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1. Complementary gene determined aleurone variegation involving a mutant R allele.

In the course of study of a mutant R allele, a stock in which a variegated aleurone phenotype (colorless areas on a colored background) regularly appears, seemingly by complementary action of independent genetic determinants, has been established.

The variegated phenotype closely resembles that produced by interaction of McClintock's Ac and Ds elements in C Ds/CDs/c aleurone genotypes appropriate for detection of variegation due to chromosome loss in the developing endosperm. In the newly arisen system, variegation might similarly be presumed to be a consequence of genetically induced chromosome breakage events. However, chromosome 10, and the R locus in particular, is clearly implicated in the variegation, since the phenotype was first observed on a single ear, where all kernels were of $R^g/R^g/r^r$ endosperm constitution, resulting from the mating

$$\frac{A\ C\ G_1R^g}{A\ C\ G_1R^g}\ \frac{Su\ Y}{Su\ Y}\ \text{♀} \times \frac{A\ C\ g_1r^r}{A\ C\ g_1r^r}\ \frac{su\ y}{su\ y}\ \text{♂}\ .$$

On this exceptional ear, there were 91 colored aleurone - not variegated kernels and 76 colored aleurone - variegated kernels. The parental genotypes listed above have been verified by progeny tests of both normal and variegated kernels. The variegated phenotype, therefore, must involve loss of R^g allele function in the colorless aleurone areas.

This case of heritable aleurone variegation has an unusual origin. The R^g mutant allele involved in the mating was derived from R^{st} (stippled) by the sequence of spontaneous mutations:

$\underline{R}^{st}$ stippled → $\underline{R}^{sc}86$ self colored mutant → Somatic sector of 7 kernels →

$\underline{R}^{g}$(sc86) - 16
$\underline{R}^{g}$(sc86) - 17
" - 18
" - 19
" - 20
" - 21
$\underline{R}^{g}$(sc86) - 22

Dosage dependent, hypomorphic, $\underline{R}^{g}$ mutant alleles.

The dosage dependent, hypomorphic, $\underline{R}^{g}$ mutant alleles so derived have been found to show a high frequency of heritable variation in quantitative level of expression of anthocyanin color in the aleurone. A dark aleurone selected line of $\underline{R}^{g}$(sc86) - 17/$\underline{R}^{g}$(sc86) - 17 genotype was treated with the chemical mutagen diethyl sulphate, and the exceptional ear under study was derived from a plant grown from a treated kernel.

Determination of the variegated phenotype by complementary action of independent genetic determinants is shown by the segregation ratio 1 colored aleurone - not variegated : 1 colored aleurone - variegated : 2 colorless aleurone kernels from the mating

$$\frac{G_1 R^g}{g_1 r^r} \text{ - variegated } ♀♀ \times \frac{gr^r}{gr^r} ♂♂ .$$

Observed numbers of kernels were 126 colored - not variegated : 126 colored-variegated : 247 colorless. This segregation evidence for two determinants, together with the obvious requirement for presence of the $\underline{R}^{g}$ allele for detection of aleurone variegation, requires that one determinant of the phenotype must be closely linked with, and possibly is a component of, the $\underline{R}^{g}$ mutant allele.

The second determinant of the variegated phenotype was inherited independently of the $\underline{R}^{g}$ allele, and yet must have originated in the single exceptional $\underline{R}^{g}/\underline{R}^{g}$ plant involved in the original mating listed above. This conclusion follows from failure to observe variegation in kernels resulting from the testcross matings,

$$\underline{gr}^r/\underline{gr}^r \; ♀♀ \times \underline{GR}^g\text{-variegated}/\underline{gr}^r \; ♂♂ .$$

Evidently the second determinant induces variegation only when present in at least two doses in the triploid endosperm. Also a proportion of

kernels in which this determinant is present in two doses do not show variegation. Because of these dosage effects, the segregation on ears resulting from self-pollination of plants of $\underline{GR}^g$-variegated/$\underline{gr}^r$ genotype do not fit a simple Mendelian ratio. However, such ears invariably segregated a proportion of variegated kernels.

An attempt is being made to isolate the determinants which produce aleurone variegation by complementary action in separate stocks.

The variegation patterns observed with the "$\underline{R}^g$" system just described strikingly resemble those produced by McClintock's Ac-Ds system. In view of the origin of these materials it is reasonable to postulate that the "$\underline{R}^g$" system is comprised of a "Ds-like" element located at or near the R locus, and an "Ac-like" element located elsewhere in the complement. Further studies of the origin and interaction of the postulated elements and of their homology with the Ac and Ds elements isolated by McClintock are being conducted.

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1. Distance between K10 heterochromatic regions in several interphase tissues.

In a stock homozygous for K10 these large knobs are thought to be recognizable as the most prominent of the heterochromatic regions found at interphase in acetocarmine squash preparations. Measurements were made in consecutive analyzable cells of systematically scanned slides (at various interphase stages) of the distance between the pair of presumed homologous K10's and of nuclear diameters. Stages studied were: premeiotic interphase and tapetal interphase from very small anthers (about 0.4 mm. in length), premeiotic interphase and tapetal interphase from larger anthers (about 1.0 mm. in length) and tapetal interphase from anthers with sporocytes at pachytene. The ratio of the distance between these heterochromatic regions and the nuclear diameter was calculated for each nucleus observed so that the relative nearness of these knobs could be compared. Mean ratios found for the different stages were as follows: