1st year: Pollinate diploid types (singles, doubles, synthetics, etc.) with 2N pollen from established tetraploids. Save the plump or normal kernels.

2nd year: Identify the tetraploid plants arising from the plump kernels by selfing and outcrossing to diploid tester (giving 3N defective seeds) or to tetraploid tester (giving 4N kernels).

3rd year: Make backcross with recovered 4N strain onto recurrent diploid parent.

Etc.

A backcross may be completed in two generations, with isolation of tetraploids in each successive backcross. Recovery of tetraploid versions of the diploid recurrent parent should be obtained in successive backcrosses in a manner similar to the expectation in the normal diploid backcrossing procedure, i.e. 75% and 87.5% recovery after the 1st and 2nd backcrosses, respectively.

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5. Frequency of mutations of R^{st} to R^{sc} (self-colored aleurone) in $R^{r}R^{st}$ and $R^{st}r^{g}$ heterozygotes.

It has been observed that R^{st} mutates to full self-color (R^{sc}), and that such mutations are more frequent in R^{st} homozygotes (17.0×10^{-4}) than in $R^{st}r^{r}$ heterozygotes (4.9×10^{-4}), (Genetics 45:19-34). Since the rate of mutation of R^{st} to R^{sc} in $R^{st}r^{r}$ heterozygotes reported in the paper cited above was based on a very small population, the test was repeated on a larger scale. In the second test the stability of R^{st} was tested in $R^{st}r^{g}$ heterozygotes with the following result: 14 mutations to R^{sc} were recovered from a population of 19,239 R^{st} gametes, a rate of 7.3×10^{-4}. The difference between this rate and the one first reported (4.9×10^{-4}) is most likely due to the large error involved in the first test because of the small population; however, the possibility of a different effect of r^{r} and r^{g} on R^{st} stability cannot be discounted.

To obtain additional information on the effect of homozygosity and heterozygosity on R^{st} stability a test was made of the frequency of R^{st} to R^{sc} mutations in R^{r} R^{st} heterozygotes. $R^{r}R^{st}$ plants were pollinated with $r^{g}r^{g}$ pollen; the self-colored kernels from this mating were planted in sand in a greenhouse bench and the resulting seedlings scored for plant color. Seedlings from non-mutant self-colored kernels ($R^{r}r^{g}$) had red plant color; seedlings with no plant color (green), presumed mutants, were transplanted into pots in the greenhouse and the resulting plants selfed.

The mutants with self-colored aleurone and green plant color recovered from R^rR^{st} heterozygotes could have arisen either from mutations of R^{st} to R^{sc}, or from mutations of R^r to R^g. It was anticipated, however, that the mutants could be classified as to their source by their phenotypic expression. Many R^{sc} mutants from R^{st} have been isolated and they invariably have given full self-colored kernels when present in only one dose in the endosperm ($R^{sc}rr$). On the other hand, R^g mutants from R^r give a mottled phenotype when present in a single dose in the endosperm. In addition, R^{sc} mutants are not susceptible to the paramutagenic action of R^{st}, while R^g mutants from R^r have been shown to be paramutable; therefore, the pigmenting capacity of the R^g mutants recovered from R^rR^{st} heterozygotes will be further reduced since they will be paramutants.

From the mating R^rR^{st} X r^gr^g 10,175 self-colored kernels were planted, and 74 seedlings were classified as green and transplanted to pots. Selfs were obtained from 63 of these plants and 49 proved to be non-mutant, i.e. R^{st}. Ten verified mutants segregated 3:1 on the selfed ears for fully self-colored and colorless kernels and were therefore considered to be R^{sc} mutations from R^{st}. The rate of mutation of R^{st} to R^{sc}, after adjustment of the total number of kernels planted for the death of 11 presumed mutants (63/74) and for percent germination (96.7), was 11.9 x 10^{-4}. This mutation rate falls about mid-way between the rate obtained from $R^{st}r^g$ heterozygotes (7.3 X 10^{-4}) and the one previously reported for R^{st} homozygotes (17.0 X 10^{-4}). The mutation rates of R^{st} to R^{sc}, as measured in various R locus combinations, are summarized below.

R locus Combinations	Frequency of R^{st} to R^{sc} Mutations	Rate X 10^{-4}
$R^{st}R^{st}$	34/19,920	17.0
$R^{st}r^r$	1/ 2,055	4.9
$R^{st}r^g$	14/19,239	7.3
R^r R^{st}	10/ 8,378	11.9

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6. A stippled - self-colored (R^gR^{st}) compound allele.

Four mutants with no plant color (green) were recovered from the above matings that did not segregate the phenotypes expected from either R^{sc} mutants from R^{st} or R^g mutants from R^r. The selfed ears carrying these four exceptional mutants segregated the expected 1/4 colorless kernels, but the colored class of kernels was made up of both self-colored and stippled kernels. Progeny tests of the self-colored and