2. The Analysis of a Twin Mutation of Medium Variegated Pericarp.

Somatic mutation of medium variegated pericarp sometimes results in the formation of twin spots. One of the latter is red (self-colored) and the other is light variegated. The change of variegated to red is due to mutation of P^{VV} (variegated pericarp and cob) to P^{RR} (red pericarp and cob). It was earlier shown (Brink and Nilan, 1952) that the light variegated component of the twin carries an unaltered P^{VV} allele but has acquired, at one or another position in the genome, an unusual kind of genetic unit (termed transposed Modulator) which sharply reduces the number of mutations of P^{VV} to P^{RR}. The transposed Modulator (tr-Mp) interacting with P^{VV} allele thus gives rise to the light variegated phenotype. Brink and Nilan suggested that the variegated allele, P^{VV}, was a compound structure comprising P^{RR}, the stable gene for red pericarp and cob, and Modulator (Mp) a unit adventive to the locus, which suppressed the pigment-producing capacity of P^{RR}. It was postulated that mutations of variegated to red result from the loss of Mp from the P locus. Twin spots were assumed to arise on medium variegated plants heterozygous for the stable colorless pericarp, red cob allele (P^{VV}/P^{WR}) in a mitotic division in which (1) P^{VV} divided to give P^{RR} and P^{VV}, respectively and (2) the Modulator unit lost from the P locus in the change of P^{VV} to P^{RR} became affixed at some other site in the chromosome complement passed to the same daughter nucleus as the unchanged P^{VV} allele borne by the other daughter chromosome.

It would be expected on this hypothesis that (1) plants from the light variegated kernels of the twin spot, mated with non-variegated would produce light and medium variegated offspring as a result of segregation of transposed Modulator (2) the kernels in the red component of the twin should lack Modulator in any location and (3) medium variegated kernels surrounding a twin spot should yield no light variegated offspring except as new mutations of P^{VV} in the germ line occur.

One case of twin spotting on a P^{VV}/P^{WW} x P^{WW} ear has now been tested, and the above three relationships were confirmed. Sixteen plants from the red component, each of which had a 50% chance of carrying transposed Modulator if the latter had been distributed at random between the two daughter nuclei resulting from the original differential mitosis, were assayed for tr-Mp. All were negative. Likewise the four medium variegateds (outside the twin spot area) tested were negative. Of two plants from the light variegated component of the twin spot, one carried transposed Modulator. The other plant was negative, a result in accordance with expectation in view of the presumed hemizygous condition of tr-Mp in the original light variegated kernels.

The test used in assaying the plants derived from the red kernels of the twin spot was definitive from transposed Modulator except if the latter occupied a position in the P^{RR} chromosome close to the P locus.

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