is control of disarticulation of the rachis, internode length, number of fertile grain-bearing florets (in Triticum) or spikelets (in Zea) and structure of the glume. In Zea other floral characters such as inclination of the spikelet and degree of cupule development are also involved (Galinat, 1963; Sehgal, 1963). The Q segment appears to control the action of genes located elsewhere in the genome, while the functions of genes on teosinte chromosome 4 are partially duplicated on at least four other chromosomes (1, 3, 9 and 10) according to Mangelsdorf (1947).

The speltoid mutants result from a deficiency for the Q segment. The linked genes which are known to be located in chromosome 4 of Zea do not occur as a single linkage group in tripsacum, the second closest relative of maize, although its genes or their functions are dispersed to several different chromosomes.

Because of the hexaploid nature of Triticum vulgare, it is to be expected that loci elsewhere in the other two genomes would have complementary, if not duplicating, effects to those of the Q segment. The partially duplicating effects of the several different teosinte segments to that on Zea chromosome 4 are not so easily explained.

If similarity in length is important to an analogy, perhaps the tunicate locus, which is compound and also on Zea chromosome 4, might be a better comparison to the Q segment and/or a supergene, as suggested by Mangelsdorf (unpub.).

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4. The genetic differences between primitive maize and teosinte.

A knowledge of the number of allelic differences which separate maize from teosinte would be helpful in estimating the rate at which teosinte might have become transformed into maize, but not necessarily a criterion of whether teosinte could be the ancestor of maize. Unfortunately studies of segregation among maize x teosinte hybrids must be based partly on an arbitrary and difficult separation into classes of characters such as induration score, disarticulation score, day-length response and even the ranking (distichous vs polystichous). The expression of distichous is often variable within the plant and it may be genetically unstable in maize.

Despite its variability, there has been some agreement between various investigators that when the F_2 segregation for distichous vs polystichous from corn-teosinte hybrids is based upon scoring of the uppermost central ear, the ratio approaches a 3:1. In our tests, a population of 100 F_2 plants from a cross between northern teosinte and string pop yielded 22 distichous ears and 80 polystichous ears. Although this might be interpreted as a 4:1 ratio, it is more probably a deviation from a 3:1 ratio. Langham (1940) found Mendelian inheritance for certain other characters separating these relatives, but Mangelsdorf (1947) and Rogers (1950) failed to get such evidence. Some results reported by Mangelsdorf and Reeves (1939) suggested that the genes which distinguish teosinte from maize are concentrated in only four chromosome segments while other data indicated that these genes are distributed among most of the ten chromosomes of maize (Mangelsdorf, 1947; Rogers, 1950).

These varying results could stem primarily from differences in the maize backgrounds as well as from the maize germplasm which might have previously introgressed into the teosinte parent. According to both Rogers and Mangelsdorf (op cit) the inheritance and/or linkage of these characters varies with the variety of teosinte involved in the cross. Mangelsdorf also found that the variety of maize had an effect, for, in his cross of Durango teosinte with Guarany maize, the spikelets were predominantly single in the F_1, whereas in crosses of the same teosinte with North American maize, they are predominantly paired.

In an attempt to minimize the importance of such complicating factors, it would seem desirable to make use of the most primitive races of maize that are now available. How could one expect to get simple segregation ratios between teosinte and modern maize when the genetic difference between modern maize and primitive maize which could have evolved from teosinte is already complex?

With this approach in mind, Confite Morocho, probably the most primitive living race of maize now available, was adapted to growing conditions in Massachusetts by incorporating some germplasm from Tom Thumb popcorn. It is hoped that the resulting string popcorn line will provide a sufficiently low level of modifier genes to make possible a more meaningful test of the old hypothesis that domesticated maize originated from teosinte by an accumulation of mutations.

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5. The possible evolution of a high sink (energy utilization or deposition) capacity in the ear of modern maize and teosinte.

In an F_2 of 100 ears from a cross between northern teosinte and a primitive string cob popcorn, there was little or no induration (hardness) in the glumes and rachis in contrast to the high induration which ordinarily characterizes maize-teosinte segregants. A comparable F_2 progeny from the same teosinte outcrossed to modern maize (A158) did give the usual preponderance of highly indurated types.

The teosinte used in these crosses was the special northern stock created in my cultures as previously described in the first item. The string cob popcorn was derived from a cross between Tom Thumb popcorn and the primitive short-day Peruvian race, Confite Morocho.

The relatively small F_2 population involving string pop yielded four good maize ears but no teosinte-like ones. The four exceptional maize ears were more indurated, had deeper cupules and were longer than the string popcorn which went into the original cross. Apparently the modern teosinte germplasm which segregated to the four plants involved had increased their capacity to produce a more productive ear. Most of the F_2 plants did not have this capability to deposit abounding energy in the glumes, rachis and kernels. While it is possible that a weak tunicate allele similar to that of Chapalote in the string pop parent was partly responsible for the lowered sink level, the indurated segregants were too few (4%) to represent the effects of only one recessive gene.

The capacity of the maize ear to function as a high energy sink could have developed during selection under domestication for more productive ears. The modern high yielding ear would combine genes for a large many-rowed cob with genes for a large ear-sink capacity. The high induration in the cupulate fruit cases of modern teosinte would represent an expression of this high-sink capacity in the presence of a tiny storage