5. Modulator activity of dark variegated.

Plants with dark variegated and medium variegated pericarp were used as males on a C Ds-tester. It would appear that the "mutations" at Ds are earlier and fewer in number (i.e., a coarser pattern of coloured and colourless areas is observed) when a Modulator from dark variegated activates Ds, than when a Mp from medium variegated is used. This would suggest that the difference between dark and medium variegated pericarp is a function of Mp. McClintock and Brink have both reported that increasing the dose of Ac or Mp delays and/or partially inhibits the changes at Ds and P resulting in a finer grade of mottling or more widely spaced red stripes. On this model of Ac-Mp action the dark variegated phenotype would result from a change of state of Mp in the direction of a lower dosage than that of the standard Mp of medium variegated.

This is at most a tentative hypothesis for the number of ears involved is small (5 and 4 respectively) and the C Ds-testers were different, although related, for the two categories of crosses.

Robert I. Brawn

MARQUETTE UNIVERSITY
Milwaukee, Wisconsin

1. The etched phenotype in the endosperm.

The etched allele (et) discovered by Dr. L. J. Stadler in an irradiated progeny has recently been examined for phenotypic detail in sectioned endosperm of et/et individuals. The following observations have been made:

1. The irregularly placed and irregularly shaped depressed areas on the surface of the kernel are not due to death of cells at these sites as one might presume from superficial observation.

2. Both the pericarp and aleurone layers at the depressed sites appear not to differ from Et/Et material. The pericarp is separated from the aleurone at these sites on the kernel leaving an air space which conceals the aleurone below (the detection of the etched spot is thus facilitated in a stock of colored aleurone).

3. The cells in the endosperm proper, underlying these depressed areas, are of a distinctly different type than the cells in the surrounding areas. They differ in that they are completely void of starch grains whereas the surrounding cells are normally packed with starch.

4. These starchless cells occur as well defined sectors in the endosperm, i.e., narrower toward the center of the kernel and broader toward the periphery.

5. The depression at the surface of the kernel results then from the starchless cell sectors occupying less space in the mature kernel than the adjacent areas filled with starch.

A possible interpretation of these findings is that in the et/et genotype the leucoplasts do not divide at a high enough rate to keep pace with cell division. Segregation of the leucoplast during cell division would then result in some cells being void. A cell, once void of the plastid would then be expected to give rise, by continued division, to a lineage of cells which lack leucoplasts. Repopulation of the leucoplasts could then take place in cells with at least one remaining when cell division ceases.

An alternative explanation is that the starch synthesis of the leucoplast is impaired though their division rate is normal. Spontaneous changes (mutations?) in the leucoplast could account for finding only some cell lineages exhibiting the starch storage defect. At the resolving power of these observations the presence of leucoplasts would go undetected.

It is of importance to note that et/et individuals also exhibit a virescence in the seedling (as reported by Stadler). A common basis for the chloroplast defect and the lack of starch in cells of the endosperm (leucoplast defect) is highly probable. The stage of development of the sporophyte and/or the physiology of the cells in which the etched phenotype occurs may account for the differences in response of a single cytoplasmic organelle to the genome. The granules of pigment (chromophores) in the aleurone show no alteration in the kernels examined.

These observations provide an explanation for the zygotic semilethality of et/et genotype noted by Dr. M. M. Rhoades (MNL 35, p. 67). If, during the development of the endosperm, the leucoplast is lost or becomes defective early enough there would remain an insufficient supply of stored food material for the embryo.

Irwin M. Greenblatt

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UNIVERSITY OF MINNESOTA
St. Paul, Minnesota
Department of Agronomy and Plant Genetics

1. All arms tester interchange set in A188 inbred.

The following interchanges in the set have been isolated in homozygous condition: 1-3 (5883), 1-3 (5982), 1-9b, 2-4b, 2-4L, 2-6b, 2-6d, 3-4 (5156), 3-7c, 5-7e, 5-8a, 5-10 (5290), and 5-10 (6061). These have been crossed to the interchange set for identifying chromosomes as a check at the end of the backcrossing program. As more of those in the set reach the desired number of backcrosses, homozygous lines for them will be established and checked. This set is the one which we started introducing into A188, and subsequent backcrossing was continued by Dr. Jenkins and Dr. Sprague. At least two of the lines have been somewhat more difficult to use because they have only about 25% sterility. Other interchanges have been substituted for them.

C. R. Burnham