Ear Characters: The four to six ears on each stem or tiller are borne at successive nodes, starting with the node immediately below the flag leaf node. The uppermost ear is about 5 cm long and terminates in a well developed spike, bearing functional male flowers. The successive ears downwards, gradually increase in size and the corresponding male spike decreases, till the lowermost ear is about 7.5 cm to 10.0 cm long with an incipient male spike. Ear diameter ranges from 1.5 cm to 2.3 cm. The kernel rows are not regular and range from 8 to 10 per ear. The number of husk leaves per ear are five to seven, thin and partially open upon maturity, thereby partly exposing the ear. The glumes are fine and soft, and cover the kernel up to about half its length. The kernels are very small, round, hard and pop upon heating.

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3. The role of cytoplasm in the manifestation of heterosis and other traits in maize.

During the past several years maize germplasm from the Americas and India has been studied for the exploitation of heterosis and for the improvement of yield and other agronomic traits of maize in India. While considerable practical benefits have resulted from the release of highly productive hybrids, yet these studies have posed a number of fundamental problems that are now being investigated. Briefly stated these problems are: (1) what is the maximum heterosis that can be attained, under very high soil fertility and keeping in view the agro-climatic conditions prevalent in India, (2) the extent of genetic divergence needed in the parental races in order to obtain maximum heterosis in hybrid combinations, (3) the role of cytoplasm and hybrid nucleus in the manifestation of heterosis and other quantitative traits, and (4) the role of cytoplasm as an isolating mechanism, thereby serving as a barrier to natural crossing during the evolutionary divergence of maize races.

In the studies relating to item (3) above, all possible reciprocal combinations, between primitive and highly advanced races are being investigated in the F_1, F_2 and backcross generations. This material was selected in order to ensure that divergent cytoplasm, if present, was utilized along with a high degree of hybridity in the nucleus.

The results obtained from such reciprocal inter-racial crosses reveal that cytoplasm also plays an important role in the manifestation of heterosis and other quantitative traits. Data from the reciprocal crosses between the primitive type, Sikkim Primitive 2 (SP 2), and a highly evolved race, Colorado (Col) from U.S.A. are presented below:

Pedigree	Yield kg/ ha.	Yield % Col	Yield % SP 2	Pt. Ht. cm	Pt. Ht. % of Col	Pt. Ht. % of SP 2	Days to Silk
SP 2	615	45	100	108	61	100	74
Col	1375	100	224	177	100	164	51
SP 2 x Col	639	46	104	140	79	130	68
Col x SP 2	2972	216	483	215	122	199	56

Grain Yield: The cross Col x SP 2 gave 116 per cent more grain yield, and the reciprocal cross 54 per cent less yield than the Col parent. When compared to the SP 2 parent, the cross Col x SP 2 yielded 383 per cent more and the reciprocal cross four per cent more. The SP 2 cytoplasm inhibited the expression of the hybrid nucleus.

Plant Height: The differences between the reciprocal crosses were also striking, but not marked to such an extent as in the case of grain yield. The cross Col x SP 2 manifested 22 per cent more, and the reciprocal 21 per cent less plant height than the Col parent. When compared to the SP 2 parent, Col x SP 2 was 99 per cent taller, whereas the reciprocal cross was only 30 per cent taller.

Days to 75 Per Cent Silking: The cross Col x SP 2 (56 days) showed the earliness of the earlier parent Col (51 days), the reciprocal cross (68 days) was 12 days later in silking and approached the late parent SP 2 (74 days).

Additional data from several reciprocal crosses between primitive and advanced races are being analyzed, and a number of quantitative traits are being studied. The indications are that the degree of inhibition exercised by the cytoplasm on the expression of the hybrid nucleus varies with different races so as to give a range from complete masking to little or no masking. It appears that in the study and exploitation of heterosis one should not only look for superior hybrid nuclei but also for superior sources of cytoplasm. Fleming et al (Agronomy Journal, 1960) and Brown (Iowa Academy of Science, 1961) have presented preliminary data relating to this phase of study.

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1. Cytological location of gl_{15}.

Linkage studies of gl_{15} (Coe, MNL 32:100) have shown that it gives 7% recombination with wx. The order in chromosome 9 is sh-wx-gl, but the centromere position with respect to wx and gl was not clear. A test of the location of gl was made by a genetic analysis of plants heterozygous for this gene and for translocations 5-9c, 3-9c, $1\text{-}9_{4995\text{-}5}$ and 7-9a with breakpoints in chromosome 9 at 9L .1, 9L .12, 9S .20, and 9S .07 respectively. The results from studies with two of these translocations will be discussed. Diagrams of chromosome pairing in the translocation heterozygotes and the postulated gene locations are included in this report. The relative length of each chromosome in microns is also given, as determined from Longley's chromosome measurements and the reported breakpoints.