7. Mutagenic effects of teosinte chromatin in maize.

For some years we have been developing a series of stocks in which chromosomes of several varieties of teosinte are incorporated by repeated backcrossing, singly or in combination, into three different inbred strains of maize. On several occasions mutations have been noted in these teosinte derivatives and we have suspected that teosinte-chromatin is in some way mutagenic when transferred to maize. Recently we have summarized data which tend to lend weight to this suspicion.

Fifteen different mutations have now been noted in the teosinte derivatives. Among these are ten defective seeds, two virescents, two albinoes and one sugary endosperm. In all cases where the teosinte chromosomes have been identified chromosome 4 is one of the chromosomes or the only chromosome involved. Chromosome 4 from three different varieties of teosinte has been associated with mutations. Only three of the defective seed mutants have so far been tested for linkage. All are located on chromosome 4 closely linked to the *Su* locus. These three defectives are slightly different phenotypically, but whether they represent different mutations at different, closely-linked loci or recurring mutations at the same locus has not been determined.

All mutations so far noted have occurred when the teosinte chromosome was either known to be or suspected to be heterozygous. The mutations have occurred in relatively small populations, not more than six to twelve plants of each stock being grown each season. The relatively high frequency of mutations and the fact that they apparently occur only in heterozygotes suggests strongly that they are the product of crossing over, perhaps unequal crossing over, between maize and teosinte chromosomes. Sax (1931) suggested some years ago, on the basis of other evidence, that crossing over may be a primary cause of mutation. This possibility is being tested but the problem is complicated by a lack of good workable genes on both sides of the Su locus.

If these mutations are indeed the product of unequal crossing over then it is probable that minute duplications, less easily detected than ordinary mutants, are also occurring. Many of these may actually be beneficial in a domesticated species in creating new more complex "genes" which serve as a new source of variation and which may be an important factor in the evolution of this species.

Since maize hvbridizes freely with teosinte and since in such countries as Mexico there is a constant reciprocal introgression of one species into the other, it may well be that a substantial part of the variability of modern maize is the product not only of Mendelian recombination of genes from the two species, but also of the mutagenic effects of teosinte chromatin in maize. At least this possibility merits a thorough study. Any suggestions from other students of maize for designing critical experiments in connection with such a study will be welcomed.

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