

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		Ear #2		Ear #3	
	% Mosaic Kernels		% Mosaic Kernels		% 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 RstRst 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, rr, pollen. Frequencies of mosaic kernels on offspring derived from the light and dark halves of ears are recorded above.

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

In MGCNL 38 we reported that when R was kept heterozygous with Rst 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 Rst on R through many more generations. Table 6 below shows that the

R pigment over a ten generation period with Rst shows a steady and measurable decrease with each generation--that is, the effects of Rst continue to be additive as measured through the phenotype of R pigmentation. It is interesting that the effects of Rst on R at this 2-dose level of R has continued to show a linear increase in numbers of kernels which show a mosaic pattern. After 10 generations with Rst, one can see in Table 6 that a mosaicism can be detected in over half of the kernels. No other effects of Rst have been observed on our inbred lines. It is likely that this reduction in pigmentation can be followed for at least ten more generations since considerable pigment still remains when two paramutated R alleles are present. From the existing data, it appears likely that R can eventually be converted to the completely colorless form and thus it seems possible that a dominant phenotype can be converted to the recessive.

Table 6
Number of generations that R has been heterozygous with Rst

	<u>R</u> ²	<u>R</u> ³	<u>R</u> ⁴	<u>R</u> ⁵	<u>R</u> ⁶	<u>R</u> ⁷	<u>R</u> ⁸	<u>R</u> ⁹	<u>R</u> ¹⁰
Kernels scored (in thousands)	2.0	6.9	7.8	6.1	6.3	6.1	5.6	4.8	2.6
% mosaic kernels	1.2	10.1	7.7	17.4	23.1	30.1	32.7	42.7	50.4

Progressive conversion of R expression (paramutation by Rst) through ten generations. Scores represent the percentage of kernels showing endosperm mosaicism (pigmented and nonpigmented cells) when R is contributed to the endosperm tissue through the pistillate parent. Scored kernels represent the RRr genotype.

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4. High level repression of R expression in the presence of two R⁶ alleles.

When R has been kept heterozygous for six generations with Rst (by self-pollination), one observes a progressive reduction in the number of aleurone cells with pigment (Vol. 38). When R⁶R⁶ segregates are self-pollinated so that endosperm cells are R⁶R⁶, one can note some 20-25 kernels whose aleurone pigmentation is considerably reduced--near the colorless level. The presence of such kernels with highly repressed pigment furnishes a striking contrast to the otherwise heavily pigmented kernels on the same ear. If pigment is repressed in certain kernels, as such lightly pigmented kernels suggest, then it may be possible to place into cells of such kernels a "normal" R and detect repression in the resulting endosperm on a standard (unparamutated) R introduced through the pollen. The