Table 2

Mean pollen size of various primitive and evolved varieties

Variety	Mean pollen diameter (μ) $\pm$ S.E.
SP 1	66.09 $\pm$ 1.23
SP 2	78.88 $\pm$ 1.23
Palomero Toluqueno	85.31 $\pm$ 1.23
KT 41	85.05 $\pm$ 1.23
Mexican June	83.48 $\pm$ 1.23

than such American races as Chapalote, Nal-Tel and Palomero Toluqueno, which are believed to be direct descendants of the wild corn.

References

Galinat, W. C. (1961) Corn's evolution and its significance for breeding. Econ. Bot. 15:320-325.

Mangelsdorf, P. C. (1958) Reconstructing the ancestor of corn. Science 128:1313-1320.

Stonor, C. R. and E. Anderson. (1949) Maize among hill people of Assam. Ann. Missouri Botan. Gard. 36:355-404.

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2. Cytoplasmic differentiation between evolved and primitive types of maize.

A number of primitive varieties of maize of Himalayan and Latin American distribution were crossed reciprocally with two commercial varieties of maize, KT 41 (an Indian variety) and Mexican June. Observations on hybrid plants from these crosses have shown significant differences between the reciprocal crosses for a number of characters including maturity index, plant height and yield components such as ear length, number of kernel rows and 1000 grain weight (Table 1).

Table 1

Crosses and the respective characters showing significant reciprocal differences

Cross	Character	Cytoplasm favoring better expression
KT 41 X SP 1	Ear length	Primitive
KT 41 X SP 2	Plant height Ear length	Evolved Evolved
KT 41 X Pollo Segregaciones	Kernel rows	Evolved
KT 41 X Chapalote	Ear length 1000 grain weight	Primitive Evolved
KT 41 X Nal-Tel (Yucatan 7)	--	--
Mexican June X SP 1	--	--
Mexican June X SP 2	Ear length	Primitive
Mexican June X Pollo Segregaciones	Days to silk	Evolved
Mexican June X Chapalote	Ear length Kernel rows	Primitive Evolved
Mexican June X Nal-Tel (Y.7)	--	--

It will be seen that except for the character of ear length the evolved cytoplasm favors better expression of various characters. Bhat and Dhawan (1969) have also found evidence of cytoplasmic effects in such crosses of maize.

Thus, the analysis clearly demonstrates that some differentiation has taken place at a cytoplasmic level between the primitive and the evolved varieties of maize. There are not many examples available in the literature where cytoplasm appears to have played an important role in the differentiation of populations of a species in the course of its evolution. The evidence from maize is, thus, of particularly great interest, and it may stimulate studies of a similar nature in other important crop plants.

Reference

Bhat, B. K. and N. L. Dhawan (1969) Effect of cytoplasm on quantitative characters of maize. Indian J. Genet. 29:321-326.

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3. Dominant genes in the evolution of maize.

Observations on a series of crosses involving primitive and evolved varieties of maize including SP 1 and SP 2 (Himalayan primitives), Chapalote, Nal-Tel (Yucatan 7), Pollo Segregaciones (Latin American primitives), KT 41 and Mexican June (evolved types) have shown that the genes determining early maturity, increased plant height, grain yield, ear length and the 1000 grain weight show a partial or complete expression of dominance in the first generation hybrids. The dominant genes were found to be contributed by the evolved varieties. It is generally believed that the primitive populations of a species show a greater concentration of wild type genes, and in the course of their evolution, they produce a large number of mutant alleles. Thus, the recessive genes are expected to show a greater preponderance in the evolved types. In the case of maize, many mutant genes having dominance effects have also been produced in the course of evolution. These mutant genes were obviously of great value and have been unconsciously or consciously selected by the early farmers and the present day plant breeders.

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4. Primitive and evolved varieties of maize and generation of heterosis.

A number of crosses between the primitive varieties of Himalayan and American distribution on the one hand, and highly evolved maize on the other, have provided evidence of a heterotic response. In the crosses between the primitive and evolved types, significant negative heterosis was more commonly generated when the Himalayan primitive varieties were involved as one of the parents. A significant positive heterosis for various characters of economic value was observed only in a few of the crosses, as shown in Table 1.