KARYOTYPIC STUDIES ON SOME NOCTUID MOTHS

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Abstract

Cytogenetic studies making use of in vitro injection of colchicine and conventional Giemsa staining have been carried out on seven species of Lepidoptera. Chromosomal preparations were made from brain ganglia and testes by using NaCl-acetic Carnoy-air drying method. The chromosomes bore typical dot like or elongated structures. Karyotype of the mitotic metaphase chromosomes on the basis of size and morphology showed 2n=62 in all the seven Noctuid moths presented in this piece of paper. Moreover, different meiotic stages from testis of these species also confirmed their diploid number.

Keywords: In Vitro, Colchicine, Karyotype, Noctuid

Introduction

The Lepidoptera constitute the major group of insects of over 200,000 species. Only a small number of these have been investigated so far. Most studies have been concerned with the chromosomes of the Macrolepidoptera, particularly butterflies. The Microlepidoptera are moths which comprise the majority of species, but have been little studied. Till date very little work has been done on Indian species of Lepidoptera (Nayak, 1975; Rishi, 1973 and Rishi, 1975). The present paper deals with the seven species of Noctuid moths.

MATERIALS AND METHODS:

Different instar larvae of the seven species of moths were collected from their respective host plants from different regions of Jammu. Male and female specimens were fed to maturity in the laboratory. Brain ganglia and testes were processed for chromosome analysis following in vitro colchicine treatment (Rishi et al., 1997) followed by a pretreatment in 0.7% NaCl for 15-20 minutes, the tissues were transferred to 1% sodium citrate for 15 minutes and then fixed in methonal- acetic acid (3:1) for 30 minutes and further processed according to air drying Giemsa technique for slide preparation.
RESULTS AND DISCUSSION:

The cells of brain ganglia of both male and female sexes as well as the male gonads yielded satisfactory results. Early metaphase plates from the brain tissue of female insects showed dot like chromosomes. Sex chromosomes could not be clearly identified in some species. Sex heterochromatin could be used as sex determination and cytogenetic marker to identify sex chromosomes (Makee and Tafesh, 2006). Chromosomal observations on the seven species of Lepidoptera dealt within the present investigation is summarized in Table 1.

Family Noctuidae, a large family of moths is cytologically known by comparatively a fewer number of species. About 74 species of moths have so far been analysed cytologically. Earlier, chromosome numbers of eighteen species from India were reported (Gupta, 1964; Kaur, 1989; Mohanty and Nayak, 1983; Rishi, 1973). During the present investigation, seven species viz, *Spodoptera litura*, *Spodoptera exigua*, *Spodoptera frugiperda*, *Spodoptera littoralis*, *Spodoptera mauritia*, *Earis vitella* and *Trichoplusia ni* have been worked out.

The main cytological features of the seven species are described as under:

1. *Spodoptera litura*: Somatic metaphase (Figure 1) complement exhibited 62 number of chromosomes (2n=62). Somatic karyotype prepared from the somatic metaphase complement of male (Figure 2) exhibited 31 pairs of moderate to small sized chromosomes. The different meiotic stages are shown in figures 3 & 4.

2. *Spodoptera exigua*: Somatic metaphase (Figure 5) complement exhibited 62 number of chromosomes (2n=62). Somatic karyotype prepared from the somatic metaphase complement of male (Figure 6) exhibited 31 pairs of moderate to small sized chromosomes. The different meiotic stages are shown in figures 7 & 8.

3. *Spodoptera frugiperda*: Somatic metaphase (Figure 9) complement exhibited 62 number of chromosomes (2n=62). Somatic karyotype prepared from the somatic metaphase complement of male (Figure 10) exhibited 31 pairs of moderate to small sized chromosomes. The different meiotic stages are shown in figures 11 & 12.

4. *Spodoptera littoralis*: Somatic metaphase (Figure 13) complement exhibited 62 number of chromosomes (2n=62). Somatic karyotype prepared from the somatic metaphase complement of male (Figure 14) exhibited 31 pairs of moderate to small sized chromosomes. The different meiotic stages are shown in figures 15 & 16.

5. *Spodoptera mauritia*: Somatic metaphase (Figure 17) complement exhibited 62 number of chromosomes (2n=62). Somatic karyotype prepared from the somatic metaphase
complement of male (Figure 18) exhibited 31 pairs of moderate to small sized chromosomes. The different meiotic stages are shown in figures 19 & 20.

**6. Earis vitella:** Somatic metaphase complement (Figure 21) revealed 2n=62. Somatic karyotype of male (Figure 22) revealed 31 pairs of moderate to small sized chromosome. Chromosome pairs gradually become shorter from the longest. The different meiotic stages are shown in figures 23 & 24.

**7. Trichoplusia ni:** Somatic metaphase complement (Figure 25) revealed 2n=62. Somatic karyotype of male (Figure 26) revealed 31 pairs of moderate to small sized chromosome. Chromosome pairs gradually become shorter from the longest. The different meiotic stages are shown in figures 27 & 28.

**ACKNOWLEDGMENTS:**

The author is thankful to Dept. Of Zoology, University of Jammu, Jammu-180006 (J&K) for providing the necessary facilities

**REFERENCES**

Table 1  Karyotypic data on the five species of presently analysed Lepidoptera

<table>
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<tr>
<th>S.No</th>
<th>SPECIES</th>
<th>HOST PLANT</th>
<th>DIPLOID CHROMOSOME NUMBER (2n)</th>
<th>HAPLOID CHROMOSOME NUMBER (n)</th>
<th>SEX CHROMOSOME MECHANISM</th>
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<td><em>Brassica oleracea</em></td>
<td>62</td>
<td>31</td>
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<tr>
<td>3</td>
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<td><em>Spinach</em></td>
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<td>31</td>
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<tr>
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<tr>
<td>5</td>
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<td><em>Abelmoschus esculentus</em></td>
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</tr>
<tr>
<td>6</td>
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<tr>
<td>7</td>
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<td><em>Brassica nigra</em></td>
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</table>

FIGURE LEGENDS:
Fig.1 : Somatic metaphase (*Spodoptera litura* - male)
Fig.2 : Karyotype
Fig.3 : Pachytene
Fig.4 : Metaphase I
Fig.5 : Somatic metaphase (*Spodoptera exigua* - male)
Fig.6 : Karyotype
Fig.7 : Pachytene
Fig.8 : Metaphase I
Fig.9 : Somatic metaphase (*Spodoptera frugiperda* - male)
Fig.10 : Karyotype
Fig.11 : Pachytene
Fig.12 : Diplotene
Fig.13 : Somatic metaphase (*Spodoptera littoralis* - male)
Fig.14 : Karyotype
Fig.15 : Diakinesis
Fig.16 : Metaphase I
Fig.17 : Somatic metaphase (*Spodoptera mauritia* –male)
Fig.18 : Karyotype
Fig.19 : Diplotene
Fig.20 : Metaphase I (Polar view)
Fig.21 : Somatic metaphase (*Earis vitella –male*)
Fig.22 : Karyotype
Fig.23 : Metaphase I
Fig.24 : Anaphase I
Fig.25 : Somatic metaphase (*Trichoplusia ni-male*)
Fig.26 : Karyotype
Fig.27 : Metaphase I
Fig.28 : Late Metaphase I