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1. The effect of abnormal chromosome 10, and a possible effect of B chromosomes, on crossing over in chromosome 5.

Rhoades (J. Am. Soc. Agron. 33:603) found crossing over in chromosome 5 to be higher in male than in female sporocytes and it has been reported that abnormal chromosome 10 increases crossing over in the proximal region of chromosome 3 (Rhoades & Dempsey, MNL 31:77 and Genetics 53:989) and in chromosome 9 (Kikudome, Genetics 44:815).

To determine the effect of abnormal chromosome 10 (K10) on crossing over in the proximal region of chromosome 5, a plant which was homozygous for $a_2 bt_1 pr$ and for normal chromosome 10 (k10) was crossed as a female to one which was homozygous for $A_2 Bt_1 Pr$ and heterozygous for K10. Sporocytes were taken from the progeny and cells in diakinesis were examined for the presence of K10. While doing this, it was noticed that some plants had from 2 to 4 B chromosomes and some had none. The plants were crossed, both as males and as females, to a chromosome 5 tester and crossover values were calculated. Since the a_2 kernels lacked aleurone color and could not be classified with respect to Pr and pr, crossing over in the Bt_1-Pr region was calculated from the A_2 classes only.

The results are as follows:

Sporocytes	# Plants	Used as	# Progeny	% C.O. A_2-Bt_1	% C.O. Bt_1-Pr	Increase in ♂ A_2-Bt_1	Increase in ♂ Bt_1-Pr
k10k10; 0 B's	4	♀	1560	4.8	20.0	+ 9.9	+ 7.9
	4	♂	1372	14.7	27.9		
k10k10; 2-4 B's	8	♀	2910	7.1	22.3	+12.8	+13.5
	8	♂	1983	19.9	35.8		
Total k10k10	12	♀	4470	6.3	21.5	+11.5	+11.0
	12	♂	3355	17.8	32.5		
K10k10; 0 B's	4	♀	1497	16.8	35.7	+ 7.2	+ 0.1
	4	♂	791	24.0	35.8		
K10k10; 2-4 B's	9	♀	3005	17.9	35.2	+10.4	+ 5.9
	9	♂	2399	28.3	41.1		
Total K10k10	13	♀	4502	17.6	35.4	+ 9.7	+ 4.3
	13	♂	3190	27.3	39.7		

The crossover values for male flowers are higher than those for female flowers, except for the Bt_1-Pr region of K10k10 plants lacking B chromosomes. K10 increases crossing over in both the A_2-Bt_1 and Bt_1-Pr regions. A similar effect for the A_2-Bt_1 region has also been found by Robertson (this MNL, p. 89). This increase is greater in the females than in the males, resulting in smaller differences in crossing over between the sexes, particularly in the longer Bt_1-Pr region.

Hanson (MNL 35:61, MNL 36:34 and Ph.D. thesis) has reported that B chromosomes increase crossing over in chromosomes 3 and 9. From the present study, although the numbers of plants in classes without B chromosomes were small and tests of significance were not done, it would seem that B chromosomes may cause an increase in crossing over in chromosome 5 and that the effect, in contrast to that of K10, is greater in males than in females.

Further work, which should make definite conclusions possible as to the effects of B chromosomes, will be done during the coming summer.

Paul Nel

2. The influence of the female parent on preferential fertilization by B^9-containing sperm.

The B chromosome of maize possesses an accumulation mechanism, whereby non-disjunction of the B chromosome at the second pollen mitosis, followed by preferential fertilization of the egg by the B-containing sperm, results in an increase in B chromosome number (Roman). Preferential fertilization of the egg has been found to occur at approximately the same rate in different genetic backgrounds (Catcheside) and is a constant feature of B chromosome inheritance.

In 1966, plants carrying one of Roman's A-B translocations, TB-9b, were crossed as male parents onto two different inbred lines, a c sh wx tester and a c sh wx gl_{15} tester. The constitution of the TB-9b plants was 9^c sh wx 9^B Wx B^9 C Sh B^9 C Sh . The Wx locus is very close to the translocation breakpoint of TB-9b, and crossing-over of the Wx allele onto the normal chromosome 9 occurs less than 0.5% of the time (Robertson). It may be assumed, therefore, that when Wx kernels are selected from the progeny of a c sh wx X 9^c sh wx 9^B Wx B^9 C Sh B^9 C Sh cross, the vast majority of the individuals each contain the 9^B Wx chromosome. It is also known, from the work of Robertson, that crossing-over of the c sh markers from the normal chromosome 9 onto the B^9 chromosome is a very rare event (0.26%). As a result, classification of C and Sh is an accurate method for determining the presence or absence of the B^9 chromosome in the endosperm. In the crosses that were made onto the c sh wx tester and the c sh wx gl_{15} tester, the Wx seeds were selected and classified for C and Sh. The results are given below:

c sh wx X 678-5 (TB-9b)	
c sh Wx =	422 (62.5%)
C Sh Wx =	252
C sh Wx =	1

c sh wx X 808-1 (TB-9b)	
c sh Wx =	238 (58.4%)
C Sh Wx =	170

c sh wx gl_{15} X 678-5	
c sh Wx =	224 (38.5%)
C Sh Wx =	356
c Sh Wx =	1

c sh wx gl_{15} X 808-1	
c sh Wx =	131 (43.5%)
C Sh Wx =	170