.

Use of tall *maize* is also prevented by **wind**. This is resolved by a *maize* already orderly lodged, save severe wind that could tangle the plants to impede harvest.

Technical analysis would divulge an advantage or disadvantage, premierly to silage/biomass *maize*, from increased or decreased sun and capacity to dry, from *la* *maize*.

The same of **rooting** pends planting of (homozygous) mutant 50% tall tropical *la* stock that is on hand. 35-40-ft *Lfy* plants indicate stress by literally fading and other wilting or basically cosmetic drought symptoms, whilst extensively and profusely rooting (at minimum in pure background) over the comparatively inordinate one-dimensional distance of stalk. The rooting is vain, an exhaustive investment of the plant, and the solution for the plant's drought dilemma is sitting directly next to it, wasted. *la* presumably connects the two, just as wished of eg *Lfy* source exploitation.

Of course, **sweet** linkage of mere 10% distance of chromosome 4 (cM proximity courtesy M Sachs, pers comm) is another incredible feature.

Author data is independently identical to published notes of plant-tipping at **8 collars, 2-ft** plant height.

Unexpectedly, plant 'height' in a cursory cultivation of *heterotic la* mutant material may be equal to that of wild type (data below). Internode quantity is even more independent. The mutation is claimed to compromise reproduction, though the problem is not excessive in the author's observation.

Height (ft/'), internode quantity (b - below ear, a - above, t - total), and flowering time (p - pollen, e1 - silk) in August 20, 2017 greenhouse planting of temperate lazy material (+ mutant, - wild type) at 10° N latitude and 5,400 ft altitude:

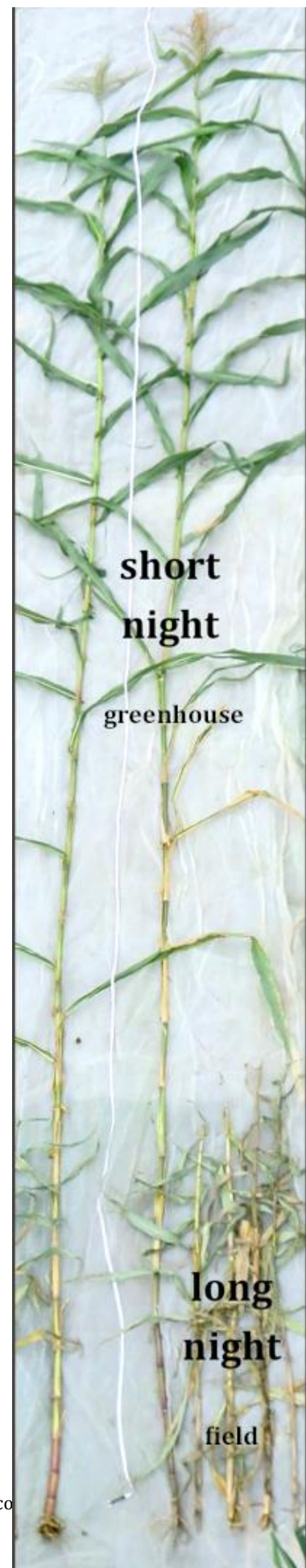
Inbred from bank				Hybrid of <i>su</i> and non- <i>su</i> bank samples			
-10 _b 4 _a 14 _t	p nv 3	e1 nv 8	7.5'	+12416	p nv 6	e1 nv 9	7'
-11415	p nv 4	e1 nv 8	7'	+12416	p nv 4	e1 nv 7	6.5'
+11415	p nv 6	e1 nv 11	5.5'	+11516	p nv 8		6'
+12315		e1 nv 17	5'	+11617	p nv 10	e1 dc 4	6'
				-12517		e1 nv 21	5.5'

It is important to note that mutant plants developed with likely critically greater shade.

MATURITY

The correlation of **maturity**/flowering time to **leaf number** (Crop Sci 7:431 always cited) is erroneous, as strains of substantially divergent leaf number share equal maturity (author data 2001, MNL 86:2, ISBN 9781512074567, etc).

The author is grateful to individuals involved in the contribution of material and information.





48.5 ft maize plant