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Research Article

INVERSION POLYMORPHISM OF THE NATURAL (MANDAGADDE BIRD SANCTUARY) AND LABORATORY POPULATION OF *DROSOPHILA NASUTA NASUTA*

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ABSTRACT

Inversion polymorphism of *Drosophila nasuta nasuta* in two localities namely Mandagadde and laboratory population was analyzed. In both the population the inversion is studied, namely 2RA, 2LA, 3A and X. The maximum frequency of 41.9% of 2RA was found in Mandagadde population and less frequency of 38.46% of 2RA was found in laboratory population. Only 2RA inversion is more in natural population than that of the laboratory population. No significant difference was found among other inversions such as 2LA, 3A and X.

INTRODUCTION

Drosophila nasuta nasuta, a widespread species presents a high order structural variability due to inversion in its natural population. It stands one among the chromosomally most variable species in the genus *Drosophila* (Shymala and Ranganath, 1988). Among the several types of chromosomal aberrations the inversions are common. Inversions polymorphism is due to paracentric inversions which occur frequently in the *Drosophila* (Freire-Maia, 1961; Kaufman 1936; Kikkawa, 1938). The degree of chromosomal variability varies in different species of *Drosophila* and also in different populations of the same species. There is an abundant evidence that inversion polymorphism in *Drosophila* reflect environmental changes not only in experimental but also in natural population as well (Da cunha, 1950).

This inversion polymorphism is an adaptive trait of the species. The species living in variable habitats are expected to have a high degree of polymorphism than the species living in less variable habitats (Ranganath and Krishnamurthy, 1972).

The present cytogenetic investigation was undertaken to study the paracentric inversions of the natural populations of Mandagadde Bird Sanctuary area and to compare with that of laboratory population.

MATERIALS AND METHODS

Population samples of *Drosphila nasuta nasuta* were obtained from Mandagadde Bird Sanctuary. Flies were collected by using banana trapping method and net sweeping method (Shyamala and Ranganath, 1988). In banana trapping method bananas were fermented and yeast was used as the bait and bottles were tied to the branches of the trees in cool, shady regions, preferably nearby some water source. After 24 hours, the flies that were trapped in the bottles were brought to the laboratory for further analysis.

In net sweeping method, a mixture of fermenting fruits were spreaded in the forests usually beneath the shaded areas. After 24, the flies were swept using a fine net and transferred to bottles with standard food media. The laboratory stock of *Drosophila nasuta nasuta* species was procured from *Drosophila* stock centre, University of Mysore and cultured and multiplied the stock.

Polytene chromosome preparation was made. The type and the frequency of inversions were scored and recorded, and the inversions were photographed using stereomicroscopic camera.

Chi-square analysis was carried out to test probability and the significance of the inversion frequency of two different populations.

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RESULTS

Chromosomal analysis in *Drosophila nasuta nasuta* revealed the presence of four inversions identified in 2RA, 3A and X. The polymorphic system in two populations under study is not same. The frequencies of the two populations are shown in table-1. The percentage frequencies of four inversions in Mandagadde Bird Sanctuary are 41.9%, 29.0%, 19.35% and 0.96% of 2RA, 2LA, 3A and X. Whereas the percentage frequencies of four inversions in laboratory population are 38.46%, 30.76%, 26.92% and 3.8% of 2RA, 2LA, 3A and X respectively.

The variable frequencies of these four inversions observed in two populations have been subjected to X^2 (chi-square) tests (Table-2). The X^2 test result showed that there is no statistical significant difference in incidence of all four inversions of both natural and laboratory populations.

The data of two populations were compared (Table-3) and the comparisons were made between each inversion of two population. The x^2 values of 2RA, 2LA, 3A and X inversions are 3.1, 2.37, 2.45 and 0.5 respectively. The comparison of 2RA inversion between the two populations is shown to be statistically significant. There is no significant difference for 2LA, 3A and X inversions comparison between two populations.

DISCUSSION

The polymorphism itself may be an adaptive feature of a population. Such populations are better buffered and are able to cope up with different environmental niches. In *Drosophila*, the absence of crossing over in males and selective elimination of dicentric and acentric chromatids during meiosis created the possibility for the groups to use inversion polymorphism in structuring of their population (Freire-Maia, 1961). Earlier studies of Nirmala and Krishnamurthy (1974) and Rajashekarasetty *et al*., (1979) have revealed the total 46 different inverted gene arrangements in different populations of *Drosophila nasuta nasuta*. In our study, among the natural population, the total frequency of inversions in *Drosophila nasuta nasuta* are found to be more and highly variable, and frequency of each inversion also high and it is suggested to be due to eco-geographical factors of the study area. It is considered with the results of other investigations on different species (Shyamala and Ranganath, 1988). The present study on laboratory population revealed that the inversion frequency when compared with natural population is least. It has yielded less number of inversions (26 out of 40) and each inversion frequency is also comparatively less. The result may be mainly due to the reason of prevailing microclimate condition and higher rate of inbreeding among laboratory population.

Table 1 Frequency of inversion polymorphism in natural and laboratory populations of *Drosophila nasuta nasuta*

Population	Number of larvae examined	Number of larvae with inversion	Number of larvae without inversion	Number of inversion				Inversion frequency in %			
				2RA	2LA	3A	X	2RA	2LA	3A	X
Natural	40	31	09	13	09	06	03	41.9	29.0	19.35	09.6
Laboratory	40	26	14	10	08	07	01	38.46	30.76	26.92	3.8

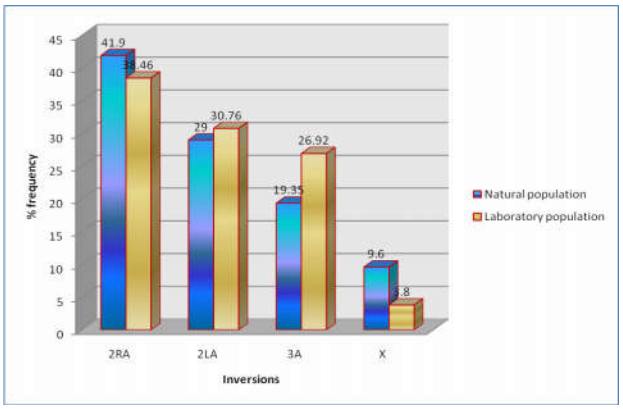

Fig 1 Percent frequency of inversion polymorphism in *Drosophila nasuta nasuta* at two localities

Table 2 Chi-square analysis for the inversion in natural and laboratory populations of *Drosophila nasuta nasuta*

Population	Types of inversion	Observed values	Expected values	X^2	Probability
Natural	2RA	13	10	0.9	0.50 - 0.20
	2LA	9	7	0.57	0.50 - 0.20
	3A	6	5	0.2	0.70 - 0.50
	X	3	2	0.5	0.70 - 0.50
Laboratory	2RA	10	6.5	2.6	0.20 - 0.10
	2LA	8	5	1.8	0.20 - 0.10
	3A	7	4	2.25	0.20 - 0.10
	X	1	1	0.0	-

Table 3 Inversion- wise comparison, values and probability values of two populations of *Drosophila nasuta nasuta*

Types of inversion	X^2 values		Sum of X^2	Probability
	Laboratory	Natural		
2RA	2.2	0.9	3.1	0.10 – 0.05*
2LA	1.8	0.57	2.37	0.20 - 0.10
3A	2.25	0.2	2.45	0.20 - 0.10
X	0.0	0.5	0.5	0.50 - 0.20

* Significant. Table value: P< 0.10

Based on the support of earlier investigations (Shyamala and Ranganath, 1988; Ramesh 1978) and the present study, it can be concluded that the polymorphic system of *Drosophila nasuta nasuta* featuring a wealth of inversions and non random distribution a seen among the other members of *Drosophila*.

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