

this independent mutator. Crosses are now in progress to determine whether this independent mutator will cause pg^S to become mutable.

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3. Studies of the mutable system at the viviparous-2 locus.

There are three alleles known at the vp-2 locus on chromosome five, vp-2, w^{alb}-4889 and green mosaic. They all are characterized by pale yellow or white seeds that often are smaller than normal and frequently have a tendency to germinate prematurely producing albino seedlings. In addition to these traits the green mosaic allele shows frequent back mutation to normal in both the endosperm and seedling, resulting in a pale yellow endosperm with patches of yellow and in white seedlings with a mosaic of green tissue.

For the past couple of years an intensive study of the mutable green mosaic allele has been made. As mentioned in last year's News Letter five levels of mutability have been recognized (very strong, strong, light, light minus, and weak); in addition several stable white lines have been isolated. In all cases these stable white lines have been derived from ears that were segregating for weak mosaic or white as well as other mutable types. As a general rule it does not appear that lines segregating for only stable white seedlings can be derived from very strong or strong mosaic stocks in one step. An ear must first occur that is segregating one of the lower levels of mutability in addition to very strong or strong mosaic. From such an ear it is then possible in future generations to isolate stable white lines.

Additional intercrosses between stocks of the various levels of mutability have been made. The results are in agreement with the pattern of interaction reported last year. Crosses of very strong, strong, light mosaic and light minus mosaic to stable white lines result in seedlings that have lower levels of mutability than the mosaic parent. Usually the level of mutability is at least one class lighter. Similar crosses to the vp-2 and the w^{alb}-4889 alleles give the same results as crosses to stable white. Crosses between very strong and light, very strong and weak, and strong and light all have lower levels of mutability than the parent with the highest level.

By selfing it has been possible to establish lines at each of the various levels of mutability that consistently, although not invariably, give ears with only one class of mosaic seedlings. When such lines are outcrossed and the outcrosses selfed, three classes of segregating ears are produced: 1) those which segregate only mutant seedlings with the original level mutability, 2) those segregating both seedlings with the original level and some with the lower levels of mutability and 3) those segregating only seedlings with levels of mutability lower than the original parent. Of 105 such outcrosses tested this year the frequencies of the three classes were 26, 52, and 27 respectively.

Selfs of outcrosses of stable white lines that were derived from mutable stocks segregate only white seedlings provided the outcross parent has not been derived from green mosaic lines. However, selfs of crosses of such white lines to non-segregating ears from families that are heterozygous for green mosaic result in ears segregating for mutability. Two such selfs of crosses to a non-segregating ear in a strong mosaic family have produced ears with weak mosaic seedlings. Other selfs of outcrosses to normal ears from mosaic families of uncertain levels of mutability have produced ears with various combinations of light, light minus, weak and white seedlings. Additional crosses of this type have been made using stocks of the different known levels of mutability. In addition the vp-2 and walb-4889 alleles are being tested to see if crosses to non-segregating ears out of mosaic families will induce these alleles to become mutable.

Selfs of normal plants from F₁ ears of very strong and strong mosaic times stable white produced 5 ears, none of which have very strong or strong mosaic seedlings. Of the three ears tested involving very strong mosaic one segregated light minus, weak mosaic and white seedlings and the other two, weak mosaic and white seedlings. Of the two ears tested involving strong mosaic one gave weak mosaic and white seedlings and the other gave only one white seedling.

The above results are consistent with the hypothesis that mutability at the vp-2 locus is caused by a separable modifier. There is some indication that the modifier can be either linked or independent of the locus. Further tests are being planned to establish this, as well as, the relationship between the various levels of mutability.

4. Allele tests of white-albino mutants.

For the past several years allele tests have been carried out between known white-albino mutants (mutants with white or pale yellow endosperm that give albino or pale green seedlings) and those sent me by other workers with the following results:

<u>Source</u>	<u>Allelic to</u>	<u>Chrom.</u>
Dr. Everett, out of KyS	w-3	2
Dr. Everett, out of 2655 54	lw-2	5
Dr. Mumm #1, out of M14	vp-5	1
Dr. Mumm #2, out of Oh7	allelic to	?
Dr. Braun, out of 182D	each other	

Crosses between w-3 and pastel-8686, both of which had been shown to be on chromosome two by linkage test, have established that these two mutants are allelic. The two mutants are quite distinct; w-3 has white seeds and pure white albino seedlings while pastel-8686 has white seeds and pale yellow-green seedlings. The F_1 between them is closer to w-3 than pastel-8686 in phenotype but this will need to be tested further since the seedling tests were performed during cloudy weather. It may be that high temperature and sunlight are necessary for the greening of pastel seedling. The fact that pastel-8686 seedlings were much paler than those observed in previous years grown under more favorable conditions would suggest that this is so.

Dr. Smith at Stanford has shown that w-3 seedlings when grown in the dark produce protochlorophyll that is converted to chlorophyll a when they are transferred to the light. Chlorophyll a on exposure to the light is destroyed so that the albino seedlings result. A study of chlorophyll synthesis in the pastel-8686 allele might prove very enlightening in view of what is already known about chlorophyll synthesis in w-3.

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1. West Indian maize.

There is support for Harland's hypothesis that West Indian maize strains are inbred lines that have also been selected for vigour. Comparison of the growth between sibs and once selfed lines has been made, although the number of lines tested has been limited owing to difficulties of seed setting. In Early Caribbean and Cuban Flint strains, the sibbed lines were no more vigorous than the selfed lines. Thus the drastic occurrence of inbreeding depression normally expected in outbreeding maize populations has not been demonstrated.

Most of the families produce seedlings differing from normal. These include small and narrow leaved ones, and various yellow leaved ones probably associated with the character "virescent". True albinos also occur and rapidly die. Comparison was made between the growth, flowering and ear formation of adult plants raised from normal and abnormal seedlings. The data were unable to establish that abnormal seedlings were severely handicapped, either in their early mortality or in their final heights and flowering times. A relationship was established between intensity of anthocyanin coloration of the seedling bases, and the frequency of small seedlings. There were no small seedlings with very dark red bases, 12% among those with very pale red bases, while all green seedlings were 65% small.