

IOWA STATE UNIVERSITY
Ames, Iowa
Department of Agronomy

1. Popcorn fertility restorer.

The popcorn inbred line W41 previously reported as a fertility restorer (Maize Newsletter 1957, pp. 95-96) with "T" sterile cytoplasm has also been tested on "S" sterile cytoplasm. Fertility Restoration was complete in 1958 and 1959. In addition, "S" sterile cytoplasm was completely restored in 1959 in crosses involving the male single cross Ky21 x W41.

W. I. Thomas*
John C. Eldredge

* Present address: Department of Agronomy
Pennsylvania State University
University Park, Pennsylvania

IOWA STATE UNIVERSITY
Ames, Iowa
Department of Genetics

1. Relationship between the two components of a mutable system.

In the mutable pg system it is hypothesized that I, the inhibitor, is located at the pg locus and is removed by En the Enhancer. The interaction of these two components results in the mutation of pale green to green.

There is some suggestion that I and En are more closely related than previously supposed. This is inferred from the observation of individual stripes and sectors of mutability in stable (Pgl) plants. These mutable sectors in stable seedlings indicate that mutability has been induced at the otherwise stable locus. Such a possibility is strengthened by the isolation in stable stocks of a newly arisen mutable allele. In tests, this new mutable was found to be of the autonomous type (PglEn). It follows, therefore, that in this case, En arose at the locus. Perhaps the En factor arises from the I factor that is associated with the pg allele.

New m-type F_2 progenies have also originated in outcrosses of pg^m stocks containing independent En. Four m-type F_2 progenies were observed in such outcrosses. It is proposed that En arose from I material at the pg locus.

Other evidence supporting the relationship between I and En is seen in the interaction effect of both pg^s and En upon pg^{mo} . In the hybrid, pg^{mo}/pg^s , the seedlings are stable. The characteristic pg^{mo} expression is inhibited. Likewise, the independent Enhancer (En) causes pg^{mo} to appear stable. Thus the I element at the pg^s locus and independent En act in a similar manner upon the pg^{mo} allele.

I and En therefore appear to be related although they differ in activity. I inhibits the expression of the normal allele (Pg) whereas En inactivates or causes the removal of I. Whether the difference in activity of the two elements is a question of position or chemical composition can only be conjectured.

-- Peter A. Peterson

2. a₁-mutable.

It has now been confirmed that a^m found originally in pg^m stocks, has the same components (I and En) as the pg mutable system. Direction of mutation, pattern types, rate of appearance and types of stables, and the relationship of particular patterns to specific stables have been studied.

The direction of mutation: Many kernel patterns have been described. They vary from a very dense pigmentation type to small, infrequently spotted types. (The former result from early, the latter from late mutations.) Each of the distinct pattern types can give rise to other pattern types and each of these derivatives has been tested and found to be heritable. The events that lead to changed patterns occur at the a^m locus or result from the mutation of the autonomous controller of mutability to the independent type.

Rate of appearance and types of stables: The rate of occurrence of stables varies with the particular pattern. The higher rates are associated with the dense type mutable patterns. Although stables are phenotypically alike, some mutate in the presence of En, others do not. Thus the response to En is a means of distinguishing among the "stables." Particular patterns give rise to a designated type of stable. This is relevant to the analysis of the genetic events that accompany changes in pattern phenotype.

Factor causing dense kernels: In the last newsletter, it was reported that in the presence of a factor "D", a specific fine pattern allele becomes dense (appears full colored), and in its absence, the pattern remains fine. It has now been confirmed that this factor is En. The stable derivatives from the dense phenotype may contain En but do not respond to it.

-- Peter A. Peterson

3. Some thoughts on the white-albino mutants.

For the past ten years I have been accumulating albino mutants. Most of these have white (or pale yellow) endosperm and chalky-white, albino seedlings when germinated in the light. I have called these mutants white-albino, although other terms have been used to describe them such as lemon-white, viviparous, (because of the tendency of some to germinate prematurely), white, etc.

The pleiotropic effects of these genes are of some interest and several explanations have been suggested for these effects. Biochemical studies which have been made here (see below) suggest that the basic block is in the carotenoid synthesis of these mutants. The lack of chlorophyll might be due to a lack of phytol which most likely is synthesized via the carotenoid pathway. However, J. H. C. Smith (Stanford) and I. C. Anderson (Iowa State) have shown that some of these mutants synthesize chlorophyllide in the dark and also have sufficient phytol available to form chlorophyll, which suggests that the lack of chlorophyll in the light-grown seedlings might be due to a secondary factor such as the photodestruction of chlorophyll in the presence of oxygen when carotenoids are absent (see below).