

knobbed chromosome 10 and 106 not carrying it. No difference in variegated pericarp pattern was observed. It would appear that either the heterochromatic knob does not have an effect on variegated pericarp, or that the effect is too small to be resolved by the technique used.

R. Bruce Ashman

4. Directed and specific genetic changes in an R^F allele occurring regularly in certain heterozygotes.

An R^F allele which has been in the writer's cultures for several years without showing any other unusual property has been found recently to change regularly and specifically to forms with decreased aleurone pigment-producing action in heterozygotes with stippled (R^{st}), light stippled (R^{stL})--a mutant from R^{st} , and marbled (R^{mb}). The changes in the case of R^{st} and R^{stL} have been shown to be heritable; that with R^{mb} remains to be tested in this respect. More or less marked reversion of the respective modified R^F 's toward the standard level of R^F pigment-producing action occurs in homozygous $R^F R^F$ plants extracted by selfing the three kinds of heterozygotes. In heterozygotes with certain r^F alleles, on the other hand, a modified R^F appears either not to revert, or to revert less rapidly and regularly.

The various R alleles in question had been incorporated previously into inbred W22, and so were on a uniform and relatively homozygous background when tested. The various endosperm phenotypes were scored in the Rrr form following testcrosses to two other inbred lines, 4Co63 ($r^F r^F$) and W23 ($r^F r^F$). A predetermined aleurone area on each kernel, approximately 12 mm², was scanned for pigmentation under a binocular microscope at 27X magnification, using a 20 x 20 reticule.

The initial body of experimental data, based on testcrosses on the 4Co63 $r^F r^F$ line, are summarized in the accompanying chart. The symbol R' is used to designate the modified form of R^F arising in $R^F R^{st}$ heterozygotes.

The results presented in the chart, supplemented by those from more recent experiments, may be summarized as follows:

1. All the R^F male gametes formed by $R^F R^{st}$ plants are changed to the R' form, which gives lightly mottled, rather than standard darkly mottled, kernels in testcrosses on $r^F r^F$.
2. The R' condition subsequently is transmitted by $R' r^F$ ♂♂ through the sporophyte, and reappears in the succeeding generation. It is now known that this holds for a second generation of $R' r^F$ plants also. R' is transmitted through the ♀ gametophyte also.

- (a) Initial testcrosses with 4Co63 rr♀ of sibs from R^rRst, selfed, in the W22 inbred line.

	F ₁	Testcross	Testcross Kernels		
			Embryo Genotype	Endosperm Genotype	Phenotype
W22 R R st Selfed	RR	→ [rr ♀ x RR ♂]	Rr (1)	Rrr	Dark mottled
	RR st	→ [rr ♀ x RR st ♂]	R'r (2)	R'rr	Light mottled
			R st r (3)	R st rr	Stippled
	R st R st	→ [rr ♀ x R st R st ♂]	R st r (4)	R st rr	Stippled

- (b) Progeny of the above F₁ testcross kernels (1-4)

	Endosperm (colored kernels only)	
	Genotype	Phenotype
4Co63 rr♀ x F ₁ Rr (1) ♂	Rrr	Dark mottled
4Co63 rr♀ x F ₁ R'r (2) ♂	R'rr	Light mottled
4Co63 rr♀ x F ₁ R st r (3) ♂	R st rr	Stippled
4Co63 rr♀ x F ₁ R st r (4) ♂	R st rr	Stippled
F ₁ Rr (1) selfed	→ RRR → RRr → Rrr	Self colored Self colored Dark mottled
F ₁ R'r (2) selfed	→ R'R'R' → R'R'r → R'rr	Self colored Self colored Light mottled
F ₁ R st r (3 or 4) selfed	→ R st R st R st → R st R st r → R st rr	Stippled Stippled Stippled
F ₁ Rr (1) ♀ x rr ♂	→ RRr	Self colored
F ₁ R'r (2) ♀ x rr ♂	→ R'R'r	Self colored
F ₁ R st r (3 or 4) ♀ x rr ♂	→ R st R st r	Stippled

(Plant color symbols are omitted. The 4Co63 inbred line is r^rr^r.)

3. Most of the kernels on selfed ears borne by $\underline{R'R'}$ individuals extracted from $\underline{R'R^{st}}$ plants by selfing are fully pigmented, but an occasional seed is darkly mottled.

4. Pollen from these $\underline{R'R'}$ homozygotes results in darkly mottled kernels when used on 4Co63 $\underline{r'r'r}$ plants. This shows that $\underline{R'}$ reverts toward the standard level of pigment-producing action in such homozygotes.

5. Reversion of $\underline{R'}$ toward standard $\underline{R^r}$ in $\underline{R'R'}$ homozygotes, however, is only partial. This point could not be definitely established in the test matings on 4Co63 because the $\underline{R'r'r}$ kernels resulting were about as darkly mottled as those formed when this $\underline{r'r'r}$ strain is pollinated by standard $\underline{R^rR^r}$. Repetition of the test matings, using a different inbred line, W23 $\underline{r^g r^g}$, as the pistillate parent, clearly demonstrated, however, that the $\underline{R'}$ allele in extracted homozygotes, although showing pronounced reversion toward standard $\underline{R^r}$, was still sub-standard in pigment-producing action. Evidently the 4Co63 strain has a much lower threshold for aleurone pigmentation than the W23 inbred.

6. The $\underline{R'R'R'}$ and $\underline{R'R'r}$ endosperms produced on selfing $\underline{R'r}$ plants are self-colored, whereas the $\underline{R'r'r}$ class is weakly pigmented. This suggests that two (or three) $\underline{R'}$ alleles in a nucleus promote reversion toward the standard $\underline{R^r}$ condition. There is little that can be said at present, however, concerning the reversion process, except that it occurs regularly under certain circumstances.

7. No regular change in the $\underline{R^{st}}$ allele has been detected thus far in $\underline{R^rR^{st}}$ heterozygotes. The same is true for the $\underline{R^{stL}}$ and $\underline{R^{mb}}$ alleles in $\underline{R^r}$ heterozygotes.

8. $\underline{R'}$ male gametes again are regularly produced by F_1 hybrids between $\underline{R'R'}$ and $\underline{R^{st}R^{st}}$ plants extracted from $\underline{R^rR^{st}}$ individuals by selfing.

9. The influence of $\underline{R^{st}}$ on the plant color component of the $\underline{R^r}$ allele in $\underline{R^rR^{st}}$ heterozygotes currently is under study. If there is any effect on plant color it is of a much lower order of magnitude than that in the aleurone.

10. Seventeen unrelated \underline{rr} inbred lines have been tested for expression of the $\underline{R'}$ phenotype after pollination with $\underline{R^rR^{st}}$, using standard $\underline{R^rR^r}$ as the control. All the lines regularly showed the change.

11. The light stippled allele ($\underline{R^{stL}}$) uniformly produces a more extreme effect on $\underline{R^r}$ than $\underline{R^{st}}$ in heterozygotes. The modified $\underline{R^r}$ allele in this case is termed $\underline{R''}$.

12. Similarly, $\underline{R^{mb}}$ markedly reduces the pigment-producing potential of $\underline{R^r}$ in $\underline{R^rR^{mb}}$ heterozygotes.

13. R^r is stable in heterozygotes with r^r and r^g in the two cases thus far tested.

14. The differences in aleurone pigmentation resulting when pollen from R^rR^{rst} , R^rR^{rstL} , and R^rR^{mb} plants is used in testcrosses on rr individuals shows that the changes induced in R^r in these respective heterozygotes not only are directed but are specific also.

15. The kernels on selfed R^rR^r ears (plants derived from R^rR^{rstL} by selfing) vary in pigmentation from self color to rather light mottling. Pollen from such R^rR^r plants used in matings both with 4Co63 $r^r r^r$ and W23 $r^g r^g$ results in a higher proportion of colorless kernels than is given by R^rR^r pollen (R^rR^r plants derived from R^rR^{rst} by selfing). This is further evidence for (a) transmission of the modified R^r 's through both male and female gametophytes and (b) specificity of the effects of R^{rst} and R^{rstL} in R^r heterozygotes.

16. A few self-colored mutants from R^{rst} either were not altered in pigment-producing potential, or only slightly, in heterozygotes with R^{rst} . This material has not yet been scored quantitatively.

17. Similarly, such self-colored mutants in heterozygotes with R^r have little, or possibly no, effect on the determinative action of R^r . In this case also detailed measurements of pigmentation have not yet been made.

18. The changes in R^r action arising in heterozygotes with R^{rst} , R^{rstL} , and R^{mb} cannot be explained in terms of any of the known kinds of plasmids. The possibility has not yet been excluded, however, that a novel type of pollen-transmitted plasmid is involved.

R. A. Brink

UNIVERSITY OF ZAGREB
Institute of Plant Breeding and Genetics
Zagreb, Yugoslavia

1. Numbers of chromosomes and knobs in some inbred lines from native varieties of *Zea mays* var. *rostrata*.

From the native varieties of *Zea mays* *rostrata* which are cultivated at the coast of the northern part of the Yugoslav Adriatic Sea, some inbred lines have been developed and the number of chromosomes and of the knobs on the chromosomes studied, using typical *rostrata* lines. Although the varieties of *rostrata* type are grown by the farmers on small fields surrounded by flint maize $\sqrt{n} = 10$ chromosomes and 2-3 knobs the mentioned inbreds have $n = 10 + 1$ to $10 + 3$ chromosomes and