



**Intra-specific cytogenetic variations among three Drosophilid species, viz., *Drosophila melanogaster*, *Drosophila repleta*, and *Zaprionus indianus* collected along an altitudinal gradient in Garhwal region, India.**

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### **Abstract**

Garhwal region of Central Himalaya is bestowed with highly varied ecological habitats ranging from near tropic to cool-temperate regions, ascertaining its status as a true Drosophilid biodiversity hotspot. The researchers until now have worked extensively towards exploration and taxonomic data-basing of Drosophilid diversity of this region. However, keeping in view diverse ecological conditions prevalent here, it could well be an arena for other research implications like cytogenetics and molecular systematics. Thus, Drosophilid biodiversity was assessed in Garhwal region along an altitudinal gradient and three most abundant cosmopolitan species, viz., *Drosophila melanogaster*, *Drosophila repleta*, and *Zaprionus indianus* were analyzed cytogenetically (for localization of nucleolus organizer region-NOR and variation in Nucleolar chromatin threads-NCTs).

### **Introduction**

Despite the major impact of *Drosophila* cytogenetics in scientific studies, however, cytogenetic studies concerning Drosophilid species inhabiting biodiversity rich Uttarakhand region are still scanty. Considering their wide distribution in the region over such varying ecological habitats, it was interesting to analyze the individuals for intra-specific cytogenetic variations. Thus, sampling surveys were carried out especially in Garhwal region to assess Drosophilid diversity along an altitudinal gradient. Though some species were found to be specialists occupying particular type of habitats, few were cosmopolitan inhabiting highly varied ecological habitats at different altitudes with highly varied temperature regimes and other climatic conditions. Such cosmopolitan species were analyzed cytogenetically (localization of nucleolus organizer region-NOR and variation in Nucleolar chromatin threads-NCTs).

An appealing observation about these threads in different Drosophilid species was that the pattern of the thread-like connection in the matrix of the nucleolus was not constant. The pattern of NCTs varied between species (Barr and Plaut, 1966) but, even between same species collected from different altitudes with highly varied climatic conditions, there was a considerable degree of variation in the morphological configuration of the threads, providing a persuasive tool for future research on evolutionary biology.

### **Materials and Methods**

For the present study different Drosophilid species were collected along an altitudinal transect in Garhwal region especially from Srinagar Garhwal - SG (550m asl, 30° 22' N and 78° 78' E,

District-Pauri), Upper Chamoli - UC (1150m asl, 30° 24' N and 79° 21' E, District-Chamoli), Mandal - MD (1600m asl, 30° 46' N and 79° 26' E, District-Chamoli), Kanchula Kharak - KK (2100m asl, 28° 43' N and 77° 34' E, District-Chamoli) and Chopta - CP (2700m asl, 30° 29' N and 79° 10' E, District- Rudraprayag).

The flies were collected using the net sweeping method and exposing fermenting fruit as baits or directly through aspirator. These flies thus trapped were sorted out and identified under stereo-zoom trinocular microscope. Further, the stock culture from single female, assuming its natural insemination was established in the laboratory. The slides of salivary gland chromosome were prepared by the usual squash method as suggested by Ashburner (1970), analysed and observed directly by captured pictures through dino-lite digital microscope camera for localization of nucleolus organizer region-NOR and variation in Nucleolar chromatin threads-NCTs.

## Results and Discussion

The data obtained through sampling were pooled to furnish a spatial distribution pattern of Drosophilid species inhabiting along different altitudes in Garhwal region. The most abundant cosmopolitan species, viz., *Drosophila melanogaster*, *Drosophila repleta*, and *Zaprionus indianus*, were analyzed cytogenetically. Observations on localization of nucleolus organizer region-NOR and variation in Nucleolar chromatin threads-NCTs in these three species are as follows-

### *Drosophila melanogaster*

The salivary gland polytene chromosome preparation of *Drosophila melanogaster*, depicted that Y Short arm and the proximal part of the X both possess a nucleolus organizer region (NOR). Moreover, the pattern of Nucleolar chromatin threads (NCTs) varied among individuals collected from different altitudes.

Four types of Nucleolar Chromatin Threads were observed in *Drosophila melanogaster* collected from different altitude:

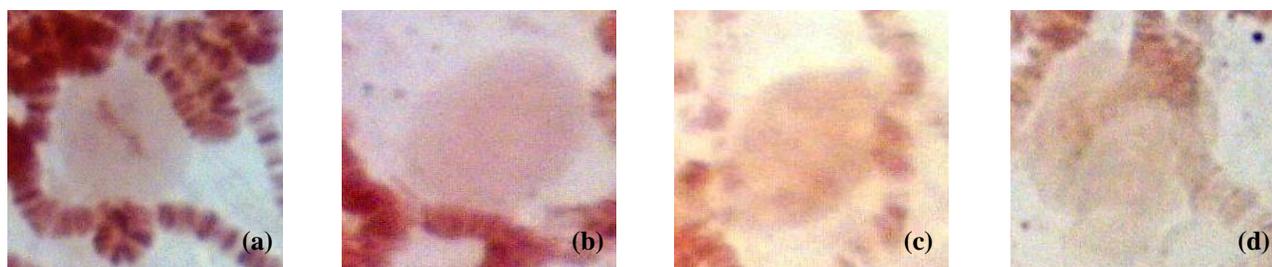


Figure 1. (a) - Chromatin threads not clearly visible highly branched and scattered throughout the Nucleolar mass with a darkly stained body. Sampled at SG and UC; (b) - More than one thread, ramified and with less condensed granules. Sampled at MD; (c) - The threads more condensed, positively stained with many darkly stained granules concentrated towards the periphery of the nucleolus. Sampled at KK; (d) - Many thread, ramified with more condensed granules concentrated at the point of origin. Sampled at CP.

### *Drosophila repleta*

The Nuclear Organizer Regions (NOR) in *D. repleta* was present in both X and microchromosomes. Five different patterns of Nucleolar Chromatin Threads were observed in *Drosophila repleta* collected along altitudinal transect:

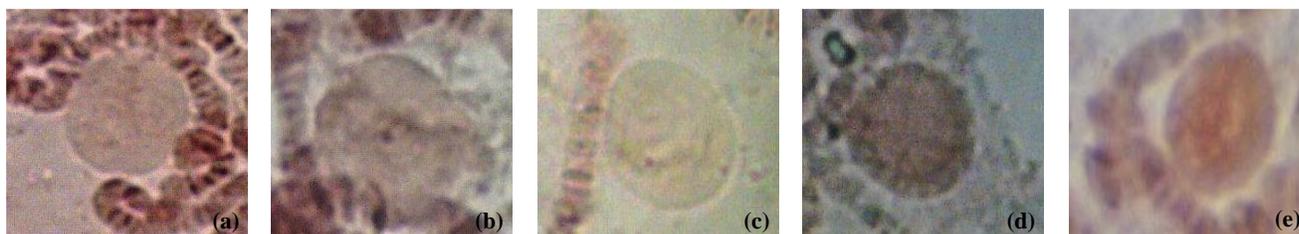


Figure 2. (a) - Nuclear Chromatin Threads thin and scattered throughout the nucleolus with small light granules. Sampled at SG; (b) - Threads branched and scattered throughout the mass but more condensed and prominent in the centre. Sampled at UC; (c) - Many threads, ramified and with less condensed granules. Sampled at MD; (d) - More condensed threads with positive stain and number of darkly stained granules near the periphery. Sampled at KK; (e) - Threads most prominent and more condensed scattered throughout the nuclear mass. Sampled at CP.

### *Zaprionus indianus*

Cytogenetic studies of the polytene chromosomes in the species *Zaprionus indianus* showed localization of the nucleolar organizer region in the X chromosome and in the dot pair. Furthermore, four different types of Nucleolar Chromatin Threads were observed in *Zaprionus indianus* collected at different altitudes:

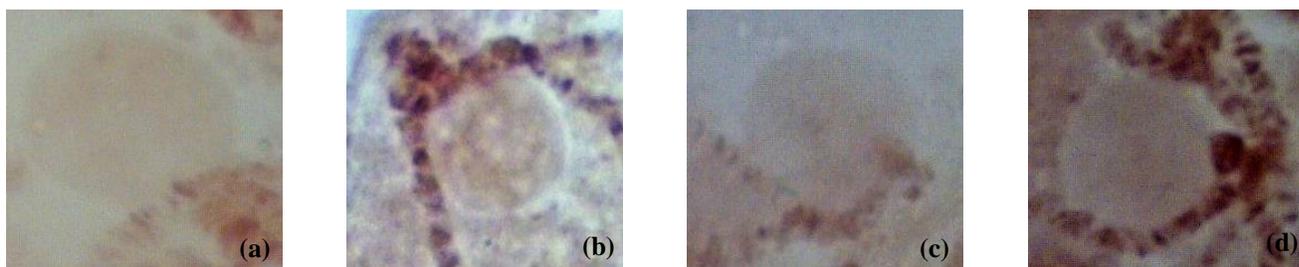


Figure 3. (a) - Thin chromatin threads, scattered throughout the nucleolus with some light granules. Sampled at SG; (b) - Threads condensed with positive stain and several darkly stained granules around the periphery of the nucleolus. Sampled at UC; (c) - Thread not visible, light granules forming a semilunar structure. Sampled at MD; (d) - Thread small with dark stain and a round chromatin mass near the point of origin. Sampled at KK and CP.

Thus, these intra-specific patterns of NCTs among individual flies of the same species collected from different altitudes with highly varied climatic conditions depict a considerable degree of variation in the morphological configuration of the threads, providing a persuasive tool for future research on evolutionary biology.

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**References:** Ashburner, M., 1967, *Chromosoma* 21: 389-428; Barr, H.J., and W. Plaut 1966, *J. Cell Biology* 31: C17-C22.