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1. Modification of R^{st} stability.

M^{st}, a major modifier of the R^{st} phenotype, is located about 6 crossover units distal to the R-locus. The modifier interacts with R^{st} to increase the frequency of colored spots in the aleurone. Tests by several investigators have shown that M^{st} does not alter the frequency of germinally recoverable mutations of R^{st} to self-colored aleurone (R^{sc}), despite its striking effect on aleurone phenotype.

Exceptional ears from crosses involving R^{st} M^{st} have been observed by the author and others in which it appeared that M^{st} was assorting independently of the R locus. Progeny tests from some of these ears verified the independent assortment of a modifier of the R^{st} phenotype. Two such isolates were designated transposed-$M^{st}1$ (tp-$M^{st}1$) and transposed-$M^{st}2$ (tp-$M^{st}2$), and the following two stocks were established: R^{st} +/R^{st} +, tp-$M^{st}1$/tp-$M^{st}1$; R^{st} +/R^{st} +, tp-$M^{st}2$/tp-$M^{st}2$. The phenotypic effects of tp-$M^{st}1$ and tp-$M^{st}2$ were not measured quantitatively but both gave the general impression of a darker phenotype than that produced by M^{st} in the linked position.

The above two stocks were tested for frequency of mutation to R^{sc} by pollinating them with r^{r} pollen and growing out the self-colored kernels for verification. The data from these tests are shown below together with those from other tests measuring the frequency of R^{sc} mutations in $R^{st}M^{st}$ and R^{st} + stocks.

	R^{sc} frequency	Rate $X10^{-4}$	Limits of expectation (P=.05) lower	upper
R^{st} +/R^{st} +, tp-$M^{st}1$/tp-$M^{st}1$	59/8,822	66.9	50.9	86.3
R^{st} +/R^{st} +, tp-$M^{st}2$/tp-$M^{st}2$	26/8,200	31.7	21.8	45.4
R^{st} M^{st}/R^{st} M^{st}	41/23,830	17.2	12.3	23.3
R^{st} +/R^{st} +	129/60,576	21.3	17.8	25.3

The two bottom lines in the above tabulation show that $\underline{M}^{st}$ in the linked position had no significant effect on the frequency of $\underline{R}^{sc}$ mutations. These two rates are lower than those in the $\underline{tp\text{-}M}^{st}$ stocks; the difference was significant for $\underline{tp\text{-}M}^{st}1$ and approached significance for $\underline{tp\text{-}M}^{st}2$. Also, the $\underline{tp\text{-}M}^{st}1$ rate was significantly higher than the $\underline{tp\text{-}M}^{st}2$ rate. If $\underline{tp\text{-}M}^{st}1$ and $\underline{tp\text{-}M}^{st}2$ are in fact $\underline{M}^{st}$ transpositions, $\underline{M}^{st}$ has been altered in such a manner that it increases the frequency of $\underline{R}^{st}$ to $\underline{R}^{sc}$ mutations, and the degree of increase was not the same in the two cases tested. The altered action of $\underline{M}^{st}$ could be the consequence of the positional change or of a transposition associated mutation (change of state).

It is possible that $\underline{tp\text{-}M}^{st}1$ and $\underline{tp\text{-}M}^{st}2$ are not in fact $\underline{M}^{st}$ transpositions but transpositions of some other element, probably from the $\underline{R}$ locus, that modifies the stippled phenotype in a manner similar to $\underline{M}^{st}$ but also increases the instability of $\underline{R}^{st}$. Kermicle (Genetics 64:247-258) has suggested that a hypothesized $\underline{R}$ locus element ($\underline{I}^{R}$) might, following transposition, have a phenotypic effect on $\underline{R}^{st}$ similar to that of $\underline{M}^{st}$.

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2. Plant color suppression by a component of the R^{st} gene.

Colorless and near-colorless aleurone mutants of several different classes have been isolated from $\underline{R}^{r}$ $\underline{R}^{st}$ plants. Mutants of one class are associated with crossing over, have near-colorless aleurone, and mutate from green to red plant color. The $\underline{R}^{st}$ allele has been resynthesized in heterozygotes between a mutant of this class, $\underline{r}^{g}$(nc)1-3, and $\underline{R}^{sc}$ (self-colored aleurone mutant from $\underline{R}^{st}$) (Ashman Genetics 64:239-245). Based on these and other data, $\underline{R}^{st}$ was postulated to be composed of an aleurone pigmenting component, $\underline{Sc}$, and a pigment inhibitor, $\underline{I}^{R}$. On this basis, the resynthesis of $\underline{R}^{st}$ in the above heterozygote resulted from a crossover that brought together on the same chromosome an $\underline{Sc}$ component from $\underline{R}^{sc}$ and an $\underline{I}^{R}$ component from $\underline{r}^{g}$(nc)1-3.

$\underline{r}^{g}$(nc)1-3 mutates from green to red plant color, and these mutants were designated $\underline{r}^{r-m}$(nc)1-3. Tests were made to determine the effect of the plant color mutation on the resynthesis of $\underline{R}^{st}$ in heterozygotes with $\underline{R}^{sc}$. The data are presented below.

Heterozygous combinations	Progeny numbers	Number of kernels	No. of $\underline{R}^{st}$ mutants
$\underline{r}^{r-m}$(nc)1-3/$\underline{R}^{sc}$	68:512-525 69:121-127	88,645	0
$\underline{r}^{g}$(nc)1-3/$\underline{R}^{sc}$	64:278-281 66:67-73 69:106-112	109,217	20