lines some substance which appears to contain starch and a phenolic compound as well as nucleotides is firmly bound to the nuclear DNA. Modification of the extraction process has on one occasion produced a 42% C-G DNA precipitate after the enzymatic removal of RNA. However, the supernatant was still strongly positive for DNA and presumably contained the contaminating substance which produces the distorted base ratios. These results were obtained only for the line lacking B-chromosomes. Identical treatment had no effect on the B-chromosome line.

It can be seen from the table that neither the B-chromosomes, the aleurone color genes nor the sugary gene alone can be responsible for the unusual behavior of the DNA in the endosperm of the Black Mexican lines. Further studies are in progress.

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1. Cytoplasmic differences in respect of some important plant characters in a maize composite.

Current trends in maize breeding techniques are mainly based on increasing the frequency of superior genes in the base population and selecting for specific interaction of these genes determining better preformance than the parents. This lays all the emphasis on the manipulation of Mendelian inheritance controlled by nuclear genes and the fact that the differences in cytoplasm may alter the expression of the genes to a considerable extent has not received attention. As early as 1933 Rhoades discovered that male sterility in maize was inherited only from the female parent. In recent years the finding of Rf genes (Restorer genes) has clearly shown that sterility or fertility in maize is conditioned by certain genes in the nucleus and the cytoplasm with which they interact.

Bauman in 1950 (quoted from Stringfield 1958) reported that ear length was significantly different in two three-way crosses differing in their source of cytoplasm only. Later Stringfield (1958), Fleming et al. (1960), Brown (1961), Dhawan and Paliwal (1964), Dhawan et al. (1965) and Mukand Singh (1965) reported high significant differences in yield and other plant characteristics in reciprocal crosses of various types.

Recently in India and in Mexico highly diverse germplasm complexes are being used in maize improvement programmes. Observations on one germplasm complex (J_1) having a very wide genetic base indicated that there is a great deal of variability for cytoplasmic effects and selection for superior combinations of genes and cytoplasm may be useful.

Observations on 46 reciprocal biparental comparisons were recorded for per plant yield, silking period, plant height, ear placement, ear length, ear girth, number of rows per ear, number of grains per ear and 100-grain weight. The analysis of variance for all the characters was done as for the randomized plot design and the differences between reciprocal progenies were compared with C.D. values at the 5 per cent and 1 per cent levels of significance.

The analysis of variance showed that the differences for the characters studied were highly significant in many of the reciprocal pairs. Since the female parent contributes almost all the cytoplasm, the observed differences between reciprocal crosses are therefore due to cytoplasmic differences. As the base population of the J_1 composite is constituted of highly diverse sources of maize germplasm from U.S.A., South America, Peru, Columbia, Venezuela, the Caribbean region, Kenya and India, it abounds in high genetic variability and different sources of cytoplasm. The magnitude of the differences for the characters in various reciprocal crosses is, therefore, an indication of the interaction of a particular cytoplasm with a specific genotype. Out of 46 reciprocal pairs, 43 pairs exhibited significant mean differences for one character or more. The details of the cytoplasmic effects on various characters are as follow:

Highly significant differences for per plant yield (range 1.4 to 40.2 grams) were observed in 15 reciprocal cross pairs. This indicates that cytoplasmic effects were quite vital in at least one-third of the population in determining the yield performance, and selection on the basis of superior interacting cytoplasm could certainly improve the yield potential of the complex. Besides yield, differences were significant for plant height in 23 progenies (0.20 to 53 cms.), silking date in 4 progenies (0.20 to 3.0 days), ear placement in 19 progenies (0.20 to 22.5), ear length in 5 progenies (0.1 to 3.6 cms.), ear girth in 2 progenies (0.1 to 2.3 cm.), number of rows per ear in 8 progenies (0.1 to 3.1), number of grains per ear in 11 progenies (1 to 181), and 100-grain weight in 3 progenies (0.1 to 6.4 gms.). The characters, yield per plant, plant height, ear placement and number of grains per ear, seem to be most affected by the cytoplasmic differences, whereas these differences did not affect the individual yield components to the same extent. The cytoplasmic effects between different reciprocal pairs are not consistent for the characters studied, which indicates that genic cytoplasmic interactions are not the same in all the reciprocal pairs and depend on the specificity of the genotype and cytoplasm for which the composite has a great deal of variability. Inconsistencies in cytoplasmic effects for various agronomic characters in different sources of cytoplasm have been reported by Fleming et al. (1960) and Mukand Singh (1965). According to Dhawan and Paliwal (1964) and Mukand Singh (1965), genetic diversity of the parents is important in the expression

and manifestation of quantitative differences for agronomic characters influenced by specific cytoplasmic effects in the crosses. Hence in a composite like J_1 constituted of genetically diverse sources of germplasm from different geographical areas, the cytoplasmic differences offer great scope for selection and putting together cytoplasm and genotype which give the most desirable plant types in the derived population. The approach of selection between reciprocal biparents would combine the ease and rapidity of different mass selection procedures to exploit the additive gene effects in such populations and at the same time would insure selection for superior interacting cytoplasmic effects.

The observations in the present study also point out that in practical breeding programmes where such composites are being used, a larger population than generally used should be involved as female parent to represent the entire range of the variability of cytoplasm in the composite, and it may be desirable to get an idea about the extent of cytoplasmic variability and the combining ability for cytoplasmic effects in such composites, so that one may have a sound basis for determining which composite should be used as the female parent. The present findings also suggest that the maintenance of composites should be based on fairly large plant populations.

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1. Verification of $\underline{R}^{st}$ reconstitution in $\underline{R}^{sc}/\underline{r}^{g}(I)^{3}$ heterozygotes.

A report in the 1966 MNL (pp. 135-137) described the recovery of four $\underline{R}^{st}$ mutants from heterozygous combinations between two $\underline{R}^{sc}$ and a near-colorless aleurone allele, $\underline{r}^{g}(I)^{3}$, originally isolated from an $\underline{R}^{r}\underline{R}^{st}$ plant. The male parent in these tests was $\underline{r}^{g}\ \underline{r}^{g}$, $\underline{wx}\ \underline{wx}$, and the four isolations of $\underline{R}^{st}$ segregated $\underline{wx}$, as expected. However, there were several plantings in the field of an $\underline{R}^{st}\underline{R}^{st}$, $\underline{wx}\ \underline{wx}$ stock culture, and the possibility existed that the $\underline{R}^{st}$ alleles isolated as mutants could have been pollen contaminants from this source. Conclusive verification required the identification of the $\underline{r}^{g}$ allele brought in from the male parent. A $\underline{R}^{st}$, $\underline{wx}$ contaminant gamete would produce a $\underline{R}^{st}/\underline{r}^{g}(I)^{3}$, $\underline{Wx}\ \underline{wx}$ kernel, whereas a mutation would produce a $\underline{R}^{st}\ \underline{r}^{g}$, $\underline{Wx}\ \underline{wx}$ kernel. The $\underline{r}^{g}(I)^{3}$ and $\underline{r}^{g}$ alleles are identifiable by phenotype and paramutagenic action.

The four stippled kernels selected as possible mutants were self pollinated when grown out. The nonstippled kernels from each ear were planted, and plants were self pollinated and crossed to $\underline{R}^{r}\ \underline{R}^{r}$. Selfed ears from the four progenies were examined for a near-colorless aleurone phenotype but