Table 1. Recombination between P locus and transposed Modulator in thirteen independently arising twin mutations.

Twin number	Position relative to P	Percent recombination[1] (P and tr-Mp) Red sector	Light variegated sector
1	distal	3.66 (6)[2]	2.21 (4)
2	random	48.94 (4)	46.46 (3)
3	random	46.87 (4)	47.39 (5)
4	distal	8.21 (5)	6.43 (5)
5	- - -	19.19[3] (3)	50.47[3] (1)
6	distal	13.87 (2)	9.29 (5)
7	random	48.57 (1)	46.95 (2)
8	random	45.35 (3)	48.85 (2)
9	distal	7.08 (5)	4.13 (1)
10	random	52.81 (2)	46.74 (3)
11	- - -	12.42 (3)	4.39 (3)
12	distal	19.33 (10)	24.13 (6)
13	proximal	29.41 (1)	32.29 (4)

1 - Secondary transpositions omitted
2 - Number of families scored
3 - A highly significant difference

significant. The most plausible explanation of this exception is that a secondary transposition occurred in the single family used to determine the site of tr-Mp in the light variegated component. These results therefore support the proposal that a single transposition of Mp from the P locus underlies a twin mutation and that the position of tr-Mp is the same in each of its two sectors.

There appears to be a single site at which tr-Mp is found within a given twin mutation, whereas the sites are different in the independently occurring twin spots. Of the six twins in which tr-Mp was linked to the P locus, five of the tr-Mp sites were clearly distal to P and one (twin number 13) was proximal to P. The reciprocal translocation in twin 13 was T1-7g (1S.17) marking a site close to the centromere. The site of tr-Mp was found to be 19 units proximal to the breakage point. It is possible that the site taken by tr-Mp in this twin is on the long arm of chromosome 1. The lack of any clear cut proximal positions for tr-Mp on chromosome 1 in this class of twin mutations suggests that a polarity in replication of the chromosome exists and that the distal portion, of this chromosome arm at least, replicates after the proximal portions.

Though no data are currently available, it is interesting to speculate that the class of twin mutations that are void of a Modulator in the red component arise by transposition of Mp from the P locus to a site which has already replicated. Linkage tests of tr-Mp in the light variegated component of such twin spots are now in progress, and should provide evidence for or against this speculation.

-- Irwin M. Greenblatt

9. Reconstitution of the variegated pericarp allele by return of modulator to the P locus.

Certain self-red (P^{rr}) mutants from medium variegated (P^{vv}) exhibit an instability in the expression of the P^{rr} allele in the form of variegated or nearly colorless sectors in the pericarp. A study

was conducted to determine if these sectors result from somatic mutations of P^{rr} to P^{vv}. According to the theory of Brink and Nilan, such mutational events would consist of transpositions which return Modulator to the P locus and thus reconstitute the P^{vv} allele ($\overline{P^{rr}Mp}$).

Most primary transpositions of Modulator result in relocation of the element at other sites closely linked to the P locus. This fact can be interpreted to mean that, in transposing, Modulator most frequently moves only a short distance along the same chromosome. Based on this premise, and assuming that the observed sectors result from reconstitutions of the P^{vv} allele, it was postulated that the rate of sectoring is a function of the distance of the transposed Modulator (tr-Mp) from the P locus. The present study tests this hypothesis.

One hundred and thirty kernels exhibiting a variegated or nearly colorless pericarp phenotype over part or all of the kernel were selected as possible sporophytic mutants from self-red ears, and grown out in the field for verification. In addition, 23 mutant self-red families were scored for the number of pericarp sectors per 1,000 kernels and the linkage of P^{rr} with tr-Mp in an attempt to determine if there is a relationship between the rate of pericarp sectoring and the closeness of the site of tr-Mp to the P locus.

In 17 of these families (10 carrying tr-Mp, 7 lacking tr-Mp) the pericarp sectoring was associated with the presence in the genome of a transposed Modulator. Among the 10 Mp+ families, the rate of sectoring was directly related to the linkage of tr-Mp to the P locus.

Mutant variegated plants were obtained from sectored kernels in 32 independent cases in which the parent red-eared individual was found to possess a tr-Mp linked to P^{rr}. Twenty-four of the variegated mutants were tested for the presence of Modulator, and all proved positive.

These results indicate that the pericarp sectoring observed on self-red ears in these families does indeed, result from transpositions that return Mp to the P locus.

In general, the variegated mutants fall into the same phenotypic classes as have been described in other investigations of variegated pericarp. However, the relative frequencies of the mutational events giving rise to the mutants in each class are worthy of consideration. Five (15.63 percent) of the mutational events yielded medium variegated mutants and an equal number gave light variegated mutants. Four (12.50percent) gave rise to orange medium variegated mutants, and six (18.75 percent) produced orange light variegated mutants. Twelve (37.50 percent) gave rise to mutants with a very light variegated phenotype. Thus, the very light variegated and orange variegated phenotypes were common among the variegated mutants obtained from sectored kernels on Mp+, self-red ears. Brawn (M.G.C.N.L. 32: 142 - 144) has reported that these phenotypes are rare among mutants from medium variegated.

Of the 32 variegated mutants obtained in this study, 23 (71.88 percent) exhibited grades of variegation lighter than that conditioned by the standard P^{vv} allele. The results of a test of the dosage effects of one of the very light variegated mutants on the grade of variegation of standard medium variegated indicate that the phenotypic grade of variegation is not a reliable index of the number of Modulators present in a variegated mutant from self-red. The diversity of phenotypes among the reconstituted variegateds could be due to changes of state of Modulator; to increases in the number of Modulators present; or to different physical associations of Modulator with the P^{rr} allele, either in the position of Modulator within the structural dimensions of the P locus or in the firmness of bonding of Modulator at a particular position.

The pericarp sectoring observed in one group of six closely related families was found to be independent of the presence of tr-Mp in the genome. One sporophytic mutant was obtained from a

sectored kernel selected from a self-red ear of one of these families. The phenotype of this mutant was non-variegated. Further study will be conducted in an attempt to determine the cause of the pericarp sectoring observed in this group of families.

-- Elwin R. Orton, Jr.*

*Present address: Department of Horticulture
Rutgers University
New Brunswick, N. J.

III. REPORT ON MAIZE COOPERATIVE

Work of the past season was concentrated principally on improving plant vigor and increasing seed supplies of the traits and tester combinations listed in the accompanying catalogue of stocks. Approximately 35,000 plants, comprising 2,200 families, were grown last summer; about 15,000 pollinations were made. Additional plantings were made in greenhouse and Florida generations.

Further crosses were made to derive new tester combinations or to determine chromosome positions of unmapped traits. It is hoped that this work, along with research on newly-acquired traits, may be intensified next season.

As time permits, all stocks are being gradually converted to the inbred lines M14, W23, and Oh51A. As a consequence of this program of developing stocks adapted to the Corn Belt, a considerable amount of effort is required to re-extract tester combinations and to confirm genetic constitutions.

Seed requests have risen sharply during the past few years. Two to three months each year are now required to supply stocks and provide information on the classification, use, and linkage relations of genetic traits.

The following listing of Maize Cooperative stocks includes the more useful combinations now available. Seed requests should be sent to the Botany Department, University of Illinois, Urbana, Illinois.