

Table 2
Protochlorophyllide, chlorophyllide, and chlorophyll production as measured
in vitro in six "chlorophyll" mutants

Mutant	Protochlorophyllide peak (484 mu)	Chlorophyllide peak (684 mu)*	Chlorophyll**
<u>l</u> ₃	trace	trace	trace
<u>l</u> ₄₉₂₀	trace	+	+
<u>l</u> _{Blandy #2}	+	+	+
<u>l</u> _{Blandy #3}	+	+	+
<u>l</u> _{Blandy #4}	0	0	0
<u>w</u> ₈₈₉₆	trace	trace	trace

*684 mu is an average value. In different samples the peak might vary two or three mu from this value.

**As measured by a shift in the spectrum peak from the 684 mu value to a peak of shorter wave length.

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2. Metabolic block in porphyrin synthesis.

The seedling mutant w₈₈₉₆ forms at most only a trace of protochlorophyll when grown in the dark. It also has a reduced amount of carotenoids in the present genetic background (see accompanying report). This pigment relationship is the opposite of that found in the group of albino mutants which we have been investigating. In these latter mutants the formation of protochlorophyll, chlorophyllide, etc., is normal but there are metabolic blocks in carotenoid biosynthesis.

The enzyme catalase is a porphyrin enzyme so it was of interest to measure the amount of this enzyme and compare the results with the findings obtained with the porphyrin chlorophyll. When dark or dim light grown leaves of w₈₈₉₆ were ground and assayed they were found to contain about one-third the catalase of normal leaves. When the extract was centrifuged there was obtained a chloroplast pellet and a chloroplast free supernatant. No catalase was found in the chloroplast pellet of w₈₈₉₆. All of the catalase of the mutant was in the supernatant. In the normal about two-thirds of the catalase activity was in the chloroplast and one-third in the supernatant fraction.

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:

- The yield of the o_2 plant is lower than its normal counterpart.
- The lower yield is mainly due to a collapse of the kernel, while the o_2 plant seems wholly normal.
- 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.