

These data also provide some evidence showing lack of association of mutation of stippled to self colored with distal crossing over. Thirteen self colored mutants (9 in the present study and 4 previously) from the cross W22 $\underline{R}^{st}(\text{light}) \text{K10}/\underline{r}^g \text{??} \times \text{W22 } \underline{r}^r \underline{r}^r \text{??}$ were all $\underline{R}^{sc} \text{K10}/\underline{r}^r$ in constitution (i.e., noncrossovers). However, only those mutants derived from colored aleurone, colored scutellum kernels legitimately test for an association with distal crossing over. Only three mutants had this origin, and all three were noncrossovers.

K. S. McWhirter

4. Mutation of stippled (\underline{R}^{st}) to self-colored (\underline{R}^{sc}) aleurone during microsporogenesis.

This investigation was prompted by the following two observations made in studies of mutation of \underline{R}^{st} to \underline{R}^{sc} in $\underline{R}^{st}\underline{R}^{st}\text{??}$. In the first place, a large portion, perhaps half, of the self-colored kernels on stippled ears prove to be non-germinal (Ashman, Genetics 45:19; and McWhirter, accompanying report). The second point is the frequent occurrence of kernels with stippled aleurone and colored scutellum (the latter is a characteristic of the \underline{R}^{sc} phenotype) which turn out, in fact, to be germinally transmissible self-colored mutants. The present experiment was undertaken to test the supposition that the two classes described above arise from mutation in the haploid gametophyte. Since, in the case of microsporogenesis, a single mitosis (the second nuclear division in the male gametophyte) gives rise to the two sperm which participate in double fertilization, one would expect the two reciprocal classes in equal frequencies from matings on colorless plants in which $\underline{R}^{st}\underline{R}^{st}$ was the male parent.

The categories and respective frequencies of mutants arising from the mating $\underline{r}^r \underline{r}^r; \underline{Y} \underline{Y} \times \underline{R}^{st}\underline{R}^{st}; \underline{y} \underline{y}$ are given in the following table. The recessive marker \underline{y} was utilized in the male parent in order to identify pollen contaminants. All presumed mutants were grown out and then tested by pollination with $\underline{r}^r \underline{r}^r; \underline{y} \underline{y}$.

Mutation of \underline{R}^{st} to \underline{R}^{sc} in $\underline{r}^r \underline{r}^r \text{??} \times \underline{R}^{st}\underline{R}^{st}\text{??}$ matings

Kernel phenotype of presumed mutant	Classification by breeding test	Number of mutants	Number of * \underline{R}^{st} gametes tested	Mutation rate ($\times 10^{-4}$)
Colored aleurone	\underline{R}^{st}	15	2,831	53.0
	\underline{R}^{sc}	27	2,831	95.4
Colored scutellum (\underline{R}^{st} aleurone)	\underline{R}^{st}	1	3,640	2.75
	\underline{R}^{sc}	13	3,640	35.7

* Initial population = 3,640. Corrected in computation where progeny were not obtained from mutant kernels.

It is apparent from the data that R^{SC} mutations are frequent when $R^{st}R^{st}$ is employed as staminate parent. Since the R^{SC} aleurone- R^{st} embryo combination and the reciprocal class, R^{st} aleurone- R^{SC} embryo, occur with frequencies of similar order, the hypothesis concerning the gametophytic origin of the types is upheld. An additional point of interest is that it is possible in this material to determine directly the mutation rate for a particular mitotic division. The frequency with which the second nuclear division of the male gametophyte gives rise to two daughter nuclei only one of which is mutant, is obtained by pooling the two classes which represent discordance between the two tissues, embryo and endosperm. In this case the rate is $\frac{15 + 13}{(2831 + 3640)/2} = 86.5 \times 10^{-4}$.

J. Kermicle

5. Differential induction of paramutation at R locus.

The earlier work in this laboratory showed that certain R^r and R^g alleles undergo weak and variable paramutation when they are made heterozygous with R^{st} , which is known to be a strong and uniform paramutagenic allele. On the other hand, some R^{SC} (self colored) mutants from stippled and R^{mb} alleles are weakly and variably paramutagenic. One explanation for such variability is that the plants in question are actually chimeras, in which paramutation of R^r or R^g has proceeded to various levels in different parts of the individual. An attempt is being made to see if this hypothesis is valid, by separating and testing paramutated R^r and R^g alleles, as well as R^{SC} alleles, from within the same plant.

The material in the present study includes (1) R^rR^{st} combinations in which the R^r alleles used showed, in previous studies, different grades of paramutation, (2) R^rR^{SC} combinations in which R^{SC} showed different grades of paramutagenicity and (3) R^gR^{st} and R^gR^{mb} combinations in which R^g showed variable changes in pigment-producing action and R^{mb} showed variable paramutagenic action. The method consists in collecting pollen lots from side branches of the tassel of the plants to be tested and then pollinating plants of $r^g r^g$ constitution (Inbred W22). From the resulting ears, 100 $R^r r^g$ or $R^g r^g$ kernels (R^r and R^g designate paramutants of R^r and R^g alleles, respectively) were scored for intensity of pigment by matching them with a standard set of kernels defining 11 classes.

The following table is a sample of data from plants in which differences in paramutation of R^r in different tassel branches could be detected. The scores from two ears pollinated by the pollen from the same tassel branch did not differ widely, and so the observed differences cannot be attributed to the $r^g r^g$ parents. One