

Currently, amylo maize hybrids, with amylose content between 50-70%, are being grown under the Bear brand name, Amicorn. Hybrids containing 70-80% amylose have been developed and will be available for general production by 1967.

Source stocks containing up to 85% amylose have been developed by the use of recurrent and reciprocal recurrent selection. These sources are currently being used to develop hybrids with above 80% amylose. The amylose increase in sources has averaged about 2% per year by growing multiple generations.

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1. Further studies on the characteristics of teosinte chromosomes.
 - a. Florida teosinte: Microsporocytes of 16 additional F₁ hybrid plants of maize-Florida teosinte were examined. One-fourth of these plants had well-spreading pachytene chromosomes. Therefore a clear observation of the characteristics of Florida teosinte chromosomes could be made. Chromosomes 1, 2 and 3 were knobless. There were three knobs on chromosome 4; in addition to two terminal knobs there was an internal knob on the short arm. The two arms of chromosome 5 were terminated by knobs. An internal knob was present on the first knob position of the long arm of chromosome 6 and a small terminal knob on the short arm of the same. There was a large internal knob on the long arm of chromosome 7. The long arm of chromosome 9 had a large terminal knob. Chromosomes 8 and 10 had no knobs.

As previously reported, In9 in the short arm of chromosome 9 was observed in all of the F₁ plants having well-spreading pachytene chromosomes. However, the paracentric inversion in probably the long arm of chromosome 3 was found only in certain plants, indicating that this inversion existed as a heterozygote in the teosinte parent. Anaphasic evidence showed that this In3 had increased the frequency of crossovers within the inverted segment of In9.

The previous study of Longley (1937) reported that Florida teosinte like other teosinte varieties from southern Guatemala, had only terminal chromosome knobs. It has now been found in the present study that there were three conspicuous internal knobs. Possibly the teosinte employed in this study came from a different population from that of Longley's. It might also be possible that the knob substance in teosinte and its relatives represents an unstable heterochromatin. This heterochromatin may transpose from one position to the other, or from one chromosome to the other, by an unknown mechanism.

b. Jutiapa teosinte: Study of the microsporocyte divisions of 27 additional F_1 hybrid plants of maize-Jutiapa teosinte (from Guatemala) was carried out. At pachytene the chromosomes were generally identifiable even though the spreading quality was not as good as expected. There were two types of chromosome 1; one was knobless, while the other had a large terminal knob on the short arm. Chromosome 2 had a large knob terminating the short arm. Both arms of chromosomes 3, 4, 5 and 6 had probably medium-sized knobs. Chromosomes 7 and 8 were knobless. A small terminal knob was present on the short arm of chromosome 9. There were two types of chromosome 10; one was knobless, the other with a large terminal knob on the long arm. It was frequently observed that the teosinte chromosome 10 was longer than its maize homologue by this knob.

A paracentric inversion in the long arm of chromosome 1 was found in five of the plants studied. The average of five separate measurements of the length of the inverted segment was 18.1μ (Table 1). The distance from the distal point of breakage to the centromere was equivalent to about 55.3μ , or 67% of the length of the long arm.

Table 1
Length and Per Cent of the Long Arm Occupied by Inl in Jutiapa Teosinte

Cell No.	Length of inversion in microns	Length of long arm in microns	Per cent of long arm
1	17.7	78.3	22.6
2	16.8	78.4	21.4
3	13.9	63.9	21.7
4	24.7	103.0	24.0
<u>5</u>	17.6	91.1	19.3
M	18.1	82.9	21.8

In the short arm of chromosome 9 of all the plants studied, a paracentric inversion was observed. This points to the fact that the teosinte plants employed in the crosses were homozygous for this inversion. Furthermore this inversion appeared the same as that previously reported in this teosinte and the other varieties of teosinte of both Mexico and Guatemala.

c. Huixta teosinte from Guatemala: Pachytene chromosomes of 17 additional F_1 hybrids of maize-Huixta teosinte were found, last year, to differ from those previously studied (Ting, 1958) in having all of the knobs terminally located. Chromosomes 1 and 10 were knobless. There was a large knob on the short arm of chromosomes 2 and 4. The long arm of chromosome 3 had also a large knob. Both arms of chromosomes 5 and 6 were occupied by a medium-sized knob. A small knob was on the long arm of chromosome 7 and a medium-sized knob on the short arm of chromosome 8. There was also a small knob on the short arm of chromosome 9.

No inversions or any other structural changes of the chromosomes were found. All of the chromosomes from teosinte associated closely with

their maize homologues. Chromosome behavior at anaphases I and II was regular.

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2. Chromosome inversion of a maize tester plant.

During last year a cytological examination of a maize tester strain was made. The marker genes of this strain are $j\ v_{16}\ ms$ (hetero). This tester was obtained from Professor P. C. Mangelsdorf of Harvard University. At pachytene a paracentric inversion was found in the short arm of chromosome 8 of one of the plants. This inversion was practically terminal and it appeared the same as the In8 found in certain other strains of maize (McClintock, 1933, 1959) and in some Mexican teosintes (Ting, 1958). The length of the inverted segment was equivalent to about 50 per cent of the length of the short arm. Evidence of crossing over, such as bridges and fragments at anaphase I and bridges at anaphase II, was found.

Since the chance of the occurrence of two identical inversions in nature is practically nil, the existence of these aberrations can be used as a reliable marker of germplasm interchange among distinct species as well as among different varieties of the same species. Therefore, the In8 in this maize tester is considered as one more evidence of introgression between maize and teosinte. The direction of the introgression and the effect of this inversion on the frequency of crossovers in the heterologous chromosome pairs are under investigation.

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3. Further study of the selfed progenies of a variegated-leaf homozygote (v_l/v_l).

Last year the selfed progenies of a variegated-leaf homozygote (v_l/v_l) were under further investigation. A total of 129 plants was available. Four of these were practically albino and died while they were at the seedling stage. This is completely different from a previous study (Maize News Letter, 1963) in which no albino seedlings were observed. The remaining 125 plants resembled average maize plants in size. However, it was found that the degree of variegation in the leaf-chlorophyll content of this mutant varied very strikingly. Subsequently these plants were classified into four classes by the size of the chlorophyll-deficiency area in per cent of the total leaf area.

Class A had three plants with 85 per cent of the total leaf-area deficient in chlorophyll. Class B had 21 plants with 75 per cent of the leaf-area deficient in chlorophyll. Class C had 44 plants with 50 per cent of the leaf-area deficient in chlorophyll. Class D had 57 plants with 25 per cent deficient.