

that (1) single bridges are found in only a small proportion of those cells which form variegation patterns of endosperm markers known to be involved in chromatid B-F-B cycles, and (2) chromosomal B-F-B cycles as recognized by the occurrence of double crossed bridges are found in endosperm material where only the chromatid cycle is expected. The former was explained by the postulate that fusion of sister broken ends is most often weak so that the bridges break at the very early separation of the chromosomes and are thus not found in middle or late anaphase where the chromosomes are well enough separated to be scored. The latter is thought to result from non-disjunction of a chromatid bridge without breakage converting a chromatid cycle into a chromosome cycle. These studies were made with endosperms resulting from pollination with irradiated pollen and in Ac-Ds material.

Recently these experiments were repeated using pollen carrying broken chromosomes resulting from crossing over in a reverse duplication of the short arm of chromosome 9 (McClintock, Genetics 1941). A batch of pollen from a single plant (material kindly supplied by Dr. McClintock), heterozygous for the duplication which carried C and Wx on the duplicated segments and a deficient chromosome 9, was used to pollinate six c wx tester plants. Three ears were allowed to develop to maturity while the other three ears were picked and fixed 7 days after pollination. Gametes carrying the deficient chromosome 9 do not function through the male so that all fertilizations are accomplished by either gametes carrying the entire duplication or a broken chromosome resulting from breakage of the AII dicentric formed from one half the crossovers in the duplicated region. The latter gametes have a competitive advantage in fertilization over those with the large duplication.

From the proportion of variegated kernels on the mature ears it was determined that approximately one half of the endosperms received a broken chromosome 9. Since the same batch of pollen was used in all six crosses, one half of the young fixed endosperms should have had a broken chromosome 9 undergoing the chromatid B-F-B cycle. None of the endosperms should have received a dicentric chromosome. Two hundred endosperms were examined cytologically. None were found with single bridges in all or even as high as 15% of the anaphase configurations. However, occasional clusters of cells with double bridges were observed, confirming the earlier observations.

D. Schwartz

OHIO AGRICULTURAL EXPERIMENT STATION  
Wooster, Ohio

1. Further studies on a mutable system involving chromosome 6.

This mutable system was first described in the 1957 Maize News Letter. The pale green character described in the 1957 News Letter

has since been found to be allelic to piebald-1 ( $pb_1$ ). In as much as the piebald allele discovered here is mutable it has been designated  $pb^m$ .

In crossover tests made thus far,  $YPb/y^m pb^m \times y^m pb^m$ , no crossing over between  $y^m pb^m$  and  $YPb$  has been found. Ear sectors of germinal mutations (yellow endosperms) have been found in homozygous  $y^m pb^m$  material. Forty one plants grown from such yellow endosperm sectors were all green. This suggests that the mutation of  $y^m$  and  $pb^m$  was simultaneous or coincidental. Thus, the above tests indicate that  $y^m pb^m$  acts as a unit in inheritance affecting the expression of the plant and endosperm characters involved.

One of the homozygous  $y^m pb^m$  plants from the original self ( $yPb/y^m pb^m$ ) was crossed by an unrelated  $YPb Su_2$  stock. Of the resulting yellow endosperms some were yellow with darker yellow spots. A number of kernels whose endosperms were yellow with darker yellow spots were planted. Several of the resulting plants ( $y^m pb^m/YPb$ ) were crossed by an unrelated white endosperm stock, ( $yPb$ ), and a few by a  $yPb su_2$  stock. Approximately 50% of the endosperms were yellow when the endosperm ratios from several plants were averaged. Considering the  $y^m pb^m/y^m pb^m/yPb$  endosperms the incidence of white endosperms with yellow mosaic areas (henceforth called yellow-mosaic endosperm) varied from plant to plant. The ratios from some plants were approximately 75% yellow mosaic: 25% white. In other cases the ratio was approximately 50% yellow mosaic: 50% white, and in others the incidence of yellow mosaic endosperms was less or more than 50%. These ratios suggested the possibility that there were two independent dominant controlling elements. However, since the incidence of yellow mosaic endosperms varied quite widely among endosperm progenies from the various plants it was also possible that mutation of the  $y^m pb^m$  unit was either autonomous or conditioned by a linked dominant controlling element.

One of the  $y^m pb^m Su_2/YPb Su_2$  plants described earlier (from yellow kernel with darker yellow spots) was crossed by a  $yPb su_2$  plant. (The same  $yPb su_2$  stock is used throughout these experiments). Seventy one percent of the resulting  $y^m pb^m Su_2/yPb su_2$  endosperms were yellow-mosaic and 29% were white. The average number of yellow spots per yellow mosaic endosperm was 18.15. A number of  $YPb Su_2/yPb su_2$  plants (from kernels with yellow endosperms from the above cross) were grown. These plants were crossed by a homozygous  $y^m pb^m su_2$  stock with a very low mutation rate for the  $y^m pb^m$  unit. The second ears were crossed by the  $yPb su_2$  stock. (The low mutation rate  $y^m pb^m su_2$  stock was obtained from an individual selfed  $y^m pb^m Su_2/yPb su_2$  plant. The resulting  $y^m pb^m su_2$  segregates were selfed or sibbed to obtain the stock). The individual  $y^m pb^m su_2$  plants which were crossed to the above  $YPb Su_2/yPb su_2$  plants were also crossed to plants of the homozygous  $yPb su_2$  stock.

One purpose of this experiment was to see if a dominant independent controlling element (or elements) was segregating. If a dominant independent controlling element or elements were involved

they should have been heterozygous in the original plant. In the offspring of this plant tested here, if a single dominant controlling element was segregating then approximately half of the plants would carry this controlling element and induce  $y^{m}pb^{m}$  to mutate. If two independent controlling elements were segregating then in approximately 75% of the plants the  $y^{m}pb^{m}$  unit would be induced to mutate.

Table 1.  $YPb\ su_2/yPb\ su_2 \times y^{m}pb^{m}\ su_2$

Plant no.	$YPb/yPb/y^{m}pb^{m}$ yellow	Endosperm Classification				Av. no. yellow spots per mosaic endosperm
		White	Yellow-mosaic	%	$yPb/yPb/y^{m}pb^{m}$	
1	296	245	33	11.9	1.6	
2	192	156	46	22.8	2.2	
3	285	237	31	11.6	1.9	
4	258	264	18	7.8	1.7	
5	226	224	10	4.3	1.1	
6	176	183	5	2.7	1.0	
8	245	232	3	1.3	1.0	
9	305	295	23	7.2	1.2	
10	219	172	29	11.4	1.2	
17	182	199	36	16.3	1.5	
19	226	237	10	6.8	1.1	
23	203	207	4	1.9	1.5	
25	193	182	18	9.0	1.6	
57	248	217	30	12.2	1.5	
		3254	3050	296	8.8	1.3

Control  
 $yPb\ su_2 \times$  individual  $y^{m}pb^{m}\ su_2$   
 plants used above  
 Total of  
 11 plants

4277      2      0.05      1.0

Examination of the data from the fourteen plants presented in Table 1 indicates that mutation in  $yPb/yPb/y^{m}pb^{m}$  endosperms was induced in all plants. However the frequency of mutation was low and varied from 1.3% to 22.8%. Also the number of yellow mosaic areas per mutant endosperm was also quite low averaging only 1.3 mutant areas per mutant endosperm. However this represents a considerable increase in mutation rate over the control. The control is represented by endosperms from the homozygous  $yPb\ su_2 \times y^{m}pb^{m}\ su_2$  (pollinator plants used for crosses in Table 1) crosses.

The second ears on seven of the plants presented in Table 1 were crossed by the homozygous  $yPb\ su_2$  stock. The resulting endosperm ratios were 1171 yellow and 1157 white. No mutations occurred.

In the reciprocal cross of the original plant, whose dosage of the  $y^{m_{pb}m}$  unit in the endosperm compares with the dosage of the  $y^{m_{pb}m}$  unit in the crosses in Table 1 ( $yPb/yPb/y^{m_{pb}m}$ ) the frequency of mutation (% of mutant  $yPb/yPb/y^{m_{pb}m}$  endosperms) was 41.1% with an average of 8.0 mutant areas per yellow-mosaic endosperm.

It would appear that the principal cause of mutation in the original plant is controlled by the  $y^{m_{pb}m}$  unit or some component closely linked to it. Certainly the data in Table 1 do not suggest the segregation of an independent controlling element (or elements) in these plants. However, the increased frequency of mutation of the  $y^{m_{pb}m}$  unit in the plants (when compared with the control) is not easily explainable. It appears that each plant is capable of increasing the frequency of mutation of the  $y^{m_{pb}m}$  unit (low mutation rate  $y^{m_{pb}m}$  unit) when introduced into these endosperms.

Table 2.  $yPb Su_2/yPb su_2 \times y^{m_{pb}m} su_2$

Plant no.	Endosperm Classification						% Crossing-over
	Yellow	White sugary-2	Yellow mosaic sugary2	Crossover types		Yellow mosaic	
				Yellow sugary2	White		
1	217	192	27	79	53	6	24.1
2	155	126	30	30	37	16	21.1
3	198	179	21	87	58	10	28.0
3*	64	57		25	13		23.9
4	203	189	6	55	75	12	26.3
5	176	173	8	50	51	2	22.6
5*	193	185		49	68		23.6
6	138	153	3	38	30	2	19.2
6*	182	169		37	51		20.1
8	201	179	2	44	53	1	20.4
9	244	221	16	61	74	7	22.8
9*	92	97		32	25	9	23.2
10	163	147	20	56	25	7	21.4
17	136	162	29	46	37		21.6
17*	127	129		39	32	6	21.7
19	172	187	4	54	50		23.3
19*	103	123		24	27	2	18.4
23	169	174	2	34	33		16.7
23*	159	153		45	28	2	19.0
25	152	142	9	41	40	9	22.9
57	188	156	20	60	61	10	26.5
			197	986	921	99	22.5
Control	2833	2947		1242	1165		29.4
Recip.	1787	1904		962	902		33.6
* 2nd ear x $yPb su_2$							

The same plant crosses which were presented in Table 1 were analyzed for crossover frequency. The crossover data are presented in Table 2.

The  $yPb\ su_2$  stock was crossed to a homozygous  $YPb\ Su_2$  stock and the resulting heterozygotes were backcrossed by the  $yPb\ su_2$  stock. These data, which are used as control data, are presented at the bottom of Table 2.

It would appear that crossing over between  $Y$  locus and the  $su_2$  locus is reduced in the  $ll$  plants. The cause of the reduced crossover ratios is not clear at this time.

E. J. Dollinger

UNIVERSITY OF THE PHILIPPINES  
College, Laguna, Philippines

1. Brachytic line from Bicol White Flint.

A brachytic inbred line was isolated from Bicol White Flint variety after a series of continuous inbreeding. The variety-source is from the white flint germplasm of the Philippine hybrids. The brachytic line is described as follows:

Color of the leafsheaths at the ground level ---- slightly reddish.

Internodes ---- shortened and the node where the ear is attached is enlarged.

Leaves ---- It has 13 leaves on the average. The leaves are broad and short.

Silks ---- the color of the silks is salmon yellow.

Inflorescence ---- spreading with many spikelets.

Anthers ---- the color of the anthers is purplish. It sheds pollen profusely.

Plant height ---- the height of the plants from the ground level to the tip of the tassel is 90 centimeters on the average.

Maturity ---- Maturity refers to the number of days from seedling emergence to 50% silking. It matures from 49 to 52 days depending upon the season (wet and dry).