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Chromosomal repatterning in drosophila: *Drosophila nasuta nasuta* and *D. kohkoa*

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Abstract. Two three-break shifts (transpositions) are detected in a chromosome comparison between *D.n. nasuta* and *D. kohkoa*. Such aberrations are not reported in studies with chromosome comparisons in *Drosophila* species. The probable sequences are given to explain the occurrence of these transpositions.

Keywords. *Nastua* subgroup ; transpositions ; inversions.

1. Introduction

In *Drosophila*, phylogenetic relationships between species can be established by way of analysing the banding patterns in the salivary gland chromosomes. Perusal of the literature reveals that there is notable chromosomal differentiation in some groups of *Drosophila* (Bicudo 1973; Bock 1971; Brncic *et al* 1971; Hsu 1952; Kastritsis 1966; Stalker 1965; Stone *et al* 1960; Wasserman 1962a, b, c) while in others the banding sequences have apparently remained unaltered (Dobzhansky 1972). The latter is referred to as homosequential species.

The members of the *nasuta* subgroup of the *immigrans* group of the genus *Drosophila* have been studied to establish their evolutionary relationships. The members are, *D. nasuta nasuta*, *D.n. albomicana*, *D.n. kepulauana*, *D. kohkoa*, *D. pulaua*, *D. sui*, *D. nixifrons*, *D. pallidifrons*, *D. sulfurigaster sulfurigaster*, *D.s. neonasuta*, *D.s. bilimbata* and *D.s. albostrigata*. This is reported in detail by Rajasekarasetty *et al* (1980). The present paper deals with the chromosome relationship between *D.n. nasuta* and *D. kohkoa*. The nature of banding in *D. kohkoa* is studied in comparison with that of *D.n. nasuta* which is taken as the standard.

2. Materials and methods

As *D.n. nasuta* (of Coorg, Karnataka, India) and *D. kohkoa* (of Gulf of Thailand —University of Texas collection No. 3256·3 # 1) proved to be cross sterile (Rajasekarasetty *et al* 1980), a direct optical comparison of the banding pattern

of the salivary gland chromosomes of both the species were made. The procedure of Ranganath and Krishnamurthy (1975) was used to prepare the salivary gland chromosomes.

3. Results and discussion

The karyotype of both *D.n. nasuta* and *D. kohkoa* includes a pair of metacentrics (chromosome 2), two pairs of acrocentrics (sex chromosome and chromosome 3) and a pair of dots (chromosome 4). The salivary gland chromosome complement of both the species thus includes four long arms representing two arms of chromosome 2 (*2L* and *2R*), chromosome 3, *X* chromosome and a short arm of chromosome 4.

Comparison of banding patterns of the salivary gland chromosome of *D. kohkoa* with that of *D.n. nasuta* revealed that the *X* chromosome and chromosome 2 are homosequential but chromosome 3 of the former species differs from that of the latter by a paracentric inversion named NKo_1 and two three-break shifts (transpositions) named NKo-S_1 and NKo-S_2 (figures 1, 2).

Structural re-organization of the chromosomes during speciation involves either paracentric, pericentric inversions, duplications and/or deletions. Chromosomal differentiation due to these changes (aberrations) have been reported in different groups of *Drosophila*. The uniqueness of the present report is that, in addition to a paracentric inversion, two three-break shifts (transpositions) are also invoved in the chromosomal repatterning in *D. kohkoa*. The existing chromosomal linearity due to transpositions in *D. kohkoa* could be explained by two successive inversions and the probable sequence of which is represented diagramatically in figure 3.

Perusal of the literature reveals that the occurrence of such three-break shifts are very rare. Dobzhansky (*cf.* Patterson and Stone 1952) has expressed that there are no sure cases of three-break rearrangements in *Drosophila* species. Similarly White (1973) has opined that chromosomal repatterning due to transpositions is rare. As far as we know, this occurrence of transpositions is a maiden report of its kind for species comparisons in *Drosophila*.

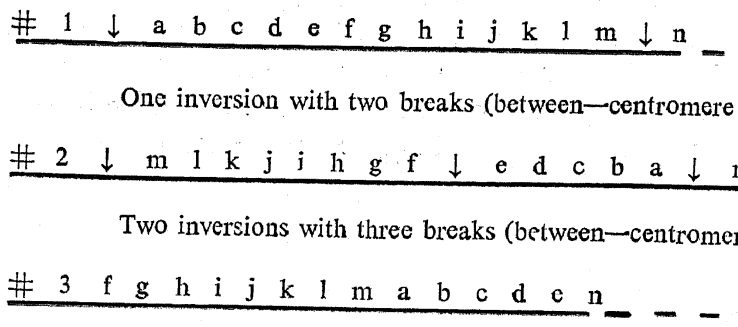
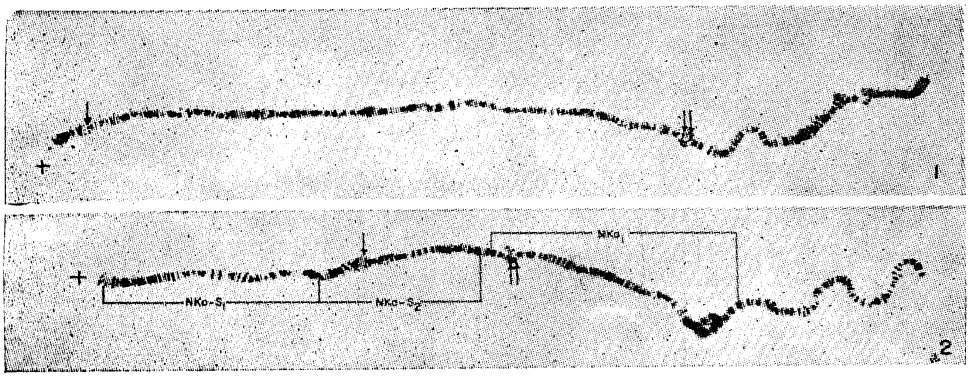


Figure 3. Diagrammatic representation of the possible/probable rearrangements to explain existing linearity of the chromosome 3 in *D. kohkoa* (when compared with chromosome 3 of *D.n. nasuta*, taken as standard).
(# Centromeric end).



+ = Centromeric end.

Figures 1–2. 1. Chromosome 3 of *D. nasuta nasuta*. **2.** Chromosome 3 of *D. kohkoa*.

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