A HERITABLE FACTOR ON CHROMOSOME 6 AFFECTING SEED COAT BRIGHTNESS

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The well known Pl locus on chromosome 6 controls the presence (Pl) or absence (pl) of a black pigment in the hilum of the mature seed. To my knowledge the pigment responsible for this distinctive feature has never been chemically characterized. Over the years 1 have noted that the seed coat, quite apart from the hilum itself, appears stained and consequently is slightly but perceptibly darker in Pl than in pl seeds. If there were no exceptions to this apparent association between the presence of Pl and the darkening of the seed coat, then it could reasonably be assumed that Pl not only affects hilum color but also affects the color of the entire seed coat, albeit in a less obvious way. Pleiotropy, however, is ruled out because not all seeds with Pl are dark or dull; some are light and bright. This was well demonstrated in the F2 of a cross between two lines, both of which were homozygous dominant Pl but one had dull testae whereas the other had bright testae. Although all plants bore seeds with black hila, the seed coats in some plants were dull and in others they were bright, the distribution conforming to a 3:1 ratio (38 dull:10 bright $X^2_{(3:1)}=0.06$. Thus, Pl itself does not determine the dull/bright difference

In another cross made earlier between a Pl line with dull seeds and a pl line with bright seeds the F2 distribution for dull vs bright testae was as given in Table 1. Although these results were obtained from a small greenhouse-grown population they clearly demonstrate an association between Pl and dull seeds on the one hand and between pl and bright seeds on the other. Equally clear is the fact that the associations are not absolute: three plants with Pl seeds had bright seeds whereas one plant with pl seeds had dull testae.

The data presented here, together with other unreported observations, foster the view that a dominant gene linked with the Pl locus in chromosome 6 controls the formation of a pigment —- or at least effects a chemical reaction -— that leads to the darkening or dullening of the seed coat . Tentatively, the gene symbol Dsc (dull seed coat) is proposed for this heritable factor.

Presumably, Dsc expresses in A as well as in a seeds, but so far the trait has been observed only in a seeds. Environmental conditions, too, affect expression. Field-grown plants frequently are unsuitable for scoring dull vs bright seed coats because bleaching obscures much or all of the difference. Under glasshouse conditions, however, this problem is obviated and the differences are quite distinct . In fact, heterozygotes often can be distinguished from the two homozygous classes. The allelic status at the R locus is another factor influencing character expression, r/r segregants being considerably less darkened than R/R seeds even in plants homozygous dominant for Dsc. Moreover, in favorable material the R/r seeds can be seen to be intermediate in darkness between the R/R and r/r homozygotes. (Even where Dsc is not involved, r/r segregants typically are lighter than R/- seeds.) Thus, both genetical and environmental conditions have a decided effect on Dsc expression, but when all modifying influences are controlled, Dsc can be distinguised from dsc with notable precision.

Since Dsc is manifest in seeds of a plants, the pigment, if indeed that is what it is, responsible for the darkening evidently is not an anthocyanin, and its chemical nature, like that of the pigment conditioned by Pl, remains to be determined.

Table 1. F2 analysis of a cross between a Pl line with dull seeds (Dsc) and a pl line with bright seeds (dsc).

				Chi-squared			Recomb.	
Pl Dsc	Pl dsc	pl Dsc	pl dsc	Pl	Dsc	Linkage	fract.	S.E.
60	3	1	15	0.95	0.21	47.10	4.8	2.5

(Population A281-76-78)

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