

Study on the polytene chromosomes of *Chironomus spp.* (Diptera: Chironomidae) in the wetlands of the Savar region, Dhaka district, Bangladesh

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INTRODUCTION & AIM

Chironomids are the members of true flies that belong to the order Diptera of the class Insecta. They are the most diverse group of aquatic creatures found in different ecotops and often mark up of one third of micro-invertebrates in freshwater ecosystems. They are broadly distributed and one of the dominant members of macro-benthic organisms in freshwater bodies. Larvae of this non-biting aquatic midges are emphasized to find out the role of benthic organisms in the function and structure of aquatic ecosystems. They play important role in freshwater ecosystems because of their majestic food values (proteins, fats, carbohydrates, bioactive components) of fishes and many other aquatic predators. Chironomids larvae have distinct salivary gland polytene chromosomes with precise banding patterns. Chromosome arms possess two transcriptionally active sites- Balbiani rings (BRs) and Nucleolar organizers (NOR). Structural changes of the chironomids chromosomes serves as pollution bioindicators in fresh water ecosystem, which is directly related to the ecology of aquatic environment.

- To observe the salivary gland polytene chromosome structural patterns of chironomids larvae
- To carried out the karyotype variation analysis of Chironomids larvae collected from the freshwater ecosystem
- To incorporate the impact of human influence on aquatic ecosystems and the status of conservation of the environment

METHOD

Larval materials were collected from different wetlands of Savar, Dhaka. Fourth instar larva were used for the salivary gland polytene chromosome preparations using the routine aceto-orcein staining method (Keyl 1962 and Barman *et al.* 2021). Experiments were carried out at the Cytology and Biocontrol Research (CBR) lab, Institute of Food and Radiation Biology (IFRB), Atomic Energy Research Establishment, Savar, Dhaka. Larvae were dissected in saline solution; subsequently salivary glands were isolated and fixed in 96% ethanol and a drop of 3:2:1 solution (acetic acid: distilled water: lactic acid). The glands were stained in aceto-orcein for about 15-30 minutes. After staining, salivary glands were squashed for polytene chromosome preparations. Finally, polytene chromosomes were observed under microscope and photographed.

RESULTS

1. Two karyotypes; Type 1 from Jahangirnagar Campus under Pseudo-thummi Cytocomplex and Type 2 from Savar DOHS under Thummi Cytocomplex have been observed.
2. Pseudo-thummi Cytocomplex has AE, CD, BF, G-Chromosome arm combination, whereas Thummi it is AB, CD, EF and G.
3. In Thummi, Chromosome AB (1st) is the longest, CD (2nd), EF (3rd) and G (4th) is the shortest.
4. In Pseudo-thummi, Chromosome BF (1st) is the longest, CD (2nd), AE (3rd) and G (4th) is the shortest in the karyotype set.
5. Arms AB/BF, CD and EF/AE have standard sequences of banding with several puffs and constrictions. Arm G have been observed with its especial features of Balbiani rings (BRs) and Nucleolar organizers (NORs).
6. In both types, BRs (Balbiani ring) and NORs (Nucleolar organizer region) are detected in arm G.
7. Centromeric bands also locate with highly heterochromatic and deeply stained features.
8. In type 2 cytocomplex each NORs are divided in two; in type 1 the BR is appeared as a big puff in arm G.

Type 1; Pseudo-thummi Cytocomplex



Red arrows indicate the centromeric band

Type 2; Thummi Cytocomplex



Red arrows indicate the centromeric band



SIGNIFICANCE OF *CHIRONOMUS* POLYTENE CHORMOSOME

Giant size and constant specific banding structure figured with heterozygous inversions, deletions, deficiencies, amplifications etc. are considered as a good candidate of evaluating the systematics and the genotoxic effects of different mutagenic agents in the ecosystems of *Chironomus* spp. It offers an excellent components to analysis chromosomal aberrations and structural rearrangements that correspondent to the alterations in somatic synapsis as because, each of the band represents a complex and identical chromomeres clinging with solid spiralized DNP (deoxyribonucleo protein) regions.

CONCLUSION

These cytogenetic approaches of the salivary glands polytene chromosome arrangements of *Chironomus* spp. facilitate to analysis the environmental monitoring agent to evaluate the degrees of genotoxicity of the selected wetland ecosystems in Bangladesh. Analysis of the chromosome arms (A-G) help to demonstrate a close relationship in between the described polytene chromosome types, their banding sequences as well as their taxonomic status. Moreover, the morphology and structural features of the banding sequences of each polytene chromosome used as quick and significant tools for the cytotaxonomy of these species in the Chironomidae family.

REFERENCES

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