6. Effect of Plant Vigor on Variegation of Pericarp.

It is of interest to know in what ways a mutable system such as variegated pericarp (P^{vv}) is subject to environmental influences. The effect of marked differences in plant vigor induced in two distinct ways was measured. In one experiment F_1 hybrids were compared with the respective inbreds under favorable conditions for plant growth. In the second experiment a comparison was made between F_1 hybrids (a) severely dwarfed by crowding and (b) well grown.

A variegated allele of a particular origin was incorporated into four near-homozygous inbred yellow dent lines. The six possible hybrids between these four inbred lines were then made and grown in comparison with the four inbreds on fertile soil with normal spacing. Theoretically these two groups of material have the same frequencies for all their genes, the only distinction being a much higher proportion of heterozygous loci in the hybrid group. Any difference in the variegated phenotype of these two groups can therefore be ascribed to the direct effect of hybrid vigor or nonadditive action of modifier genes.

Variegated ears were scored for frequency of mutations to red within various stages in the development of the ear. The most useful stages were found to be those represented by mutant areas covering 1/4 to 1/2, 1/2 to 1, and 1 to 2 kernels, after allowing for the lack of symmetry in the development of the kernel as far as possible. Earlier and later stages did not give additional information. The effect of transposed Modulator (an element which markedly reduces mutations to self color) was eliminated by excluding all light variegated ears from the scored material. The results, expressed in mutations per thousand kernels and based on about 110,000 kernels in total, are given in table 1. With the exception of the two values marked with an asterisk there is no difference between values for hybrids and their component inbreds which can not be explained by partial to complete dominance of modifiers. Hybrid vigor, as such, appears usually to be without significant effect.

An additional comparison was made in which the effect of nonadditive action of genetic modifiers was excluded. Remnant seed from the variegated hybrids was planted very densely in poor soil, and the minimum amount of thinning was done. The resulting ears were reduced in weight about two to three fold, even below the level of normally grown inbreds. The values obtained (based on a total of about 100,000 kernels) after scoring in the usual way, are given in table I in the columns headed "stunted". With the exception of hybrid 8 x M14C the stunted material shows a distinctly lower mutation rate, on the average, 0.54 of the normally grown hybrids. Therefore, lack of vigor thus induced does have a conspicuous depressing effect on the mutability of the variegated pericarp allele.

Table 1. Mutations per thousand kernels for different strains at three successive developmental stages.

	Developmental stages represented by mutations covering		
Strain	1/4–1/2 kernel	1/2–1 kernel	1–2 kernels

	Normal size	Stunted	Normal size	Stunted	Normal size	Stunted
F_1, 8 x 22R	32.5*	12.4	10.7	5.0	2.5	1.5
F_1, 8 x 23	39.9	20.5	17.5	9.6	5.4	2.1
F_1, 8 x M14C	28.8	20.5	8.5	6.2	1.5*	1.6
F_1, 22R x 23	34.1	17.7	14.5	5.4	5.6	1.5
F_1, 22R x M14C	25.6	14.5	9.2	5,8	3.0	0.9
F , 23 x M14C	30.3	16.5	13.8	9.4	5.7	3.1
Inbred 8	25.7		9.6		3.5	
Inbred 22R	15.8		6.4		2.1	
Inbred 23	38.3		20.6		10.7	
Inbred M14C	24.4		9.2		3.0	

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