

It will be noted from the table that cytoplasmic effects on a particular character in one year were not repeated in the other year of study. Reciprocal crosses of SP2 with Yellow Tuxpan, Eto Amarillo and San Andres Tuxtla did not give cytoplasmic effects on any of the four characters studied during 1964, whereas significant effects were obtained on days to silk, plant height and ear height in the 1965 study. Reciprocal crosses between Pira Blanco and Colorado gave a significant cytoplasmic effect on days to silk in 1964, whereas no cytoplasmic effect was obtained for this character in 1965; instead plant height and ear height were significantly affected. KT41 X San Andres Tuxtla and its reciprocal revealed a significant cytoplasmic effect on plant height in 1964 and on yield in 1965. Reciprocal crosses of Basi and Eto Amarillo did not show significant cytoplasmic effects on any of the four characters studied.

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3. Threshold concentration of plasmon sensitive polygenes in the expression of quantitative characters.

During the course of studies of cytoplasmic effects on quantitative characters such as yield, maturity, plant height, ear height and number of ears per plant, it was observed that, if a character was under the dual control of nuclear genes and cytoplasm, cytoplasmic effects were expressed only up to a certain threshold concentration of the plasmon sensitive polygenes. Once the concentration of these genes crossed the threshold limit, they alone controlled the character and no cytoplasmic effects would be expressed.

This concept, to the knowledge of the authors, is a new one and has a direct bearing on the expression of cytoplasmic effects on quantitative characters.

If a cytoplasmic effect on a certain quantitative character is expressed in the F_1 and disappears in backcross generations, it might be due to the increased number of genes of one parent introduced by backcrossing which now exceed the threshold limit and thus nullify the cytoplasmic effect. Such a phenomenon was seen to exist in nine of the eighteen cases showing significant cytoplasmic effects on yield, days to 75 per cent silking, plant height and ear height.

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4. Male sterility caused by nucleus-cytoplasm interaction.

Llera III, a derivative of the Tuxpeno race of maize from Mexico, was reciprocally crossed with SP2, a primitive variety of maize from Sikkim (MNL 38:70), and it was observed that male sterility was produced only when Llera III contributed the cytoplasm. The data are presented in the table.

Pedigree	Per cent male sterile plants
Llera III	2.9
SP2	0.0
(Llera III X SP2) X Llera III	4.2
(SP2 X Llera III) X Llera III	0.0
Llera III X SP2	12.2
SP2 X Llera III	0.0
(Llera III X SP2) X Sp2	100.0
(SP2 X Llera III) X SP2	0.0

On increasing the dosage of SP2 in Llera III cytoplasm, the percentage of male sterile plants also increased. When 25, 50, and 75 per cent of the nuclear component of SP2 was present in Llera III cytoplasm the percentages of male sterile plants were 4.2, 12.2, and 100.0, respectively. The reciprocals, however, were male fertile. It may be mentioned that Llera III itself had 2.9 per cent male sterile plants. Since it is not known what type of male sterility is present in Llera III, no clear cut explanation could be given. It is presumed that with increase of the SP2 nuclear component in Llera III cytoplasm a strong nucleus-cytoplasm interaction took place which resulted in male sterility. The interaction when 75 per cent of the nuclear component of SP2 was present in Llera III cytoplasm was strong enough to produce 100 per cent male sterile plants. The interaction, however, did not occur between SP2 cytoplasm and the Llera III nuclear component. Studies are in progress to find out what type of male sterility is present in Llera III.

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