4. Frequency of mutation of R^{lst} to R^{sc} in plants heterozygous $R^{lst}/r^{r}(I)$ and R^{lst}/r^{g}.

The frequency of germinally recoverable mutations of R^{st} or R^{lst}, which differ only in the presence of a linked modifier on the R^{st} chromosome, to R^{sc} (self-colored aleurone) has been observed by several investigators to be greater when R^{st}, or R^{lst}, is homozygous than when it is heterozygous with R^{r} or r^{g}. These findings suggest that a meiotic or premeiotic interaction takes place between two R^{st} genes that reciprocally increases their instability.

In further investigations of this phenomenon use was made of paramutagenic, near-colorless aleurone mutants with red plant color that were obtained from plants heterozygous R^{r} R^{st}. The mutants were designated $r^{r}(I)$, and similar mutants from a more recent test have been shown to be associated with recombination in the R locus region (see above). The "I" is used in the notation to indicate that the mutants are paramutagenic. A small population of kernels homozygous for several different $r^{r}(I)$ mutants was examined and no mutations to self-colored aleurone were observed. Since the $r^{r}(I)$ mutants carry the paramutagenicity characteristic of R^{st}, but were not observed to mutate to self-colored aleurone, as does R^{st}, a test to determine the effect of $r^{r}(I)$ mutants on the stability of R^{st} seemed appropriate.

Stocks for the test were obtained by pollinating $R^{r}/r^{r}(I)$ and R^{r}/r^{g} plants with R^{lst} pollen. The $R^{lst}/r^{r}(I)$ and R^{lst}/r^{g} kernels from the matings were planted and the resulting ears were pollinated with r^{g} pollen; the R^{lst}/r^{g} heterozygous combination was used as a control. Two independently occurring $r^{r}(I)$ mutants were used, $r^{r}(I)^{1}$ and $r^{r}(I)^{3}$. The self-colored aleurone kernels were selected and grown out for verification of germinal R^{sc} mutations. The plants from the self-colored kernels were scored for plant color, with the thought in mind that if any of the R^{sc} mutants did arise from mutations of $r^{r}(I)$ to self-colored aleurone these mutants would very likely have red plant color; however, all R^{sc} mutants had green plant color. The data from the test are presented in Table 2.

The data clearly show that R^{lst} mutates to R^{sc} more frequently when heterozygous with $r^{r}(I)$ than when heterozygous with r^{g}. The rate of mutation obtained in $R^{lst}/r^{r}(I)$ heterozygotes is comparable to that previously obtained in R^{st} R^{st} and R^{lst} R^{lst} homozygotes, which was found to be 17.0, 28.3, and 19.9×10^{-4} in three independent tests (Ashman, Genetics 45:19; McWhirter, MNL 1961). Therefore, even though the $r^{r}(I)$ mutants have lost the stippled phenotype they still possess two properties of the R^{st} allele: paramutagenic action, and that of acting on R^{st} genes to increase their instability. These data offer additional evidence for the compound nature of the R^{st} gene.

Table 2. Frequency of mutations of $\underline{R}^{lst}$ to $\underline{R}^{sc}$ when heterozygous with $\underline{r}^{r}(I)$ and $\underline{r}^{g}$.

Heterozygous combination	Pedigree number	No. of $\underline{R}^{lst}$ kernels	No. of R^{sc} mutants	Rate of mutation X 10^{-4}
$R^{lst}/r^{r}(I)^{1}$	R56	7,179	17	23.7
$R^{lst}/r^{r}(I)^{3}$	R58	7,318	26	35.5
Pooled		14,497	43	29.7
R^{lst}/r^{g}	R57	3,366	4	11.9
R^{lst}/r^{g}	R59	4,532	1	2.2
Pooled		7,898	5	6.3

R. B. Ashman

UNIVERSITY OF SÃO PAULO
Escola Superior de Agricultura "Luiz de Queiroz"
Piracicaba, São Paulo, Brasil
Department of Genetics

1. Evidence of heterofertilization in maize.

From one of our projects of corn breeding one interesting finding regarding heterofertilization was accidentally obtained. As part of a project for obtaining a new white flint variety for this area (São Paulo State and neighboring), a planting was made in an isolated plot of white kernels from segregating F_2 ears of a cross yellow x white, involving the local Cateto variety and flints from Colombia. At harvest 61 ears were found to be segregating white and yellow kernels. These ears are considered to be the result of plants from heterofertilized kernels (white endosperm $\underline{y}$ $\underline{y}$ $\underline{y}$ and embryo $\underline{Y}$ $\underline{y}$). It is estimated that the total population was about 60,000 plants. So we had roughly 0.1% of segregating ears due to heterofertilization. If we assume the same proportion of non detected heterofertilized ears (i.e. both embryo and endosperm being recessive white) we come out with an estimate of about 0.2% of heterofertilization in this material.

The proportion of white and yellow kernels in these 61 ears is expected to follow the 1:1 ratio, since the plants should be heterozygous $\underline{Y}$ $\underline{y}$ and the bulk of the 60,000 surrounding plants were homozygous recessive $\underline{y}$ $\underline{y}$. This was in fact the case, except that two ears had a highly significant X^2 (0.1% level) and one had a X^2 significant at the 5% level. All the others did not deviate significantly from the