Table 4
Growth Chamber Treatments, Spring of 1966

| | LD | LL | Field | LL-LD | LD-LL | t-Test Comparisons | P |
|---|---|---|---|---|---|---|---|
| Ear means based on 50-kernel samples/ear. Fall, 1966. | 17.14 | 8.38 | 13.98 | 15.36 | 11.58 | LD vs LL | <.001 |
| | 18.52 | 8.34 | 14.56 | 17.04 | 11.70 | LL-LD vs LD-LL | <.001 |
| | 15.78 | 9.92 | 16.38 | 16.20 | 13.70 | LD vs Field | <.05 |
| | 13.60 | 9.98 | 13.56 | 15.92 | 9.36 | LL-LD vs Field | <.05 |
| | 17.20 | 11.78 | 9.58 | 15.60 | 11.22 | LD-LL vs Field | <.20 |
| | 17.26 | 11.78 | 14.52 | 16.52 | 13.82 | LL vs Field | <.01 |
| Pooled $\bar{X}$ | 16.58 | 10.03 | 13.76 | 16.11 | 11.90 | | |

Testcross data for $\underline{R}^1$ expressions from $\underline{RR}^{st}$ heterozygotes given environmental treatments during the first four weeks of seedling development in 1966. A repeat of experiments performed in 1965.

Bernard C. Mikula
Robert Locy
Richard Sherman

2. Selection for different states of $R^9$ when transmitted through the female.

In MGCNL 40 we reported that it was possible to select heritable light and dark phenotypes from among testcross kernels when $\underline{R}^1$ was removed from the $\underline{R}^1\underline{R}^{st}$ heterozygote. Such differences in phenotype, following paramutation, suggest that the $\underline{R}$ alleles have different heritable states which are reflected in different degrees of mosaicism in the endosperm of testcross kernels. In advanced stages of paramutation, when $\underline{R}$ is introduced through the pistillate parent and is represented in endosperm cells by two chromosomes with $\underline{R}$, one can observe many near colorless kernels. In Vol. 38 we reported that the lightest and darkest of such phenotypes (when $\underline{R}^6$ was introduced through the female parent) did not respond to selection.

It was noted, in 1965, that upon self-pollination of $\underline{R}^9\underline{R}^9$ homozygotes (nine generations with $\underline{R}^{st}$) the upper halves of ears produced 20% more kernels with mosaic patterns of pigment in the aleurone than did the lower halves of ears. Kernels from the upper half of the ear were grown out along with kernels from the lower half in an effort to check for the heritability of these mosaic sectors in the female inflorescence. Table 5 shows the percentage of mosaic kernels observed in the upper and lower halves of ears in 1965; 1966 results show nearly the same numbers of mosaic kernels were found in both groups of progeny from each of the

ears sampled. It is concluded that where R is introduced through the female and differences in frequency distribution of light and dark kernels exist over the length of the ear, such ear mosaics will not result in heritable differences if selection is practiced on the light and dark kernels. Thus far, selection for heritable differences in R expression has been possible only when R is introduced to the endosperm by the male gamete.

Table 5

| | Ear #1 % Mosaic Kernels | | Ear #2 % Mosaic Kernels | | Ear #3 % Mosaic Kernels | |
|---|---|---|---|---|---|---|
| | Lower ½ | Upper ½ | Lower ½ | Upper ½ | Lower ½ | Upper ½ |
| Year, 1965 | 15.9 | 35.4 | 16.6 | 37.3 | 20.2 | 35.2 |
| Progeny from above, 1966 | 68.0 | 70.7 | 62.2 | 65.8 | 59.3 | 59.3 |
| Number of seeds scored in thousands | 1.5 | 2.4 | 2.0 | 2.6 | 2.8 | 3.1 |

Heritability of light and dark kernels from the upper and lower halves of $\underline{R}^9\underline{R}^9$ ears, self-pollinated in 1965. Samples of kernels representing upper and lower halves of three ears were grown out in 1966 and mated using W22, $\underline{rr}$, pollen. Frequencies of mosaic kernels on offspring derived from the light and dark halves of ears are recorded above.

Bernard C. Mikula
Robert Locy
Richard Sherman

3. Progressive paramutation of R-locus expression through ten generations.

In MGCNL 38 we reported that when R was kept heterozygous with $R^{st}$ for eight generations, a progressive reduction in number of cells with pigment could be observed with each generation. Since the amount of pigment which R is capable of producing, when transmitted through the pollen, rapidly reaches the null level by the third or fourth generation, it was necessary to follow changes in level of pigmentation when R is introduced into endosperm through the pistillate parent. When brought into the endosperm through the female, two R genes are contributed to the triploid endosperm cells. With two paramutated R genes present, a considerable increase in pigment is realized and it is possible to continue to follow the effects of $R^{st}$ on R through many more generations. Table 6 below shows that the