the same effect on the mutant, a chlorophyll concentration of .009 mg/gm f.w. would be expected (Table I, column 6) at 19° C. The value of .066 mg/gm f.w. observed for the mutant at this temperature is seven times higher than expected.

A similar temperature effect upon the content of the yellow pigments of mutant seedlings also has been demonstrated although the exact quantitative relationships have not been worked out as yet.

-- Donald S. Robertson and I. C. Anderson

5. The use of w-3 to study the role of carotenoids in the protection of chlorophyll from photodestruction.

The studies of Cohen-Bazire and Stainer, (Nature 181:250-252, 1959), and Fuller and Anderson (Nature 181:252-254. 1958), have shown that colored carotenoids are required for the protection of bacteriochlorophyll from photodestruction in the photosynthetic bacteria. It has been proposed that this is a unique role of carotenoids in all phototrophys. The white-albino mutant, w-3, provides a tool for determining if carotenoids might serve such a protective function in higher plants. This mutant is a chalky-white albino when grown in the light. However, when grown in the dark it produces protochlorophyll which is converted to chlorophyll on short exposure to light, but upon continued illumination the chlorophyll is bleached.

To determine the carotenoid content of white-3 and normal seedlings, plants grown in the greenhouse seedling bench were ground in a mixture of acetone and hexane. The hexane fractions containing carotene and colorless precursors of carotene were isolated and their spectra were made with a Beckman DU spectrophotometer. The visible and ultraviolet spectra of white-3 seedlings did not show any absorption typical of carotenoid as was found for the extract of normal seedlings. Instead, the w-3 extracts had large amounts of a substance which absorbed light in the ultraviolet region with peaks at 275, 285, and 297 mμ. These peaks are similar to those reported for the carotenoid precursor, phytoene. Extracts of normal seedlings showed no absorption at these wave lengths.

Koski and Smith (Arch. Biochem. Biophys. 34:189-195. 1951) reported that dark grown white-3 seedlings contained as much and usually more protochlorophyll than did normal seedlings and that the protochlorophyll of both normal and mutants was readily converted to chlorophyll upon exposure of the seedlings to light. To determine if oxygen was necessary for the photodestruction of chlorophyll observed in white-3 seedlings, one group of normal and mutant dark-grown plants was exposed to light in an atmosphere of air and another group of normal and mutant dark-grown seedlings was exposed to light under anaerobic conditions. When normal seedlings were exposed to light in the anaerobic environment, the chlorophyll level diminished slightly for the first twenty minutes, after which stabilization was observed, followed by an eventual increase in chlorophyll content. The chlorophyll level of dark-grown normal seedlings, exposed to light in an anaerobic environment, remained essentially constant for the 100 minutes of the experiment. The chlorophyll of dark-grown white-3 seedlings was completely destroyed after a twenty minutes exposure to light under aerobic conditions. However, upon exposure to light under anaerobic conditions the chlorophyll level of dark-grown white-3 seedlings remained stable.

The chlorophyll content of white-3 seedlings grown in dim-light (less than 0.5 foot candle) increased over a two-week period. Visual observations of chloroplasts from sectioned leaves of such mutant material reveal that they are as numerous and of the same size as those of normal seedlings. Free chloroplasts obtained from grinding mutant leaves in sand and 0.35 Na Cl and centrifuging were a little more opulescent but otherwise they appear to be normal.

These results would suggest that the albino phenotype of w-3 when grown in the light is not due to the inability of the plants to synthesize chlorophyll or to their lack of chloroplasts. The rapid destruction of chlorophyll in this carotenoidless mutant when exposed to light under aerobic conditions would suggest that the colored carotenoids of higher plants have a role in the protection of chlorophyll from auto-photodestruction in the presence of oxygen.

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1. Defective endosperm factors from maize teosinte derivatives.

Additional data have been obtained on the defective endosperm types detected in the derivatives of controlled teosinte introgression into the inbred A158. So far, allelism has been established for the following two series:

A. (de^{t2}), de^{t3}, de^{t4}, de^{t5}, de^{t10}, de^{t11}, de^{t14}, de^{t15}, de^{t17}, de^{t18}, de^{t19}, de^{t20}, de^{t23}, and de^{t24}.

Allelism seems also established for the series:

B. de^{t13}, de^{t22}, de^{t26}, de^{t27}, and de^{t29}.

As described in previous M N L issues, each series appears to have a characteristic behaviour. When defective kernels of the A-series type, apparently homozygous, give rise to adult plants, these can be self-pollinated and produce ears showing all the kinds of kernels from extreme defective to normal ones. When, on the other hand, apparent homozygotes of the B-type produce adult plants, these, after self-pollination, produce ears showing a 3:1 ratio of normal to defective kernels. Such behaviour seems to hold also for de^{t28}. Both de^{t28} and the B-series have in common the condition of a clear cut distinction between the defective and the normal phenotype, which is not the case, as known, for the A-series. Moreover, although allelism tests have not yet been conducted, de^{t28} and the B-series seem located at different "loci." In fact, there is some evidence that the de^{t22} is linked with su, and de^{t28} with y, as suggested by the data presented in Table I. However, this point needs confirmation, in view of the peculiarity of this hereditary behaviour.

Extensive data, on the contrary, are now available on the behaviour of the B-series factors, when kept in heterozygous condition. As reported in MNL 33, normal kernels from ears segregating extreme (de^{t29}) or intermediate (de^{t22}) defective give rise, following self-pollination, to ears which show no defectives in 1/3 of the cases and in 2/3 of the cases to ears segregating defectives, among which the extreme or intermediate defective, according to the parental condition, represented 9/10 of the defectives and 1/10 were of the alternative type. Moreover, the stocks segregating both types of defectives produce ears in which a unique type is present or both; in the latter case the percentage of defective may exceed greatly the expected 25%.