controlled by all four gene dosage levels of the shrunken-1 allele decreased with the age of the kernel. Glucosidase activity, present in normal endosperm, was missing from developing shrunken endosperm, and granular bound ADP-glucose:starch synthetase had higher activity in normal than in shrunken endosperm.

J. C. Linden*
Dexter French*
Peter A. Peterson

*Department of Biochemistry and Biophysics, Iowa State University

7. Diversity of germinal derivatives of $a_2^{m(r\text{-}pa\text{-}pu)}$.

As reported in MGCNL 45:77-78, the $a_2^{m(r\text{-}pa\text{-}pu)}$ allele is stable pale in the absence of En; in the presence of En, the phenotype is colorless but is mutable expressing colorless, pale and deep purple sectors in the aleurone. Full mutant colorless and colored kernels not responsive to the presence of En are recovered in the testcross progeny of $a_2^{m(r\text{-}pa\text{-}pu)}$. The colored mutations occur as single kernels on the progeny ear and only one occurrence of an ear sector has been recovered. Intensity of the aleurone pigment of these mutants varies from a dark pale color to full A_2 expression.

In order to verify the visual distinction of these derivatives, a quantitative analysis of the pigment was made. Four kernel types were examined. These included: uniformly pale colored ($a_2^{m(r\text{-}pa\text{-}pu)}$ without En) and full colored (independent germinal mutations of the $a_2^{m(r\text{-}pa\text{-}pu)}$ allele) kernels and, for comparative purposes, the control included full colored and colorless types. The pale and full colored derivatives were isolated from testcrosses.

Following methanol extraction of the ground kernels, a colorimetric reading of the pigment was made on a Beckman Model DB Spectrophotometer (510 or 530 mu - depending upon the Pr genotype). The mean was determined from three samples from each ear and the results are shown in Table 1.

Table 1. Pigment content of pale kernels of $\underline{a}_2^{m(r\text{-}pa\text{-}pu)}/\underline{a}_2^{m(r\text{-}pa\text{-}pu)}/\underline{a}_2$ constitution, colored germinal mutations of the $\underline{a}_2^{m(r\text{-}pa\text{-}pu)}$ allele, and colored and colorless controls.

Sample	Phenotype	Genotype	Optical Density
A. Control (colored)			
1	full colored	$\underline{A}_2/\underline{A}_2/\underline{a}_2$	.71
2	full colored	$\underline{A}_2/\underline{A}_2/\underline{A}_2$	.76
B. Germinal mutants			
3	full colored	$\underline{A}_2/\underline{A}_2/\underline{a}_2$	.70
4	full colored	$\underline{A}_2/\underline{A}_2/\underline{a}_2$	.38
5	full colored	$\underline{A}_2/\underline{A}_2/\underline{a}_2$	.13
C. Pales			
6	pale	$\underline{a}_2^{m(r\text{-}pa\text{-}pu)}/\underline{a}_2^{m(r\text{-}pa\text{-}pu)}/\underline{a}_2$	.07
7	pale	" "	.05
8	pale	" "	.05
D. Control colorless			
9	colorless	$\underline{a}_2/\underline{a}_2/\underline{a}_2$	.02
10	colorless	"	.03
11	colorless	"	.02
12	colorless	"	.02

The pale kernels, though low in anthocyanin content, were statistically differentiated from the colorless control.

The three colored germinal mutations are decidedly different showing a wide range of anthocyanin content (70, 38 and 13). This is consistent with their variable phenotypes. One has a value similar to that of the colored control. This confirms that germinal mutant derivatives of the $\underline{a}_2^{m(r\text{-}pa\text{-}pu)}$ allele vary from colorless to full color $\underline{A}_2$ alleles including alleles showing variable intermediate levels of color.

Robert G. Fowler
Peter A. Peterson