2. Effect of heterozygosity for variegated pericarp on mutation to red and to light variegated.

The rate of somatic mutation of the variegated pericarp allele (P^{vv}) to red (P^{rr}) usually is much lower in homozygous P^{vv}/P^{vv} than in heterozygous P^{vv}/P^{wr} plants. Emerson reported this relation in 1929, and it has been confirmed since in a number of our stocks. It is now well established that mutations of variegated to light variegated, related in origin to the reds, also occur. An experiment was made to measure the frequencies of these two mutant phenotypes among the offspring of otherwise near-isogenic homozygous and heterozygous variegated pericarp plants.

A P^{vv} allele of common origin was incorporated into the yellow dent inbreds W22 and W23 (P^{wr}, colorless pericarp, red cob). Fifth backcross generation P^{vv}/P^{wr} (variegated pericarp, red cob) plants in both the W22 and W23 series were selfed to provide homozygous variegated (variegated cob) and heterozygous variegated (red cob) plants. Both classes of plants were then pollinated with P^{ww} (colorless pericarp and cob). The progeny from the P^{vv}/P^{vv} x P^{ww} and P^{vv}/P^{wr} x P^{ww} matings were classified for pericarp phenotype into medium variegated, light variegated, red, and colorless pericarp with red cob. The following table shows the distribution of the progeny from the testcrosses:

	W22				W23			
	Homozygous		Heterozygous		Homozygous		Heterozygous	
Pericarp class	No. of Plants	Percent	No. of Plants	Percent	No. of Plants	Percent	No. of Plants	Percent
Medium var.	4325	94.7	2137	45.8	6114	90.5	3293	40.9
Light var.	108	2.4	48	1.0	337	5.0	329	4.1
Red	132	2.9	52	1.1	302	4.5	411	5.1
P^{wr}	0	0	2433	52.1	0	0	4018	49.9
Total	4565		4670		6753		8051	

It will be seen that in the W23 series the frequencies of reds in the progenies of heterozygous and homozygous parent ears are approximately the same. Since there are two P^{vv} alleles in the homozygote which could mutate to red and only one in the heterozygote, the mutation rate is roughly twice as high per P^{vv} allele in heterozygotes as in homozygotes. It is apparent from the data that a similar relationship exists also in the light variegated class: per P^{vv} allele in the parent, somewhat less than twice as many light variegateds appear among the offspring of heterozygotes as among the offspring of homozygotes.

The P^{vv} allele shows a markedly lower rate of change to both red and light variegated in the W22 than in the W23 background. Furthermore, the frequency of red and light variegated is slightly more then twice as high in the progeny of homozygotes as in the progeny of heterozygotes. This stock, therefore, is an exception to the rule of greater instability of P^{vv} in heterozygotes.

These data, and the results of other studies still in progress, point to three phenomena as being involved in the coincident occurrence of red and light variegated mutants: (1) "release" of Modulator (Mp) from the P locus, (2) "capture" of Mp at one or another chromosomal site (see Genetics 37:519-544 and 39:724-740) and (3) increase in number of Modulator units, in certain cases, in the mutation process.

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