

These results indicate that in the normal plants there are probably two pathways for the biosynthesis of porphyrin compounds, one located in the plastid and the other in the cytoplasm. The plastid system would seem to be responsible for synthesizing prophyrin for both catalase and chlorophyll. The mutant gene w_{8896} evidently interrupts this pathway before the biosynthesis of these two compounds diverge. The w_{8896} locus does not seem to be involved in the cytoplasmic pathway for porphyrin synthesis.

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3. Increased crossing over in chromosome 5 in the presence of abnormal 10.

In the 1966 Maize Cooperation News Letter (pp. 65-69) data were presented indicating a map distance of 5.05 between a_2 and bt_1 . To determine if crossing over could be increased in this region, abnormal 10(K10) was incorporated in our stocks. Rhoades and Dempsey and Kikudome have reported that the incorporation of abnormal 10 in a stock will increase crossing over in chromosomes other than 10. In the testcross $a_2 a_2 bt_1 bt_1$
 $x \frac{A}{a} \frac{+}{bt} \frac{K10}{+}$ there were observed 103 A_2-bt_1 seeds and 113 $a_2 +$ seeds out of a total of 1,125, to give an a_2-bt_1 distance of 19.2. This amounts to approximately a four-fold increase in our previously observed level of crossing over in this region.

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1. Biochemical and breeding aspects of opaque-2.

Experiments have been conducted with the opaque-2 gene in view of breeding problems. Preliminary results lead to the following conclusions:

- (a) The yield of the o_2 plant is lower than its normal counterpart.
- (b) The lower yield is mainly due to a collapse of the kernel, while the o_2 plant seems wholly normal.
- (c) The difference in yield can be evaluated from the difference between normal and o_2 kernels on the same ear provided by a heterozygous plant.

A group of 13 lines has been crossed to an opaque line. The hybrids have been selfed and crossed according to a diallel cross system. The results of selfing the hybrids are reported in the table.

The opaque kernels show a slightly higher total protein content (+ 0.33%). The yield reduction varies from 6.9 to 16.3%. The lysine content ranges from 3.29 to 4.26%. A positive correlation exists for the content in lysine, histidine, arginine, aspartic acid, and glycine.

The total protein content, the weight decrease and the lysine content are not significantly correlated.

Table 1
Some Characters in Opaque-2 Kernels

Background of the selfed hybrid	Total protein content (%)		% Weight reduction between normal and opaque-2 seeds	% Lysine content in $\frac{o_2}{s}$ seeds	% Histidine content in $\frac{o_2}{s}$ seeds	% Arginine content in $\frac{o_2}{s}$ seeds	% Aspartic acid content in $\frac{o_2}{s}$ seeds	% Glycine content in $\frac{o_2}{s}$ seeds
	normal	opaque-2						
W 153 x $\frac{o_2}{s}$	9.30	9.32	12.7	3.61	2.56	5.40	8.66	4.14
W 22 x $\frac{o_2}{s}$	12.66	12.93	12.9	3.76	3.07	6.00	9.52	4.56
R 3b x $\frac{o_2}{s}$	11.03	12.09	10.2	3.29	2.67	5.53	8.46	4.27
W 75 x $\frac{o_2}{s}$	10.10	10.88	13.4	3.87	2.66	5.95	8.36	4.79
M 14A x $\frac{o_2}{s}$	10.06	10.13	7.4	3.45	2.76	5.85	9.79	4.93
W 3c x $\frac{o_2}{s}$	9.46	9.71	16.3	3.84	3.12	6.00	9.28	4.64
W 324 x $\frac{o_2}{s}$	9.53	9.18	7.8	3.93	2.83	5.79	9.49	4.81
W 64A x $\frac{o_2}{s}$	11.48	11.58	13.9	4.11	3.02	6.40	10.46	4.68
W 374R x $\frac{o_2}{s}$	9.18	9.35	15.0	4.26	3.29	6.65	8.90	4.35
Se1 224 x $\frac{o_2}{s}$	10.56	10.48	8.3	3.94	2.79	6.01	8.80	4.31
W 187d x $\frac{o_2}{s}$	9.07	10.60	6.9	4.11	2.83	5.74	9.13	4.57
OH 43 x $\frac{o_2}{s}$	8.00	8.06	11.1	3.54	2.88	5.59	7.95	4.55
A 158 x $\frac{o_2}{s}$	10.32	10.30	9.2	3.81	2.96	6.03	8.04	4.74

The diallel system has provided data on the heritability of the difference between the kernel weight in the normal and opaque-2 phenotypes. A large fraction of the genetical variance is of the additive type. Significant are also the components related to dominance and to maternal effect.

The main conclusions are as follows:

- (a) the lack of phenotypic effect of the o_2 gene on the plant suggests the use of heterozygous plants in selection, which permits the evaluation of weight decrease in o_2 ;
- (b) the selection for a negligible difference between o_2 and normal kernels is expected to be successful on the basis of the statistical significance of the additive component of heritability;
- (c) the variability in lysine content of o_2 kernels justifies the selection for a better expression of the character;
- (d) the simultaneous selection for o_2 kernel weight increase, total protein content, and lysine content appears feasible.

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2. Further data on an unstable factor affecting anther and aleurone color.

The data obtained recently on the system reported in the 1967 M.N.L. (100-101) permit us to present the following conclusions:

- (1) A factor appears to affect both anther and aleurone tissues; in fact the color pattern in the anther corresponds perfectly with that of the aleurone.
- (2) The segregation data suggest that the instability of the color gene is controlled by an Activator factor. The latter is linked to chromosome 9 markers (sh, wx). When the Activator is absent the phenotype produced by the color gene is pale bronze. Such a gene is not allelic to any of the following factors: A_1 , C_1 , C_2 , R , Bz . The only indication of linkage is with chromosome 1 markers; consequently we suspect that we are dealing with a bz_2 allele.
- (3) A Spm test has been carried out with plants exhibiting the typical anther and aleurone pattern of instability. The wx pollen from these plants on a wx^{m-8} tester produced typical wx patches in the kernels.
- (4) The activator shows dosage effect. Two or three doses of the factor delay the formation of the colored spots which, in such cases, appear very small.

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3. The knob endowment of selected lines of maize.

A number of standard inbred lines have been studied as to knob endowment as appears from the following table: