It is evident that deviation in some of the classes has contributed to a high Chi-square value with $P < 0.005$. In fact, class 3 shows the maximum departure from the expected. This class can be called compensatory since a high chiasma frequency in the 6-9 interchange is combined with a low number in the chromosome carrying the inversion. A high deviation from the expected is also observed in class 1, a non-compensating type of combination, in which high chiasma frequencies are observed in chromosome 2 as well as in chromosomes 6-9. There is an excess of PMC's of the class 3 or compensating type; but in the case of class 1, the non-compensating type, the observed frequency of PMC's is much below the expected. Thus, it appears that under conditions leading to low PMC chiasmata, events underlying chiasma formation in the nonhomologous chromosomes may not be entirely independent of each other.

Besides providing an evidence of compensatory chiasma formation, this study further suggests that the phenomenon can be detected easily under conditions rather stringent for chiasma formation.

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2. The distribution of bivalent chiasmata in maize plants heterozygous for two pericentric inversions.

An investigation was undertaken in maize to determine the effect of inversion heterozygosity on the distribution of chiasmata in maize, since the information on this aspect appears to be meagre.

The material, heterozygous for two pericentric inversions designated Inv. 2a (2S 0.7; 2L 0.8) and Inv. 9a (9S 0.7; 9L 0.9), was synthesized through suitable crosses involving the inversion stocks and a highly inbred line, Ext. 355. Chiasma frequency was studied at diakinesis in PMC's. Data were recorded separately for the longest, the shortest, the sixth and the remaining bivalents. The PMC's were grouped into classes according to chiasmata per PMC. The class-wise distribution of chiasmata was worked out for the longest (presumably chromosome 1), the shortest (presumably chromosome 10) and the sixth bivalent. These distributions were compared with the expected values calculated on the basis of relative pachytene lengths (published data of Rhoades, 1955). Two kinds of comparisons were attempted. Inversion heterozygotes were compared with normal sibs. Further, the pooled data from a number of inbred lines were used to give an idea of the minimum and maximum number of chiasmata in a specific bivalent in different groups of PMC's. Class-wise chiasmata records of the inversion heterozygotes were next compared with these values.

Table 1

Comparison of class-wise distribution of chiasmata in the sixth bivalent in a normal plant and inversion heterozygotes (figures inside parentheses indicate % of PMC's with a particular number of chiasmata).

	Mean bivalent chiasma frequency in PMC's with chiasmata numbering:						
	12	13	14	15	16	17	18
Expected	1.06	1.15	1.23	1.32	1.41	1.50	1.59
Observed in normal plant		1.00 (6.00)	1.00 (14.00)	1.16 (38.00)	1.20 (32.00)	1.50 (8.00)	2.00 (2.00)
Observed in inversion heterozygotes	1.00 (13.30)	1.00 (15.00)	1.20 (33.30)	1.37 (26.70)	1.57 (11.70)		
Minimum and maximum values observed in earlier studies*	0.95 1.07	0.90 1.02	1.00 1.09	1.09 1.19	1.18 1.29	1.29 1.71	1.42 1.71

*Pooled data from several lines (unpublished data of Sinha and Mohapatra, 1967; Sinha and Pany, 1968). Upper and lower figures represent minimum and maximum values, respectively.

The salient points that should be noted from the data in Table 1 are as follows:

(1) Compared with the normal plants, there is a general reduction in the range of total chiasmata numbers in inversion heterozygotes.

(2) As indicated by the pooled data, except in the 17- and 18-chiasmata classes of PMC's, the observed bivalent chiasmata are much fewer than expected.

(3) In normal plants only 2% of the PMC's, those having 18 chiasmata, show more than the expected bivalent chiasmata. In most of the PMC's, the observed frequency is much below the expected frequency.

(4) On the other hand, in plants heterozygous for the inversion quite a high percentage (38.4%) of PMC's show more than the expected frequency of bivalent chiasmata. In about half the PMC's (those with 13-14 chiasmata), the bivalent chiasma frequency almost approaches the expected values.

(5) Thus, there is a well-marked tendency for increase of chiasma frequency in almost all classes of PMC's.

In maize, Rhoades (1955) reported that a reduction in recombination within the limits of the inversion in heterozygous condition leads to a simultaneous increase in the adjacent regions. Bellini and Bianchi (1963) studied the influence of two pericentric inversions in chromosomes 2 and 9 of maize on recombination frequency in chromosomes 9 and 2, respectively. The results of these studies are comparable to those obtained in Drosophila. Thus, within the same chromosomes as well as in heterologous chromosomes, there is evidence of increased crossing over accompanying reduction due to inversion heterozygosity. Further evidence supporting such compensation in maize has been presented recently (Sinha and Mohapatra, 1969). However, as suggested by Sinha and Mohapatra (1969), the magnitude of the compensatory increase would depend on the genotype. In the present investigation, the loss of chiasmata due to heterozygosity for two long inversions appears to be only partly compensated since, compared with the normal material, average chiasma frequency is lower in the inversion heterozygote. There is evidence from the earlier work in this laboratory (Sinha and Mohapatra, 1969), that Ext. 355, the inbred line in which the inversions have been incorporated, does not show compensatory chiasma formation. The results of the present investigation appear to further support the inference regarding Ext. 355. It should be interesting to study the effect of inversion heterozygosity in a genotype showing a high degree of compensation.

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