vol. 29, no. 19, shows corn tied with 2002 for shortest plant height in the last 11 years. August 4, no. 23, shows corn two weeks behind the 5-year average for dough stage. My corn grew very tall. I pollinated inbred plants that appeared to be too tall and too late for northern Illinois; yet, on those same days, I drove by hybrid corn fields on the way to work that had not yet flowered. It was a very unusual season. We had higher than average yields; several experiments on the farm averaged well over 200 bushels per acre.
Is there a lesson? Yes: The delayed, late-shed tassels that were encased in a leaf or two indicate heat units must warm the tassel per se to cause pollen formation and dissemination. The plant is a sufficient enough receptor of heat units to develop the plant and tassel, but the tassel per se must receive heat units to develop and shed pollen.

Spring seasons like our 2008 are probably rare.

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Branched tassel (*Brta*) on chromosome 2

--Brewbaker, JL; Yu, H

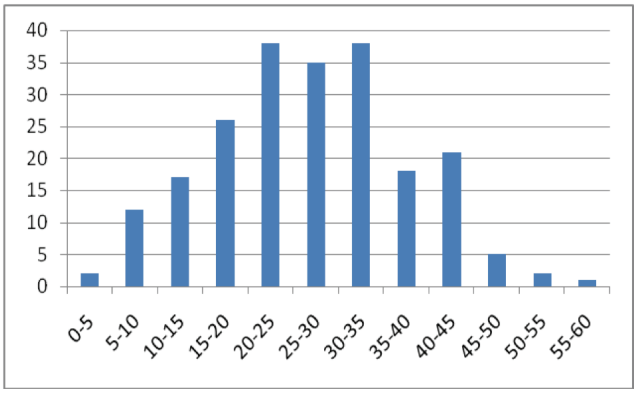
Tassels of inbred Hi27 and most of our 150 NILs (MNL81:15) average ~13 branches (Figure 1). Reduced branch numbers occur only when plants are under biotic or abiotic stress. Several of our Hi27 NILs display more highly branched tassels (Figure 2), of which the most prominent are in stocks with chromosome 2 mutants like *fl* and *v4*. This branching we show to be governed by a single gene designated *Brta*.

Tassel branch numbers were recorded in the classic series of publications on the races of maize. These data are summarized in Table 1, showing an average of 27.0 tassel branches (both primary and secondary) for the 251 races included in our survey. The data were normalized and ranged from 3.6 for Palomero Toluqueño (Mexico) to 50+ for the Piras of Colombia. Tropical breeders are very familiar with the large and impressive tassels of many tropical

Figure 1. Normal Hi27 tassel.

Figure 2. Branched tassel in genotype (*fl Brta*)^Hi27.

Table 1. Tassel branch number in 251 races of maize.



varieties and hybrids. The contrast of a 40-branch tropical tassel with that of B73 (6.0 branches) or of Mo17 (4.7 branches) is most striking. Historically, temperate breeders have selected inbreds with small tassels, reflecting the small but significant energy requirements of tassels. This trend continues for tropical plant breeders. Male-sterile tassels are now seen in many commercial fields.

In a survey of 60 largely tropical inbreds in the collection of Hawaii Foundation Seeds (HFS), branch numbers averaged 15.4. The numbers appeared again to be normally distributed but concentrated around their mean (very similar to Hi27, with ~13 branches). Temperate inbreds were generally at the low end of this range. Environmental effects can be very great. In a trial planted 11/16/07 under severe winter stress (low light, heavy rain, yields reduced 75%), Hi27 averaged only 2.8 branches and the branched NILs averaged only 5.7

Backcross conversions of Hi27 to incorporate the dominant genes *fl* (chrom. 2S-75.7) and *v4* (chrom. 2L-87) began in 1969 with MGC stock 63-2370-5/2367-2 (*lg gl2 fl v4*). Selfing after 6 backcrosses created *fl* and *v4* NILs, each proving to be double mutants *fl v4*. The line selected for *fl* alone had highly branched tassels (20.9 branches), while the line selected for *v4* had normal Hi27 tassels. An additional NIL selected as a floury with white kernels (*y* locus on chrom. 6) was also highly branched, and we've bred a branched floury stock lacking *v4*.

Average branch numbers were collected in a generation mean analysis study planted in February 2008 with parent P1 = Hi27 and parent P2 = *fl v4* (branched). Branch numbers were as follows: P1=11.1, P2=20.9, F1=16.0, F2=16.1, B1=13.1 and B2=16.5. However, seeds were classified as normal or floury before planting, and the data were as follows: F2, 16.6 floury vs. 15.5 normal; B1, 15.3 floury vs. 11.0 normal; B2, 17.3 floury vs. 15.8 normal. A GMA analysis revealed no significant non-additive effects. F2 segregation could generally be interpreted as a 1:2:1 affected by the linkage of floury and the branching locus.

It is inferred that the branched tassel trait is governed by a single locus that we've designated *Brta* ("branched tassel"). We chose to symbolize branched allele as the capitalized *Brta* with normal as *brta*. The locus is on chromosome 2 and suspected to be somewhere between *v4* and *fl*. No other NILs we have on this chromosome show branched, including *sk1* (2-57) and *gs2* (2-50). Inheritance is simple and dominance absent. The brt phenotype bears no resemblance to described loci *ub* (unbranched) and *td* (thick tassel dwarf), nor does it lead to seed-bearing flowers in the tassel as in the highly branched ramosa mutants. Several genes greatly reduce or eliminate tassel branching (*ad1*, *baf1*, *lg1*) but none are in this region. The relevant NILs are now designated (*fl Brta v4*)^Hi27 and (*fl Brta v4*)*y*^Hi27.

Double-cob (*dbcb*) on chromosome 1

--Brewbaker, JL

Conversions of Hi27 to the variegated-pericarp allele *P-vv* were initiated in 1967 using Maize Coop Stock 63-2656-2/2655-5, a stock showing variation at the following loci: *A1, A2, C, et, lg2, R* and *P*. In a somewhat sophomoric way, we began a series of 10 backcrosses to Hi27 together with an extensive series of selfs and sibs aimed at preserving only the *P-vv* (with its *Ac* insertion). The "pure line" *P-vv* inbred has always been uniquely semi-dwarf, narrow-leaved, poor in seed set and irregular in expressivity of variegations.

In 2001, in the 23rd cycle of breeding *P-vv*, we observed four sister lines with a trait we named double-cob (Figure 1). The mutant cobs normally split at the tip into two or three arms, and were not highly competent at filling seed. However, the trait proved to be considerably more stable than *P-vv* and to be inherited as a simple recessive. The linkage of the two loci is inferred from many of these segregations, but mapping has not been done. The double-cob trait has been carried through more backcrosses to Hi27 (which is *P-ww*) and a series of selfs to produce three sub-lines--(*dbcb P-ww)* ^Hi27*, (dbcb P-vv)* ^Hi27 and *(dbcb P-rw)* ^Hi27. All of these NILs are otherwise identical to recurrent parent Hi27 (Brewbaker, Crop Sci. 37:637, 1997) in maturity, color (e.g., bronze tassel), disease resistance, tassel and kernel type, etc. None of the 14 other chromsome 1 mutants among our NILs show the double cobs.

Figure 1. Phenotype of Hi27 near-isogenic line (*dbcb P-ww*)^Hi27.

Floppy tassel (*Flta*) on chromosome 9

--Brewbaker, JL; Yu, H

Tassels of Hi27 and most modern inbreds are relatively erect in appearance (see accompanying article on branched tassels). In contrast, a tassel with lax branches that we characterize as "floppy" is rather common among tropical maize varieties. Breeders of popcorn and of waxy Asian maize ("glutinous" or "sticky" corn) also find such "floppy" tassels to be the norm, as we do also in our breeding of popcorns.

The floppy tassel trait (Figure 1) segregated monogenically in our conversions of inbred Hi27 to the gene *wx* (chrom. 9S-47.9). The mutant originated from MGC stock 70-1000-3/999-3 (*wx-a*), and had 6 backcrosses through 24 generations of breeding to Hi27. Floppy tassel was also observed in our digenic NIL with

Figure 1. Floppy tassel of *wx*^Hi27 near-isogenic line.