These results indicate either an incomplete dominance of the Rf, fertility restoring factor (Noble and Russell, 1963) or as Duvick reported (Genetics, 1956) there may be modifying or minor fertility restoring genes which affect the fertility restoration in such a way that pollen shedding would be delayed.

The observations described by the present authors seem to indicate that in nature sterile cytoplasm can be detected, as expressed in the form of protogynous condition where a complete set of fertility restoring genes and the modifiers are not present to affect normal and timely development of pollen. The pollen development is therefore delayed and results in a protogynous condition. The protogynous marker is worth being explored and may be a valuable tool for identification of sterilizable cytoplasm. Experiments are in progress to throw more light on the exact nature of gene-cytoplasm interaction resulting in the protogynous condition, and to confirm the above hypothesis.

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2. Primitive maize in Sikkim.

Primitive maize types were reported from the hill country of Assam and Burma by Anderson (1945), and Stonor and Anderson (1949). More recently, certain peculiar varieties, occurring in Central Nepal, have been described by Ono and Suzuki (1952). The Indian Agricultural Research Institute has been conducting a survey of maize germplasm in the northeastern Himalayas and the mainland of India. These studies have revealed that a wide spectrum of genetic variability in maize exists in the northeastern Himalayas, while the northern plains and peninsular India are characterized by a lack of such genetic divergence.

Among the collections from these regions, those from Sikkim present strikingly primitive features. A detailed morphological study has been made of two such types; physiological, genetical and cytological investigations are in progress. The distinctive morphological characteristics of Sikkim Primitive 1 (SP 1) are presented below:

Plant Characters: SP 1 is a pop corn. In its native habitat the plants attain a height of 130 cm to 200 cm. Each plant has a central stem and two to four tillers. Each stem or tiller terminates in a drooping tassel and bears from four to six ears. The lowermost four to five internodes are highly condensed and are from 2.2 cm to 5.0 cm. in length. The main stem bears about 13 leaves. The leaf bearing the best developd ear has a length and width of 57.0 cm and 5.6 cm, respectively. The venation index is about 2.5.

Tassel Characters: The tassel is drooping and has on an average five primary and seven secondary branches. The condensation index is 1.05. The basal end of the lowermost one to two primary branches bear from 10 to 20 functional pistillate flowers. These ultimately develop viable seeds.

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.

N. L. Dhawan

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