

indication of inter-component interaction in many crosses.

Heterosis in maize. The two principal hypotheses which have been advanced to explain the genetic basis of heterosis are dominance and overdominance. The available information on these seems to suggest that the two hypotheses are not mutually exclusive. Present studies definitely suggest that this situation would be expected if it is assumed that there are, in the genetic complex of maize, small heterotic segments of "Tripsacum" and teosinte, which confer selective advantage to the heterozygote, but are somewhat deleterious in homozygous condition. The pseudo-over-dominant effect of these segments may be due to any of the models of gene action. Some of the segments may show additive effect, others epistatic, and still others dominance. If this assumption is valid, as the experimental results described above indicate, then to compartmentalize the observed vigor to one or the other hypotheses, at least for a complex hybrid like maize, is a basic fallacy.

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## 12. Field studies on teosinte in Mexico.

Guerrero Teosinte. Teosinte was studied on the mountains (700 m to 1650 m) that surround the Balsas Basin where it behaves as a weed on open sites. Teosinte is extremely common on road cuts, erosion gullies and forms dense local populations on sites where there is available more moisture than on the surrounding hillsides. There is widespread evidence that the natural vegetation has been cleared in the past and abandoned hillsides have returned to a dry semi-arid scrub forest. In some areas the cultivation of maize has been only sporadic, but in areas accessible by road, cultivation of maize is of an intensive milpa, shifting-field form, except where prohibited by excessively steep slopes. Collections were made of teosinte expressing all degrees of vigor depending primarily on the population density and quality of the site. Under intense competition from other grasses the plants were often less than a meter high with one or two tassel branches. The other phenotypic extreme were plants in or adjacent to maize fields which developed thrifty stalks of 3 meters. Locally teosinte is definitely one of the dominant grasses on slopes that have obviously been cleared in the past but have not been cultivated for several years. Natural hybrids are not common but they have been collected from a majority of the populations studied to date. Also included here as Guerrero teosinte are collections from the drainage of the Rio Papagayo (Mazatlán, Guerrero).

Chalco Teosinte. A detailed study was made of teosinte in the Chalco area. Observations were conducted over the entire growing season in almost every part of the valley and under a wide variety of cultivation practices. In direct contrast to the situation studied in Guerrero, teosinte is limited to cultivated fields as a weed where it mimics maize. Field to field inspection indicated considerable variation in the number of teosinte plants, but essentially fields were of two types: either teosinte was absent (less than 1% of the plants in the field), or teosinte was present (more than 3%, usually between 5 and 15% of the plants in the field). The two classes were almost equally frequent. At the end of the season three selected representative fields were harvested and every plant was scored. The results are presented below:

Field	Total No. of Plants in the Field	Maize x teosinte Hybrids	% of Teosinte Plants in the Field*
Los Reyes	17,511 (acre)	38	4%
Chalco	17,574 (acre)	39	9%
Amecameca	9,121 (1/2 acre)	44	5%

\*Based on sample counts of 3600 to 4000 plants at the time of pollination.

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1. Estimates of spontaneous non-reduction in diploid inbreds.

Three to thirteen plants in each of 121 dent inbreds were pollinated by Synthetic B, a tetraploid variety. Plump and presumably tetraploid kernels were counted, as well as the shriveled triploids on each ear. The following year, plump kernels were planted and the resulting plants were pollinated by a diploid. At maturity, each plant was scored for its ploidal nature on the basis of seed set.

The frequency of diploid eggs, presumably arising largely from non-reduction varied widely from inbred to inbred. Eighty five percent of the inbreds produced no verified tetraploids in as many as 3,500 fertilizations. However, the frequency of tetraploidy in the WF9 crosses was high.