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CYTOTAXONOMY OF THREE SPECIES OF THE FAMILY CHIRONOMIDAE (DIPTERA)

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INTRODUCTION

While morphological characters and life history stages still remain important in the division of the Family Chironomidae into sub-families and lower taxa, the usefulness of other criteria is being increasingly recognised as such an approach is being directed to a better understanding of the classical systematics. Besides the search for better morphological tools, current trends include the ideas crystallizing from studies on cytological and biochemical aspects. However, the introduction of novel techniques and the ever new characters utilized by resourceful taxonomists merely supplant those of classical workers rather than replace them.

It was Steffan (1966) during the First International Symposium on Chironomidae who presented the salient aspects of earlier cytotaxonomic investigations of this group. Within the genus *Chironomus*, Keyl (1962) employed methods which had advantages, although certain difficulties and limitations were encountered. Those methods were based on investigations in giant chromosomes as they were known to be 'primary' species characteristics, which are known to be not directly influenced by changes in the environment. The banding pattern of these giant chromosomes proved very ideal for such studies. These structures were extensively used in cytotaxonomic studies since they are subject only to heritable variation and unlikely to show convergence. Furthermore, the complexity of banding patterns almost entirely excludes the likelihood of any similarity between species. Differences between species are hence based only on the translocation of complete chromosome arms and inversions. These inversion patterns in many cases have proved as efficient as classical morphological methods, since they show clear chromosomal differences, even while external differences of adults, pupae and larvae were minimal. However, cytotaxonomy is no 'clue all' for the many problems that beset chironomid systematics and would certainly be insufficient by itself.

MATERIALS AND METHODS

The three species studied were *Chironomus costatus* Johannsen, *Nilodorum stupidus* (Johannsen) and *Stictochironomus affinis* (Johannsen).

The chromosome material for the present study came from larvae collected from the field or reared from eggs. Salivary gland squashes were prepared following the technique given by Wulker *et al* (1971) modified slightly by us. The glands were transferred to a clean microscope slide and covered with a drop of 50% acetic acid. The individual cells of the salivary gland were dissected out of the surrounding mass of saliva to ensure a proper squash. (Sublette, personal communication). The dissected salivary glands were subsequently stained and mounted in Lacto-Aceto-Orcein. The detailed banding patterns and their location with reference to the arms in the respective chromosomes (I-IV) along with their puffs, Balbiani rings and the nucleolar regions have been studied employing standardized procedures (Keyl, 1962; Martin, 1968).

RESULTS AND DISCUSSION

Chironomus costatus Johannsen : This has three long and one short salivary gland chromosomes similar to most species of the genus. The three large pairs are metacentric and the small pair is acrocentric. Only 2 inversions have been recorded in the present study. Chromosomes were numbered I–IV in order of length and in each, the right and the left ends were arbitrarily fixed. These ends were later fixed accurately by identifying the bands A-G, corresponding to those recognised by Keyl (1962).

Arm A is usually polymorphic for the genus *Chironomus* and in the present species *C. costatus* a relatively large inversion is seen in the distal half in nearly 50% of the individuals examined. Arm A is heterozygous for inversion, by the presence of a small loop configuration near the distal end.

Chromosome IV is heterozygous for a small terminal inversion as seen near the left end of the arms. Based on the above characters of the I, II, III and IV chromosomes, this species probably belongs cytologically to the *psuedothummi* group, as it has the chromosome arm combinations AE, BF, CD and G. (Keyl, 1962).

Nilodorum stupidus (Johannsen) : This has three pairs of chromosomes which are revealed by the meiotic chromosomes to be meta or submeta-centric. One chromosome was homozygous in all specimens examined, while another had an inversion (which occurred either together or singly) at each end. The third chromosome was heterozygous in males for a very complex inversion, involving much of the chromosome indicating that this polymorphism is sex-linked. However, all the females studied were homozygous for this chromosome. As standard maps do not exist for this genus, the arm could not be designated.

Stictochironomus affinis (Johannsen) : This species also had three pairs of

chromosomes. One of these was heterozygous for an inversion at one end. The other two were homozygous, of which one appeared to have had two inversions recorded in a single specimen only. Once again the lack of standard maps for this genus made the identification of the various arms difficult.

The cytotaxonomic studies on the three species of larvae of Chironomini show that characters in *Chironomus costatus* Johannsen resemble closely the standard map of Genus *Chironomus* (Keyl, 1962). the same number of chromosomes, three pairs metacentric and one pair acrocentric were present in this species also. However, the present species in having only two inversions differs from the otherwise highly polymorphic species of the Genus *Chironomus* found in other parts of the world (Martin, 1966; Keyl, 1962). Further, the arm combinations of AE, BF, CD and G, observed here (Martin, personal communication) places the present species in the *psuedothummi* group (Keyl, 1962) known to be cosmopolitan in distribution (Martin, 1966). The karyotypes of the other two species show three pairs of chromosomes in each of them. Although a number of inversions are visible in both these species, the want of standard maps excludes the possibility of placing them in definite cytotaxonomic groups. These interesting preliminary results clearly indicate the need for more detailed work on the cytotaxonomy of Indian Chironomidae.

SUMMARY

Karyotypes of three species, *Chironomus costatus, Nilodorum stupidus* and *Stictochironomus affinis* all belonging to the tribe Chironomini were examined for cytoxonomic studies. Karyotype of *C. costatus* closely resembles the standard map of the genus, except in having only two inversions, while the genus *Chironomus* is highly polymorphic. The arm combinations observed in the present study places the species in *pseudothummi* group. The other two species could not be placed in definite groups for want of standard maps.

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