TENTATIVE DESCRIPTION OF THE put GENE WHICH CONDITIONS DARK PURPLE TESTA IN PEAS

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The dominant gene U produces a uniformly purple testa, its allele U st a purple-striped testa (1,4,10). Purple spots caused by F, Fs, or F Fs sometimes coalesce to give a uniformly dark violet testa (3,5,8,11,12). The phenomenon has been termed obscura and the expression is influenced by environmental factors (6,7,9); it has been impossible to isolate lines that breed true for the trait although it may have a genetic basis (6,7).

In the fall of 1978 a spontaneous mutant (S-35) was found in the cultivar 'Fenn' which produced a solid purple colored testa in all seeds from the original plant and all subsequent progeny. Fenn is dominant for the A gene for anthocyanin production and the seedcoats are purple speckled. Reciprocal crosses were made between S-35 and four cultivars: Fenn, 'Melrose', 'Romack', and 'Garfield'. Both Melrose and Romack carry the A gene but Melrose has speckled and mottled seed while Romack has a light tan seed coat. Garfield is recessive at the A locus, i.e. a/a. Crosses were made and the F1 generation was thrown in the greenhouse in 1980. The F2 generation was analyzed in separate evaluations in 1981 and 1985.

F2's of crosses with Fenn and Melrose showed a good fit to a 3:1 phenotypic ratio, indicating the dark purple testae observed in S-35 were conditioned by a single recessive gene (Table 1). The 1985 F2 of S-35 x Melrose failed to fit a 3:1 F2 ratio. The 82 plants in this population came from two F2 families. when 2^ families were analyzed separately, one of the families fit a 3:1 ratio whereas the other showed a slight deficiency of plants with self-purple testae. The crosses of S-35 with Romack showed a poor fit to a 3:1 but fit a 13:3 with low X-sq values. This possibly indicates that the expression of put (tentative symbol for purple testa) may be dependent upon the presence of the dominant genes F or Fs but the results may simply be due to chance variation. The crosses with Garfield fit a 9:4:3 F2 phenotypic ratio which showed that the expression of put required the dominant A gene, necessary for anthocyanin production. (Presumably Garfield carried F, Fs, or F Fs which was not expressed due to the lack of the A gene.).

Additional crosses were made with the type lines WL741 (U-st) and WL582 (U) for allele testing. WL658 was also used as a parent in crosses. As expected where dominant and recessive alleles condition a similar phenotype, the recessive gene put was shown to be a separate unlinked gene and not an allele of U (Table 1). No epistatic interaction was noted in those seed which carried both genes (put and U) which condition purple testa.

In separate preliminary studies, the pigment produced by put was shown by thin layer chromatography to be chemically similar to that found in Fenn. However, the compound conditioned by put occurs at several times greater concentration than the compound found in Fenn. This anthocyanin-like compound was also shown to have a very fungistatic effect on Phoma

Table 1. Chi square values and phenotypic ratios of eleven F_2 populations of peas involving crosses with S-35 to determine the inheritance of the put gene.

Cross	1981 data				1985 data			
	Non-purple	Purple	Expected phenotypic F_2 ratio	X^2	Non-purple	Purple	Expected phenotypic F_2 ratio	X^2
	-----no.------			--value-	---no.------			-value--
Fenn x S-35	67	23	3:1	0.015 ns	73	25	3:1	0.014 ns
S-35 x Fenn	80	20	3:1	1.563 ns	70	28	3:1	0.667 ns
Melrose x S-35	168	49	3:1	0.677 ns	71	28	3:1	0.569 ns
S-35 x Melrose	113	39	3:1	0.035 ns	82	16	3:1	3.932 *
Romack x S-35	85	21	13:3	0.079 ns	--	--	--	--
S-35 x Romack	134	28	13:3	0.229 ns	73	18	13:3	0.064 ns
Garfield x S-35	--	--	--	--	(38)(14)	8	9:4:3	1.541 ns
S-35 x Garfield	(57)(24)	22	9:4:3	0.693 ns	--	--	--	--
L 741 $\frac{Ust}{---}$ x S-35	--	--	--	--	74	26	3:1	0.053 ns
L 582 $\frac{U}{---}$ x S-35	--	--	--	--	10	71	3:13	2.181 ns
L 658 $\frac{u}{---}$ x S-35	--	--	--	--	(50)(28)	17	9:4:3	1.019 ns

ns, * -X^2 values with less than or more than a 0.95 level of probability, respectively.

medicagini var. pinodella grown on potato dextrose agar containing this compound. Future studies are planned to map this gene and further quantify the concentration and chemical properties of this pigment.

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THE EFFECT OF THE GENOTYPE ON IN VITRO ROOTING OF PEA SH00TS

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In order to investigate the effect of the genotype on in vitro rooting ability in peas an experiment was performed using nine genotypes showing wide variability for growth behavior in vivo.

Shoots were obtained by culturing the buds of the cotyledonary node as described earlier (3); the production of shoots was examined every week. The number of transplantable shoots (i.e. 10-15 mm long) produced per bud and the rate of production varied widely in the genotypes tested. P. fulvum (JI 224) did not produce any transplantable shoots. Shoots were induced to form roots on Murisighe Skoog half strength, sucrose 10g/l, activated charcoal 2g/l, CaCl2 220 mg/1, agar 8g/l, pH 5.7-5.8 (3) in a growth chamber at 24C and I6h light. The formation of roots, number of roots formed per shoot, and shoot length were scored after five weeks.

A significant effect of the genotype ($X = 48.26$ $P<0.001$) on the percentage of rooted shoots was found (Table 1). The rooting ability of pea shoots seemed to decrease progressively in those regenerated from buds cultured for a longer time, probably as a consequence of the residual effect of IBA present at high concentration (5mg/l v. lmg/1 of IBA) in the medium we used for bud culture. These results agree with those reported by other authors (4,5). Moreover, it is noteworthy that in other experiments performed in our laboratory the cuttings obtained in absence of any hormone always rooted much more easily.