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Studies on the effect of X-Chromosome inversion on crossing-over in 2nd chromosome of Drosophila melanogaster.

The present investigation was carried out to get information about the mode of action of hetero- and homozygous X-Chromosome inversion on crossing-over when both the homologues of the second chromosome are normal and when they are heterozygous for inversion. A complex X-Chromosome inversion (sc^{S1} In-S sc^{8}) obtained from 0_1 stock, having a recessive yellow body, has been used throughout the study. Two types of experiments were conducted. The females were with either hetero- or homozygous X-Chromosome (0_1) inversion, whereas for the second chromosome the genetic constitution of the females was + + + L^2 +/ dp b cn + bw in the first experiment, Cy + + + +/dp b cn bw in the second experiment respectively. Cy, a wing marker gene is associated with two long inversions, i.e., Cy Ins (2L+2R). These females were mated separately with the dp b cn bw/dp b cn bw males.

It is evident from table 1 which includes data from the first experiment that there is a significant increase over control in crossing-over in the presence of hetero- as well as homozygous inversion, but inspite of involving the whole or arm of the chromosome, it is restricted only in certain regions, mainly region b-cn, centeromeric region. The difference between the cross-over value of hetero- and homozygous inversions is not statistically significant. In the second experiment when 2nd chromosome was having Cy Ins (2L+2R), no cross-over in the case of control (X-Chromosome without inversion) has been observed, but it is clear that the centromeric region viz. b-cn, shows an increase in cross-over value in the presence of both hetero- and homozygous 0_1 inversion (table 2).

The results obtained (a) cross-over increase in only certain regions of the chromosome (b) enhancement in cross-over frequency in the presence of homozygous inversion, argues against the "mechanical hypothesis" proposed for interchromosomal effect.

Table 1. Analysis of the single cross-over in the cross + + + L^2 +/dp b cn bw ♀ X dp b cn bw/dp b cn bw ♂

Sl. No.	Treatment (X-Chromosome)	Total No. scored	dp-b Mean of cross over%	b-cn Mean of cross over%	cn-L^2 Mean of cross over%	L^2-bw Mean of cross over%
1.	+/+ (control)	2226	18.00±0.975	3.65±0.314	6.39±0.573	15.33±1.408
2.	y sc^{S1} In-S sc^{8}/ + + + +	2310	17.39±0.863	7.84±0.657	10.19±0.665	14.06±1.569
3.	y sc^{S1} In-S sc^{8}/ y sc^{S1} In-S sc^{8}	1084	16.31±1.407	7.15±0.721	9.94±1.528	14.16±1.582

Table 2. Analysis of crossing-over in the cross Cy/dp b cn bw ♀ X dp b cn bw/dp b cn bw ♂

S.No.	Treatments	Parental types		Recombined types		Cross-over%
		Cy ++++/ dp b cn bw	dp b cn bw/ dp b cn bw	Cy ++ cn bw/ dp b cn bw	dp b ++/ dp b cn bw	
1.	+/+ (Control)	712	655	-	-	-
2.	y sc^{S1} In-S sc^{8}/++	1538	1201	22	20	1.53
3.	y sc^{S1} In-S sc^{8}/ y sc^{S1} In-S sc^{8}	821	612	10	10	1.39