Table 2

Progeny of the cross $\underline{rr} \times \underline{R^{st}r}$

$\underline{R}^{st}$	$\underline{r}$	Total	% $\underline{R}^{st}$	s.e.
44	260	304	14.5	2.02
31	374	405	7.6	1.32
47	373	420	11.9	1.58
94	236	330	28.5	2.48
56	347	403	13.9	1.72
3	24	27	11.1	6.04
34	455	489	6.0	1.07
76	332	408	18.6	1.93
227	285	512	44.3	2.19
36	481	517	7.0	1.12
44	316	360	12.2	1.72
692	3,483	4,175	16.6	0.57

Cytological observations were made on root tip metaphases. The abnormal chromosome appears sharply different from a normal chromosome 10, in that 1) it shows a long arm exceeding by more than 30% the length of the long arm of the normal chromosome and 2) the long arm is club-shaped with a constriction at .35-.40. This chromosome looks quite similar to the well known K10. The similarity with K10 is supported by the frequent exclusion from pairing and by the lower recombination frequency in the region distal to R. However, a remarkable difference between the two is apparent in the genetic behavior of this chromosome, namely its low transmission and the male gametophyte effect. Sporocytes have not been studied yet.

A. Ghidoni

4. Nondisjunction and preferential fertilization in balanced and hyperploid structural heterozygotes for the translocation TB-9b.

Nondisjunction of the B^9 chromosome in the presence of the 9^B chromosome occurs at highly variable rates in the second pollen mitosis, while preferential fertilization of the egg by hyperploid sperm occurs at more constant rates. The data of various investigators were briefly reviewed by

D. S. Robertson in Maize News Letter 46:88-93.

In the translocation TB-9b two markers with easily classifiable phenotypes are useful in estimating the rates of nondisjunction and of preferential fertilization. The Wx allele is a good marker of the 9^B chromosome because of its close linkage with the translocation breakpoint. The C^I allele is useful because of its location in the B^9 chromosome and also because of the dosage effect observed in endosperms heterozygous for I and C. A single dose of C^I is unable to completely inhibit pigment formation in the aleurone, which appears more or less tinged; moreover, sharp spots of deep pigment are frequently observed following losses of the inhibitor factor. On the other hand, two doses of the C^I allele are able to completely inhibit pigment formation in the aleurone, which appears colorless with infrequent and smaller spots of color; these are the consequence of coincidental loss of both inhibitor factors in the same clone of cells.

A stock of TB-9b, homozygous for the translocation and marked with Wx and C, was crossed to a wx C^I (normal) stock in 1967 in order to obtain a Wx C^I marked translocation. The F_1 was crossed as male parent to a C wx (normal) stock. Among the progeny, two types of crossovers were then selected: those with C^I Wx endosperm, colorless scutellum (balanced translocation 9^BWx, B^{9C^I}, resulting from regular disjunction of B^{9C^I}), and those with C Wx endosperm, colorless scutellum (hypoploid endosperm, hyperploid embryo, resulting from nondisjunction of B^{9C^I} at the second microspore division). The selected individuals were then crossed as male parents to a C wx (normal) stock with colored scutellum. Four classes of offspring were observed with regard to presence and distribution of pigment in the endosperm and scutellum. The Wx and wx types were separated within each class, and the data are reported in Table 1. The main characteristics of each class are briefly described:

Class I (purple aleurone, purple scutellum): The large wx group comes from fertilization by sperm carrying nontranslocated chromosomes; the few Wx types are the result of crossing over bringing C back to the B^9 chromosome. The fraction of such B^{9C} chromosomes undergoing nondisjunction cannot be detected by seed classification.

Table 1

Progeny of crosses involving the TB-9b translocation as the male parent.
The classification of the progeny was made for the markers C,C^I and Wx,wx.

Type of cross	Class		I		II		III		IV	
	Aleurone		purple		purple		colorless		tinged, purple spots	
	Scutellum		purple		colorless		purple		colorless	
		No. of ears	Wx	wx	Wx	wx	Wx	wx	Wx	wx
9Cwx, 9Cwx x 9Cwx, 9^BWx, B^{9C^I} (balanced translocation)		2	20	241	143	0	89	0	92	110
9Cwx, 9Cwx x 9Cwx, 9^BWx, B^{9C^I}, B^{9C^I} (hyperploid translocation)		31	26	268	3,412	13	2,250	11	454	1,610

Class II and Class III (respectively: purple aleurone, colorless scutellum, and colorless aleurone, purple scutellum): Nearly all individuals belonging to these classes are Wx because of the presence of 9^B; the exceptional wx individuals are the result of heterofertilization or of crossing over between Wx and the translocation point. Class II has hyperploid embryos with two B^{9C^I} chromosomes and hypoploid endosperms with no B^9. The reverse situation is found in Class III, with hypoploid embryos and hyperploid endosperms.

Class IV (tinged aleurone with spots of deep pigment, colorless scutellum): The classification of Wx and wx individuals allows an estimate of the rate of regular disjunction of B^{9C^I} in the presence of 9^B or with a normal chromosome 9. Some wx individuals inherited the C^I allele with chromosome 9; their frequency can be estimated from the frequency of reciprocal crossovers (Wx individuals of class I).

The rate of nondisjunction of B^9 in the presence of 9^B is estimated as follows: the total number of individuals in class II and class III, plus a fraction of the crossovers in the left column of class I (see Table 1), is divided by the total of the Wx types. The rate of preferential fertilization is obtained by dividing the number of individuals of class II by the total number of individuals in class II and class III. The values found are reported below, with standard errors:

Pollen parent	Rate of nondisjunction of B^9 in the presence of 9^B	Rate of preferential fertilization
Balanced translocation $(9,9^B,B^9)$	71.0% (2.5)	61.5% (3.1)
Hyperploid translocation $(9,9^B,B^9,B^9)$	92.3% (.4)	60.7% (.6)

Despite the inconstancy of nondisjunction rates frequently found for the B^9 chromosome, the present data indicate that there may be a significant difference, in this regard, between the two conditions of the translocation (i.e., balanced and hyperploid). W. Carlson reported comparable results (Ph.D. Thesis, Indiana University, 1968) for nondisjunction rates of B^9: 75% (balanced translocation) and 84% (hyperploid translocation). If

this difference is confirmed by further tests, an explanation should be sought. It is not obvious why the nuclear conditions existing prior to the meiotic separation of homologues should influence the nondisjunction of B^9 during the second microspore division.

Another peculiarity of the two genotypes (balanced and hyperploid) was observed after comparing the total ratio of Wx : wx.

	Total Wx	Total wx
Balanced translocation	344	351
Hyperploid translocation	6,142	2,002

In the case of balanced translocation, the ratio found is close to the expectation since the loss of all deficient spores (9^{B}Wx) is compensated by the loss of a considerable number of hyperploid spores (9wx, B^9) in the male gametophyte. In the case of the hyperploid translocation, an enormous excess of Wx was found. Since the two B^9's are expected to undergo a fairly regular meiotic segregation, most of the microspores will be either 9^{B}Wx, B^9 (balanced) or 9wx, B^9 (hyperploid). The latter type is frequently lost by gametophyte competition to the extent indicated by the observed ratio of Wx : wx.

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1. Test for cytoplasmic mutants induced by E.M.S. seed treatment.

The tests for induced mutations with which I am familiar were not planned to test for possible cytoplasmic mutants. This experiment was planned to test only for that type.

The first experiment was set up in 1970, but the treatment was too heavy. The main growing point tissue in many plants was killed or so heavily damaged that the plants were highly deformed. Many of them developed tillers but only a few had ears or tassels. The next experiment was begun in 1971, using a less severe treatment. In both experiments, the