near-colorless noncrossover mutant, if any, was not complementary to the one(s) carried by the $\underline{R}^{sc}$ mutants, (5) mutations of $\underline{R}^{st}$ to $\underline{R}^{sc}$ and to near-colorless alleles not associated with crossing over involve alterations of a common $\underline{R}^{st}$ component, (6) paramutagenic and nonparamutagenic $\underline{R}^{sc}$ mutants carry the same unaltered components of $\underline{R}^{st}$, and (7) secondary changes may occur in the separation and reassembling of $\underline{R}^{st}$ components as evidenced by the altered phenotype of one of the reconstitued $\underline{R}^{st}$ alleles.

Table 1

Occurrence of reconstituted $\underline{R}^{st}$ in four heterozygous combinations of $\underline{R}^{sc}$ and near-colorless aleurone, green plant mutants, and in two near-colorless, green homozygotes.

Combination of alleles	Total No. of kernels scored	No. of stippled kernels Selected	Verified as $\underline{R}^{st}$	Non-mutant	Not verified
$\underline{R}^{scl_{113}}/\underline{r}^{g}(I)^3$	24,459	5	3	1	1
$\underline{R}^{scl_{132}}/\underline{r}^{g}(I)^3$	14,877	1	1	0	0
$\underline{R}^{scl_{113}}/\underline{r}^{g}(I)^2$	28,033	0	-	-	-
$\underline{R}^{scl_{132}}/\underline{r}^{g}(I)^2$	19,952	0	-	-	-
$\underline{r}^{g}(I)^3/\underline{r}^{g}(I)^3$	22,260	0	-	-	-
$\underline{r}^{g}(I)^2/\underline{r}^{g}(I)^2$	32,155	0	-	-	-

R. B. Ashman

3. Seed color mutations from $\underline{R}^{r}\underline{R}^{sc}$ heterozygotes.

Three general classes of mutations to or toward colorless aleurone in $\underline{R}^{r}\underline{R}^{st}$ plants have been identified: near-colorless aleurone, green plant; near-colorless aleurone, red plant; and colorless aleurone, red plant. The near-colorless, green mutants do not form a homogeneous group, varying in seed and plant color stability and in their association with recombination between outside markers. Tests have shown that near-colorless mutants possess either all or part of the paramutagenic action of $\underline{R}^{st}$, and that colorless mutants are nonparamutagenic. The apparent association between the near-colorless phenotype and paramutagenic action was examined further in the following test.

Self colored mutants (R^{sc}) from R^{st} are known to vary from non-paramutagenic to as fully paramutagenic as R^{st}. Two paramutagenic R^{sc} mutants, $R^{sc}(1-1)$ and $R^{sc}(1-5)$, and two non-paramutagenic R^{sc} mutants, $R^{sc}(1-2)$ and $R^{sc}(1-9)$, were made heterozygous with standard R^{r}. The four heterozygous combinations were pollinated with rg, wx pollen, and the colorless and near-colorless seed color mutants were selected and grown out for verification. The results are shown in Table 2; data from the earlier test of $R^{r}R^{st}$ are included for comparison.

Table 2

Occurrence of near-colorless and colorless aleurone mutants in $R^{r}R^{st}$ plants and in $R^{r}R^{sc}$ plants of four heterozygous combinations involving the paramutagenic R^{sc} mutants 1-1 and 1-5 and the non-paramutagenic R^{sc} mutants 1-2 and 1-9.

Heterozygous combination	Total No. of kernels scored*	Number of Mutants: Near-colorless, green	Near-colorless, red	Colorless red
$R^{r}R^{st}$	92,820	13	15	14
$R^{sc}(1-1)/R^{r}$	27,621	0	6	4
$R^{sc}(1-5)/R^{r}$	28,568	0	4	8
Pooled	56,189	0	10	12
$R^{sc}(1-2)/R^{r}$	27,669	0	0	7
$R^{sc}(1-9)/R^{r}$	18,469	0	0	7
Pooled	46,138	0	0	14

*Adjusted for proportion of selected kernels verified.

The heterozygous combinations involving the two paramutagenic R^{sc} mutants carried proximal and distal outside markers, and all 10 of the near-colorless, red mutants, and 11 of the 12 colorless, red mutants were recombinant for these markers. The combination of outside markers was the same as that obtained in the isolation of these kinds of mutants from $R^{r}R^{st}$ plants, i.e. the proximal marker from the R^{r} chromosome and the distal marker from the R^{st} chromosome. Heterozygous combinations involving the two non-paramutagenic R^{sc} mutants were marked proximally only, and all 14 mutants received the marker from the R^{r} chromosome.

Absence of the near-colorless, green class of mutants in the heterozygotes involving either paramutagenic or non-paramutagenic Rsc mutants indicates that mutation of Rst to Rsc alters an R component essential for the near-colorless, green phenotype, or alters the pairing relationships of the R components in such a way that a crossover necessary for the isolation of such mutants cannot occur.

The recovery of near-colorless mutants from the heterozygous combinations involving the paramutagenic Rsc mutants, but not from the heterozygous combinations involving the non-paramutagenic Rsc mutants is additional evidence for a close association between the near-colorless phenotype and paramutagenic action.

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4. A new dominant mutant.

A dominant mutant, clumped tassel (Ct), has been recovered from inbred M14. This mutant gives a compact, shortened tassel, some dwarfing of the plant and modified ear morphology. The homozygous Ct Ct is not easily recovered. Classification is fair in most backgrounds. Preliminary linkage tests indicate Ct is located on chromosome 8.

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1. Further studies on disjunction at anaphase I of the chromosomes of a trivalent configuration.

In 21 chromosome maize plants carrying a normal chromosome 2, a 2^T chromosome and a T^2 chromosome a genetic test of frequency of nondisjunction at anaphase I of the 2^T and T^2 chromosomes is readily available. From plants carrying recessive ws lg and gl only on the T^2 chromosome the test gives frequency of nondisjunction following crossing over; from plants in which only the 2^T chromosome carries dominant alleles the test gives frequency of nondisjunction regardless of chiasma formation. Results of the former type of test have been published (Genetics 49:69-80, 1964). Data have recently been accumulated from the latter type of test with the expectation that differences might be attributable to the pattern of distribution of univalents. From a total of 922 plants it now appears that the frequency of nondisjunction from the second type of test is very much higher (average 38%) than that found in the first (19%). Even if all the univalents were distributed nondisjunctively at first anaphase,