

The maximum leaf quantity of the maize subspecies

--Karl, J

Roughly 65 leaves occurred on a 9.5-meter (m) maize plant (height of newest visible leaf, 41st leaf) that had a tassel on the scale of .5 cm (Figure 1). A tassel of that size on a 9.5-m plant is unprecedented; it is 3 m higher than on previously known tallest strains. This means that the new strain may accordingly be 3 m taller (15 m). The genetic background of the plant was primarily accession 234 of Chiapas, Mexico, with the *Leafy* mutation (chromosome 3, H.Cai, personal communication, 2007) inserted (Figure 2, 3). The plant was cultivated in Allegany, New York, USA under short nights, inside a wooden frame (Figure 4) wrapped with plastic. The genotype was derived by backing the mutation once into the Wellhausen Guatemalan accession 863 and then twice into that of Chiapas 234 when the allele become public in 2003 (one leaf has been lost with each backcross; 17 leaves above-ear originally, then 16, now 15). With a wild-type sib of the 65-leaf plant maturing at 8.5 m (Figure 5), this *Leafy* strain could stand more back-crossing. The derived genotypes are not available from a public repository.

A second dissected meristem of the material (eared under long night but likely permitting *short-night leafy*) indicated the possibility that 65 leaves is a low expression level for a segregant with the *leafy* phenotype. *Short-night leafy* has not yet been confirmed in the natural materials in a short-night regime. As *leafy* involves an increased quantity of leaves above the ear (20+ counted in this work, from *Leafy* and also *short-night leafy*), it is pertinent to note that the ear height in the natural strains is more than 9.5 m (Figure 6). The (approximately) 7 wild-type leaves above the ear bring the height to 12 m. To developmentally contextualize the tall maizes of the subspecies, it is relevant to note that there was a peak growth rate of 3.7 m in a month. This was in month 3, when the plant height goes from 2.5 to 6.1 m.

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Figure 1. The 9.5-m *leafy* plant.



Leafy
Chiapas 234

Figure 2. Throughout the development of this *Leafy* strain, the cobs have branched.



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Figure 3. An ear of this *Leafy* strain.



Figure 4. This is the author's photo. A 14-m (height) wooden frame wrapped with greenhouse plastic, which was the environment for the plant. This environment lengthens the internodes compared with the internode length in field cultivation. The predominant hypotheses for the cause of elongation are the preponderance of far-red wavelength because of the filtration by the plastic before the light reaches the plants (on this point, there is the counterpart phenomenon in which the absence of UV wavelength, due to its obstruction by the plastic, dictates expression of the *indeterminate* allele [Shaver, MNL 41:33, 1967; J Hered 58:273, 1967], which was assumed, in past times, to have wild-type prevalence in the tallest maizes and in teosinte and an allelism with these materials' gross height), and the difference between daytime and nighttime temperature (cf. Irwin et al., HortScience 30:940-949, 1995) being exaggerated due to the greenhouse effect. A more remote possible affector would be the neutralization of air movement near the plants. The idea of growing maize in a wooden frame wrapped with plastic was introduced to the author via personal demonstration by N. Craven, Stouffville, Ontario, Canada. Via heat units and internode extension, plants in the enclosure can attain a height range of ≥ 8 m at this New York location, compared with ≥ 5 m in the field (frost May 20/Sept. 20).



Figure 5. An 8.5 m, wild-type segregant of this *Leafy* strain of maize.

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Figure 6. This is the author's photo. Left plant: Chapas 234 approaching 10 m; right plant: 234 x 2825 F1 approaching 10.75 m with ear shoot near 9.5 m