

2. B chromosomes induce nondisjunction in $9B^9$ pollen.

Roman (1949) found that the B^4 chromosome of TB-4a was incapable of nondisjunction at the second pollen mitosis when present in $44B^4$ plants. The $4B^4$ pollen, while unbalanced, functions at a fairly high rate and inheritance of the B^4 is regular, in contrast to the frequent nondisjunction found in $4B^B 4$ pollen. Since the 4^B chromosome is missing in $4B^4$ pollen, the distal part of the B (on 4^B) may carry a gene(s) required for nondisjunction. Alternately, the duplication of genes on chromosome 4 may for some reason prevent nondisjunction. Following Roman's work, similar results were obtained for several other A-B translocations, i.e., AB^A pollen does not support nondisjunction of the B^A . Since it seems unlikely that the duplication of several different groups of genes would each inhibit nondisjunction, it is generally assumed that distal regions of the B chromosome carry a gene(s) involved in nondisjunction. Ward's recent (1973) localization of a factor in the distal tip of the B which is needed for nondisjunction rests on this assumption. However, one might argue that genetic imbalance of any kind is detrimental to the fitness of pollen, and nondisjunction may in some way be linked to pollen fitness and therefore to balanced pollen. The data presented below demonstrate that B chromosomes do indeed carry a distally located factor(s) required for nondisjunction. Utilizing TB-9b, it is shown that the B^9 chromosome of $9B^9$ pollen can be induced to undergo nondisjunction in the presence of added B chromosomes. Hyperploid $9^{\underline{bz} \underline{wx}}$ $9^{\underline{wx}} B^9$ $9^{\underline{Bz}}$ $9^{\underline{Bz}}$ plants were constructed that differed in the presence or absence of B's. The two groups of plants (with and without B's) were related but not isogenic. The plants were crossed to a sh bz wx B Pl tester and Bz wx kernels were selected in the progeny. The Bz wx kernels are expected to derive mainly from $9^{\underline{wx}} B^9$ pollen. The very low rate of crossing over (< 0.5%) between wx and the translocation breakpoint virtually eliminates the 9^B chromosome from this group. In Table 1 are given the seedling classifications for plants grown from Bz wx kernels.

Table 1

Seedling classification of kernels with Bz wx endosperm phenotype.

Kernels were progeny of the cross sh bz wx B Pl x

$\frac{9}{9} \frac{bzwx}{B^{wx}} \frac{9}{B^{Bz}} \frac{9}{B^{Bz}} \pm B's.$

Male parent	Number of B's in male parent	Number of <u>Bz wx</u> kernels planted	Seedling classification of <u>Bz wx</u> kernels		
			<u>Bz</u>	<u>bz</u>	Green (not classifiable)
1763 - 1	0	21	20	0	1
1768 - 1	0	135	131	0	3
1770 - 1	0	126	121	0	1
1771 - 2	0	134	132	1	0
1772 - 1	0	<u>62</u>	<u>57</u>	<u>1</u>	<u>0</u>
		478	461	2	5
1764 - 2	2	23	7	10	4
1765 - 2	7	63	18	41	3
1766 - 1	1-2	32	14	18	0
1767 - 2	2	61	25	33	2
1769 - 2	3-4	<u>34</u>	<u>10</u>	<u>22</u>	<u>1</u>
		213	74	124	10

Germination was uniformly high and classification was relatively good, although some plants failed to develop color. Plants without B chromosomes show almost no nondisjunction and it is likely that the two bronze plants in the seedling classification resulted from heterofertilization rather than nondisjunction. Among plants with B chromosomes, the rate of nondisjunction is very high since approximately two-thirds of the seedlings were bronze. The reciprocal class of nondisjunction, in which a bronze kernel and purple seedling are present, was also found at high frequencies in plants with B chromosomes. The data

are not given here because of problems in achieving high germination frequencies for the bronze endosperm class, which also has a defective (sh) endosperm phenotype.

References:

- Roman, H. Factors affecting mitotic nondisjunction in maize. Records Genetics Soc. Amer. 18: 112 (1949).
- Ward, E. Nondisjunction: Localization of the controlling site in the maize B chromosome. Genetics 73: 387-391 (1973).

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1. Combining ability of high protein opaque-2 maize lines for protein content in diallele crosses.

Twelve opaque-2 high protein lines were included in this study (Table 1).

Lines 1 to 9 were related by their high protein source, IHP, which in the local environment of Krasnodar Region shows 24-28% protein; lines 10, 11 and 12 were not related either to each other or to lines 1-9. All lines except 1 and 8 have a common opaque-2 source, Synthetic A o_2 (S Ao_2); line 1 had the source B 37 o_2 , and line 8 had the genetic stock $o_2ra_1gl_1$ as a source of o_2 . The lines from 9 to 12 were heterozygous for o_2 .

Two-directional diallel crosses were made in 1972 in 3-5 female ears. A pollen mixture from 5-7 plants was used. The kernel protein content of the absolute dry matter was determined in separate ears, sibbed and female as well. The lack of outcrossing for protein made it possible to utilize the results of analyses for evaluation of the lines for protein. The morphological traits of lines were relatively uniform and corresponded to S_2 , S_3 generations.

In 1973 all F_1 crosses and parental lines were sown in a randomized block design (plots of 10 sq.m.) using four replications. The grain