

### 8. Linkage in tetraploid hybrids of maize and perennial teosinte.

Because preferential pairing and gene segregation in the 4N hybrid of maize and teosinte affect the frequency of recovery of recessives in the backcross, linkage in the hybrid cannot be compared with that in the autotetraploid control simply by examination of frequencies of crossover-type progeny. However, if the assumption is made that all bivalents in the 4N hybrid are homosynaptic (maize with maize, and teosinte with teosinte), the  $\beta$  coefficient can be used to compare the relative amount of crossing over in the 4N hybrid with that in the autotetraploid maize control during heterosynaptic (quadrivalent) associations. (Limited data indicate that bivalents in the 4N "intergeneric" hybrid are rarely or never heterosynaptic. Conversely, all heterosynaptic associations are in quadrivalents.)

TABLE 3.  $\beta$  Coefficients of Tetraploid Linkage in 4N Duplex Hybrids of Maize and Perennial Teosinte, and in Autotetraploid Maize Controls.

Segment	"Intergenic" Hybrid	Autotetraploid Control
B - lg <sub>1</sub>	.600	.119
su <sub>1</sub> - gl <sub>3</sub>	.542	.184
Y - Pl	.392	.505
wx - C	.023	.567
wx - sh <sub>1</sub>	1.000	.547
wx - yg <sub>2</sub>	1.000	.347

It should be remembered that the above values measure degrees of linkage only during heterosynaptic events. In the B - lg<sub>1</sub> and su<sub>1</sub> - gl<sub>3</sub> regions, crossing over is less in the hybrid, as expected from cytological observations indicating a general reduction in chiasma frequency in the hybrid.

Crossing over in the Y - Pl region was apparently increased in the hybrid. Cytological data for the chromosome involved (6) show that although quadrivalent frequency was less than one-half the average value for other chromosomes, the frequency of quadrivalents with effective partner exchanges was more than twice as great. (An effective partner exchange is defined as the occurrence of chiasmata on both sides of the point of pairing partner exchange within a chromosome arm.) Since an effective partner exchange specifies that one exchange must be heterosynaptic, the explanation for the apparent increase in crossing over per quadrivalent in the hybrid may lie in the special nature of chromosome 6 quadrivalents.

The data from the wx - C, wx - sh<sub>1</sub>, and wx - yg<sub>2</sub> segments of the short arm of chromosome 9 are clearly incongruous. In the wx - C region, linkage was virtually absent, while in the overlapping wx - sh<sub>1</sub> and wx - yg<sub>2</sub> regions, linkage was complete. For reasons given below, it is assumed that the wx - C data are anomalous, and that actual crossovers in the short arm of nine are never or rarely consummated. It seems likely that *E. perennis* carries an inversion in the short arm of chromosome 9, like Florida, Durango, and Nobogame teosintes.

It is interesting to note that Emerson and Beadle (Zeit. f. Induk. Abstammgs. u. Vererbungslehre 62:305-315, 1932) also found apparent crossovers in the wx - C region of triploid hybrids of maize and perennial teosinte. Since the results of the present study are in agreement with theirs, it seems likely that the present results must be considered real, and therefore require a non-conventional explanation.