Table 1

Frequencies of "exceptional" cells at anaphase I

Stock*	No. plants	No. cells	Overall mean	Variance
	Mid and late anaphase I combined			
A	7	200	.23	.02
B	4	76	.32	.06
B'	4	182	.097	.0008
	Mid-anaphase I only			
A	4	71	.40	.03
B	7	128	.53	.05
C	3	57	.39	.01

*Described in text.

on most chromatids in each affected cell, although few complete connections between chromatids could be resolved.

The significance of these phenomena is not clear. Darlington (Recent Advances in Cytology, 1937) suggested that terminalization of chiasmata may be arrested when a region where there is a change of homology is encountered. The data presented here provide neither support for, nor disproof of, this hypothesis.

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1. The effects of light on pigmentation in developing maize seeds.

A. Increased aleurone pigmentation induced by light in developing seeds.

Plants of six strains of W22 differing only with respect to factors conditioning pigment formation in the aleurone were pollinated and cobs sampled at various time intervals after pollination (normally every two

days). Ten kernels were removed from a specified location on the cob. Five of these kernels were placed on a moistened filter paper in a closed petri dish, and exposed to Sylvania GRO-LUX fluorescent lights at a distance of twelve inches. The other five kernels were kept in the dark, but otherwise under identical conditions. At the end of four days, optical density measurements were taken of pigments extracted in 1% HCl in MeOH, and the kernels were dried and weighed.

Of the six strains, five showed significantly more pigmentation ($P > .95$) in the light than in the dark. Included in these five were the following: $\underline{R}^{sc}_{57}$; $\underline{R}^{sc}_{61}$; $\underline{R}^{s}$ (Arizona P.I. 218164); $\underline{R}^{s}$ (Canada P.I. 214199); and standard $\underline{R}^{r}$ (see Table 1). A strain with an aleurone pigmenting factor at the $\underline{B}$ locus (Peru 1497, described by Styles 1965, MGNL 39:172 as $\underline{R}^{s}2$), was the only family that did not show a significantly greater amount of pigment in the light at the 95% level, although the trend was in the same direction.

Table 1

The effects of light and dark on aleurone pigmenting ability of six strains of W22. All values are in terms of optical density units per five kernels.

	$\underline{R}^{sc}_{57}$	$\underline{R}^{sc}_{61}$	$\underline{R}^{g}$ (Arizona)	$\underline{R}^{g}$ (Canada)	Std. $\underline{R}^{r}$	Peru $\underline{B}$ ($\underline{R}^{g}2$)
Number of samples taken at even time intervals from initial pigment formation to harvest. (n)	31	31	18	18	23	26
Mean deviation between light and dark values ($\bar{D}$)	0.866	0.649	0.197	0.681	0.174	0.597
Standard error of the mean deviation ($S_{\bar{D}}$)	0.244	0.308	0.060	0.243	0.062	0.327
Paired comparisons t-test (light vs. dark) (t_s)	3.55**	2.11*	3.30**	2.81*	2.80*	1.83ns

*P > .95 **P > .99 ns P < .95

B. Rates of aleurone pigmentation in light and dark.

Graphs were made from the data obtained from the above experiment, plotting days after pollination (ordinate) against optical density (abscissa) over the period of time from the initial pigmentation to the time of harvest. Linear regression lines were computed and the goodness of fit determined by a t-test. The calculated regression lines were shown to be statistically valid ($P > .95$) for three of the R alleles only, and thus a linear regression may not represent the correct relationship of pigment formation with time. Such calculated regressions do allow some comparisons to be made between the light and dark treatments, however. The data for these three alleles are shown in Table 2.

Table 2

Rates of aleurone pigmentation in three strains of W22 as explained by linear regression

		R^{sc}_{61}	R^{sc}_{57}	Std. R^{r}
Sample size (n)		22	29	20
Y-intercept (a)	light	-0.2534	-0.4364	-0.1832
	dark	-0.1050	-0.2469	-0.0358
Slope (b)	light	0.0263	0.0269	0.108
	dark	0.0127	0.0144	0.0058
Goodness of fit (t)	light	2.81**	4.13**	5.35**
	dark	4.91**	4.73**	2.53*

*P > .95 **P > .99

For all three alleles the slope from the light treated seeds is greater than that from the dark treated seeds. More interestingly, the slope from the light treatment is consistently about twice that for the dark treatment. Thus, at any one point in time there is a doubling of pigmentation as a result of exposure to light.

C. Pericarp pigmentation in developing R^{nj} seeds exposed to light.

Two R^{nj} strains (R^{nj} cudu and R^{nj}_{6}, a compound allele derived by Brink from a stippled crown allele $R^{nj:st}$) were included in the experiment described above. Aleurone pigmentation in R^{nj} stocks is normally confined to the crown of the seed and usually pigment does not start forming until late in the development of the kernel. Although R^{nj} pericarp is normally colorless, it was found that when the seeds were removed from the cob and exposed to light for four days, anthocyanin forms in the pericarp. The potential for this light induced pigment formation is present at about twenty-five days after pollination and lasts until the time when aleurone pigment starts to form (approximately fifty days after pollination under our conditions). Pigment does not form in the pericarp of R^{nj} seeds kept in the dark.

Sastry (MGNL 39:178) has shown that although Pl is normally required for pigment formation in R^{ch} pericarp, pl R^{ch} plants can develop pericarp pigment if the husks are removed from the ears, thus exposing the pericarp to the light. Although it has been reported that R^{nj} does not produce pericarp pigment with Pl, it does seem to have the potential for pericarp pigmentation under certain conditions, as demonstrated in this experiment. The fact that R^{nj}_{6} showed the same pattern of pericarp pigmentation as R^{nj} cudu is worth noting, because R^{nj}_{6} is similar to R^{st} and R^{sc} in plant color distribution (i.e., green plant and anthers) and it is similar to R^{nj} only in aleurone pigment distribution. Other R^{nj} alleles, including R^{nj} cudu, have red seedlings, red anthers and deep red silks. If, as Sastry has suggested (MGNL 43:204), some R alleles have a component (Ch) for pericarp color, then it would seem that R^{nj}_{6} does contain such a component, perhaps normally inactive, and that this component was retained together with the aleurone pigmenting component when the $R^{nj:st}$ compound allele was derived.

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2. Peonidin in W22 Pr pericarp and cob glumes.

The ratio of cyanidin to other anthocyanidins in pigmented tissues of W22 Pr strains is normally weighted very heavily towards cyanidin.