Comparison of R repression in the endosperm in the presence of two R^{st} and two R^{6} alleles. Each of the above figures represents ear mean scores based on 25-kernel samples. The lightest 25 kernels were selected from each of the ears for the above comparisons.

Bernard C. Mikula
Robert Locy
Richard Sherman

5. Heritability of light and dark phenotypes from RR and Rr tassel mosaics.

In MGCNL 40 we reported that tassel mosaics could be found from RR and Rr combinations and that such mosaics parallel variations to be found for R from RR^{st} heterozygotes. Such differences in R expression when R is removed from the RR and Rr combinations may involve the same mechanisms responsible for differences in R from RR^{st} combinations. In Vol. 40 we reported that the differences in R expression from RR^{st} tassel sectors were heritable. Table 8 below shows that heritable differences, though very much smaller than from RR^{st}, can be found for R from RR and Rr backgrounds. Dark kernels, resulting from pollen collections made on the first day pollen was shed, were planted for comparison with the lightest kernels resulting from a pollen sample taken six days later from the same tassel. Scores of testcrossed plants from these light and dark seed selections show their means separated by two standard deviation units. Likewise, selected light and dark phenotypes from testcrosses from Rr plants show heritability. Seeds in this last case were provided by pollination from a single pollen sample from an Rr plant in 1965. Plants resulting from selected seeds were tested in 1966; the light and dark selections produced scores whose means were separated by two standard deviation units. In another test, in Table 8, it can be seen that where tassel samples were separated by six days in 1965 and where testcross scores were nearly alike from these pollen samples, again, the scored seeds produced plants whose testcrosses, in 1966, show no significant difference for pigment scores. This variation in R expression from the RR and Rr combinations must be considered to originate in somatic sectors arising during the course of tassel differentiation. These somatic sectors, in turn, result in pollen transmissible levels of mosaic expression (different states of R) visible in the aleurone layer of the endosperm.

Heritability of different states of R (light and dark pigment mosaics) from RR and Rr backgrounds. Seeds were selected from 1965 testcross ears reported in MGCNL 40. Selected Rr seeds were grown and resulting plants were testcrossed in 1966 for the scores given on the next page.

Table 8

Source of R	Ear $\bar{X}$	Stan. Dev.	Ear $\bar{X}$	Stan. Dev.	Pollen Collection Detail 1965
RR	20.73 n=9	.29	20.13 n=9	.35	Pollen from same tassel; collections separated by 6 days; darkest and lightest seeds selected from darkest and lightest ears, respectively.
Rr	21.35 n=6	.23	20.42 n=5	.41	Single pollen sample; darkest and lightest seeds selected from single ear.
Rr	20.82 n=6	.58	20.81 n=7	.37	Pollen samples separated by six days; randomly selected seeds from two testcross ears whose pigment scores were alike.

Bernard C. Mikula
Robert Locy
Richard Sherman

6. Ranges of R expression (paramutation) from RR, Rr, RR^{st} and $R^{1}R^{1}$ plants.

Brink and his students have reported that different levels of R expression from RR^{st} heterozygotes can be attributed to the somatic sectors which occur during tassel formation. Our data in MGCNL 39 and 40 confirm the Wisconsin reports for tassel mosaics--our methods of sampling pollen from tassels differed from those used by the Wisconsin group. By sampling RR^{st} tassels daily during the time of pollen shed, usually a period of seven days, we have found that earliest pollen collections produce the lightest R^{1} expression; the darkest R^{1} expressions come from the last pollen samples from the tassels. It would appear, therefore, that paramutation can be defined as somatic mosaicism which is manifested as heritable changes in R expression. The level of R expression--the state of R--depends, in turn, on the position in the tassel from which the gamete carrying R emerges. It is hypothesized that different ranges of mosaicism result from different allelic combinations; evidence for this hypothesis is presented below.

Samples of pollen from single plants representing the different allelic combinations, RR, Rr, RR^{st} and $R^{1}R^{1}$, were taken over a period of seven days and applied to colorless inbreds. Such testcrosses were scored by the method of matching testcross kernels against a set of standard kernels, detailed in earlier reports above. Each test plant was represented, on the average, by four testcrosses (four pollen samples made on different