

At about 1000 B.C. a completely different maize with tripsacoid characteristics, presumably the product of hybridization with teosinte or *Tripsacum*, makes its first appearance. Since neither teosinte nor *Tripsacum* is known in Tehuacan Valley today and since no archaeological remains of either species have been uncovered in the caves although the remains of other indigenous grasses are abundant, we assume that the tripsacoid maize has been introduced from elsewhere.

The hybridization of the introduced tripsacoid maize with the early cultivated maize of Tehuacan Valley gave rise to types resembling two living Mexican races: Chapalote and Nal-Tel, the former now found in northwestern Mexico, the latter in southern Mexico. The two races are closely related, differing primarily in pericarp color, Chapalote having brown and Nal-Tel orange pericarp. Since both colors occur among the prehistoric kernels in the Tehuacan caves there is no way of distinguishing Chapalote from Nal-Tel in the prehistoric cobs - both are obviously components of the same complex.

It now seems probable that wild maize, though perhaps never abundant in any part of Mexico, was widely distributed geographically. Fossil pollen from deep drill cores from the Valley of Mexico, identified by Barghoorn *et al.*, show that wild maize once grew there. The appearance of a tripsacoid maize in the Tehuacan Valley suggests that adjoining regions also had maize. The popcorn race from the Valley of Toluca, Palomero Toluqueño, differs from the Chapalote-Nal-Tel complex of the Tehuacan Valley in having pilose leaf sheaths and pointed kernels and it may represent the descendant of a fourth distinct geographical race.

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2. Further data on the components of the tunicate locus.

In previous News Letters (35, 36) we reported that the two components of the Tu locus which had been separated by crossing over appeared to have slightly different effects. After an additional backcross to the inbred A158 which produced lines which are theoretically $61/64$ or 95.3 percent A158 there is now no doubt that this is true. The differences are apparent in a number of characteristics. Lines heterozygous for the locus tu^{h-d} have more prominent central spikes, longer staminate glumes, and longer, thicker pistillate glumes than lines heterozygous for tu^{h-1} . Although the kernels are not completely enclosed in either group of lines they are shelled off with difficulty from the tu^{h-d} lines and more easily from the tu^{h-1} lines.

There is still a possibility that the differences are due to modifying genes linked with the loci in question rather than to the loci themselves. This possibility now seems somewhat remote since increasing isogenicity has served to differentiate the components instead of increasing the similarity between them as would be expected if they were actually identical.

As pointed out previously, a difference in the two components of the Tu locus suggests that (a) the wild locus was Tu or (b) that there were two wild loci, tu^{h-d} and tu^{h-1} which through unequal crossing over sometime during domestication were brought together to produce the present Tu locus. The fact that all early prehistoric corn so far studied is similar to half tunicate rather than to full tunicate favors the latter possibility.

Crosses were made in 1961 between plants heterozygous for the two components. In 1962 plants heterozygous for both (+-/-+, a modified trans form in which the two +'s represent different "wild" loci) were backcrossed to tu tu. A backcross population is now being grown in Florida to determine whether the Tu locus can be resynthesized by restoring its separate components to their original positions on the same chromosome.

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3. Combining extracted chromosomes with tripsacoid effects - its bearing on convergent improvement.

In last year's News Letter I reported the results of intercrossing lines of A158 which had been modified by incorporating into them chromosomes with tripsacoid effects extracted from varieties of maize from the countries of Latin America. During the past summer highly tripsacoid segregates from F₂ populations of such crosses were grown for the purpose of establishing new lines of A158 carrying extracted chromosomes from both parental lines. In virtually all lines some plants were completely barren, producing no ears - in some lines virtually all plants were barren. This confirms the conclusion reached last year that there is a limit to the amount of tripsacoid germplasm which can be introduced in a homozygous state into an inbred strain.

These results have an important bearing on the method of convergent improvement in maize which assumes that inbred strains and their single crosses can be improved by backcrossing an F₁ hybrid to each of its parental lines followed by selfing. If heterosis is due in some instances to blocks of genes originally from teosinte or Tripsacum then convergent improvement will not in such cases be successful because these blocks of genes tend to have deleterious effects when homozygous.