P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-2* ISSUE-5* August- 2017
E: ISSN NO.: 2455-0817 *Remarking An Analisation*

Morphometric Comparison from Somatic Karyotypes of Male and Female *Psyche Casta*

Meenu Sadhotra
Assistant Professor,
Deptt.of Zoology,
Govt. College for Women,
Parade, Jammu

Abstract

Among insects the holocentric chromosomes is widely observed in orders, Hemiptera, Dermaptera. Although evidence suggested the holocentric nature of lepidopteran chromosomes, it is still an open question as stated by White (1973). Cytogenetic studies making use of *in vitro* injection of colchicine and conventional Giemsa staining have been carried out to study chromosomes of Lepidoptera. Somatic metaphases of male & female *Psyche casta* revealed 2n=62. Karyotypes and histograms of both male and female moth were prepared and morphometric comparison was taken into consideration.

Keywords: Holocentric, Lepidopteran, Colchicine, Karyotype, Histogram.

Introduction

Karyological analysis of Lepidoptera has been a difficult task due to small dot-like chromosomes of similar sizes. On account of inadequate techniques in early work, sex chromosomes could not be clearly differentiated from the autosomes in a majority of the species investigated in this group. In respect to Indian Lepidoptera, only meager data are available, namely, 8 by Gupta and Narang (1980); 30 by Rishi (1973); 45 by Mohanty and Nayak (1983); 31 by Kaur (1988) and 7 by Sharma and Bajwa (1992, 1995 a,b). However, the cytological data so far available, including those from neighbouring Nepal do not give satisfactory information to elucidate the cytotaxonomic relationships among lepidopteran species. Therefore, more chromosomal investigations should be done in various taxonomic groups of Lepidoptera.

Aim of the Study

The aim of the present study is to compare the karyotypes of male and female moth of the same family *i.e.* Noctuidae for evolutionary purpose. Identification of a particular set of karyotype will help in taxonomic positioning of various species within the same family and help to calculate the differences of karyotype of both the sexes of specie.

Materials and Methods

Different instar larvae of *Psyche casta* were collected from *Thuja orientalis*, a host plant growing in the vicinity of Jammu University campus. 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). After this, the preparations were made by the usual NaCl-acetic Carnoy-air drying method and stained with 2% Giemsa solution.

The slides were prepared and photographed for karyotypic and morphometric analysis.

Resultsand Discussion

The cells of brain ganglia of both male and female sexes 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 of Lepidoptera. Makee and Tafesh (2006) showed that sex heterochromatin could be used as sex determination and cytogenetic marker to identify sex chromosomes. Somatic metaphase complement of both male and female specimens showed 62 chromosomes in a diploid set *i.e.* 2n=62. Chromosomal observations on male and female species of Lepidoptera (*Psyche* casta) dealt within the present investigation is summarized in Table 1 & 2.

Taxonomic Position

Superfamily : Noctuidea
Family : Psychidae
Order : Lepidoptera
Genus : *Psyche*
Species : *casta*

Table 1 : Morphometric data of somatic karyotype of *Psyche casta* (male- brain) 2n = 62.

Chromosome pair number	Mean total length (μ)	Relative length percent (RL%) (μ)
1	1.221	5.232
2	1.210	5.185
3	1.200	5.142
4	1.174	5.031
5	1.100	4.714
6	0.989	4.238
7	0.960	4.114
8	0.894	3.831
9	0.885	3.792
10	0.864	3.702
11	0.810	3.471
12	0.750	3.214
13	0.744	3.188
14	0.720	3.085
15	0.714	3.060
16	0.702	3.008
17	0.690	2.957
18	0.684	2.931
19	0.642	2.751
20	0.612	2.622
21	0.588	2.520
22	0.540	2.314
23	0.500	2.142
24	0.480	2.057
25	0.450	1.928
26	0.428	1.834
27	0.400	1.714
28	0.393	1.684
29	0.383	1.641
30	0.375	1.607
Z	1.23125	5.271

Morphometric Data Of Somatic Karyotype

Actual mean length of the largest chromosome = 1.231μ
Actual mean length of the smallest chromosome = 0.375μ
Relative length percent of the largest chromosome = 5.271μ
Relative length percent of the smallest chromosome = 1.607μ
Ratio of the largest to the smallest chromosome = 3.282μ
Total mean haploid length = 23.333μ

Somatic Karyotypes

Male Karyotype

Male somatic metaphase, 2n=62 (Fig. 1a). The karyotype of male *Psyche casta* (Fig. 1b) consisted of 31 pairs of elongated chromosomes showing diffused nature. Sex chromosomes (ZZ) were the largest chromosomes. Histogram (Fig.1c) was prepared on the basis of decreasing RL% value from chromosome pair number 1 to 30 but the sex chromosome ZZ showed highest value of RL% (5.271μ) (Table 1).

Table 2: Morphometric data of somatic karyotype of *Psyche casta* (female- brain) 2n = 62.

Chromosome pair number	Mean total length (μ)	Relative length percent (RL%) (μ)
1	0.990	4.032
2	0.960	3.910
3	0.958	3.902
4	0.942	3.837
5	0.936	3.812
6	0.918	3.739
7	0.900	3.666
8	0.900	3.666
9	0.893	3.637
10	0.876	3.568
11	0.876	3.568
12	0.850	3.462
13	0.810	3.299
14	0.780	3.177
15	0.742	3.022
16	0.712	2.900
17	0.707	2.879
18	0.691	2.814
19	0.673	2.741
20	0.661	2.692
21	0.659	2.684
22	0.642	2.615
23	0.640	2.607
24	0.633	2.578
25	0.621	2.529
26	0.615	2.505
27	0.610	2.484
28	0.600	2.444
29	0.599	2.440
30	0.59375	2.415
Z	1.6/1.6= 1.0	4.073
W	0.9/1.6= 0.5625	2.291

Morphometric Data Of Somatic Karyotype

Actual mean length of the largest chromosome = 1.0μ
Actual mean length of the smallest chromosome = 0.562μ
Relative length percent of the largest chromosome = 4.073μ
Relative length percent of the smallest chromosome = 2.291μ
Ratio of the largest to the smallest chromosome = 1.779μ
Total mean haploid length = 24.549μ

Female Karyotype

Female somatic metaphase, 2n=62 (Fig. 2a). The karyotype of female *Psyche casta* (Fig. 2b) revealed 31 pairs of chromosomes showing diffused centromere. One pair of heteromorphic sex chromosomes (ZW) comprised the largest 'Z' chromosome and the smallest 'W' chromosome. Histogram (Fig. 2c) was prepared on the basis of decreasing RL% value from chromosome pair number

1 to 30. Sex chromosome 'Z' showed highest value of RL% (4.073µ) whereas 'W' chromosome showed the smallest value of RL% (2.291µ) (Table 2).

Conclusion

The comparison from both male and female morphometric data generated from somatic karyotypes showed RL% of male sex chromosome (ZZ) is 5.271µ and that of female sex chromosome (Z) is 4.073µ and (W) is 2.291µ. There is no significant variation as we compare the RL% of chromosome pair 1 to 30 of both the sexes of *Psyche casta*.

Acknowledgments

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

Refrences

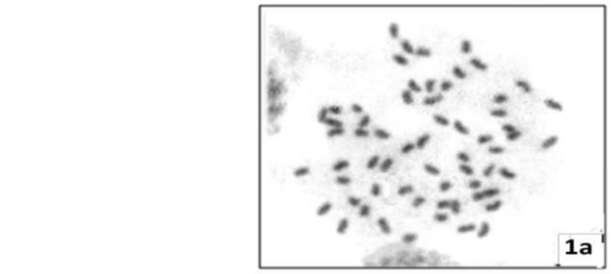
1. *Gupta, M.L. and Narang, R.C. 1980. Chromosome number, sex chromatin and sex chromosome mechanism in some Saturniid moths of India. Entomon,5(1) : 13-18.*
2. *Kaur, T.1988. Chromosome numbers of 31 species of Indian Lepidoptera. Genetica, 76 : 191 – 193.*
3. *Mohanty, P.K. and Nayak,B. 1983a. Chromosomes of seven species of Indian sphingid moths. J. Res. Lepid., 21(4) : 238-244.*
4. *Rishi,S. 1973. Chromosome numbers of thirty species of Indian Lepidoptera. Genen Phalnen, 16(3) : 119-122.*
5. *Rishi, S., Sahni, G. and Rishi, K.K. 1997. Female heterogamety and localized centromeres in Papilio demoleus Lin. (Lepidoptera : Papilionidae). Chromosome Sci. 1: 109-113.*
6. *Sharma, V.L. & Bajwa, R.K. (1992). Karyological studies in two species of butterflies*

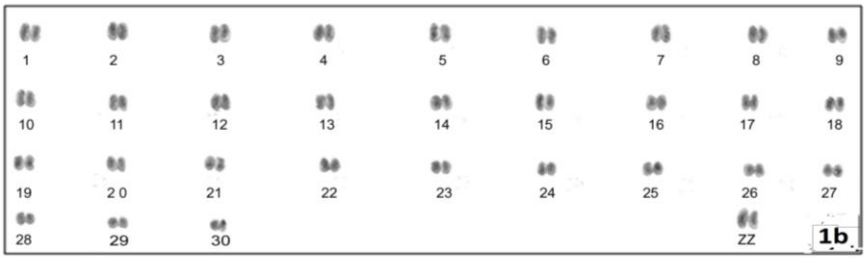
a. *(Pieridae) in India. La Kromosomo II 67-68 : 2298-2300.*

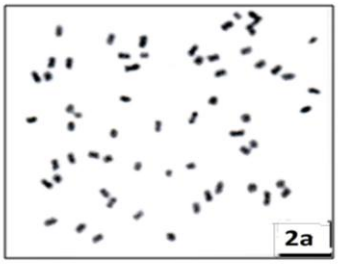
7. *Sharma, V.L. & Bajwa, R.K.(1995a). A study of chromosomes in three species of family*

a. *Nymphalidae. Chrom. Inf. Serv. No. 58 : 22-23.*

8. *Sharma, V.L. & Bajwa, R.K. (1995b). The chromosome analysis in Colias electo (Pieridae) and Hypolimnas bolinac (Nymphalidae) from India. Chrom. Inf.Serv. No. 58 : 25-27.*
9. *White, M.J.D. 1973. Animal cytology and Evolution, 3rd Edition Cambridge University Press, London.*







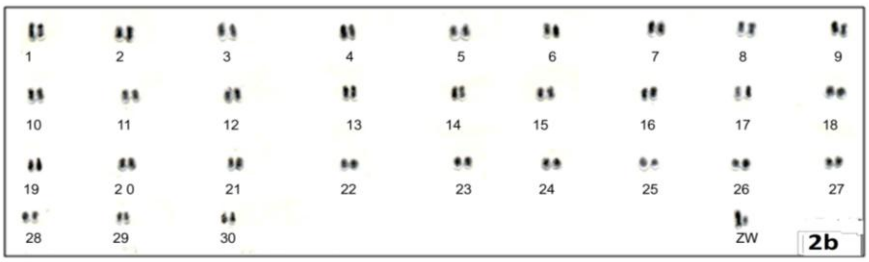


Fig. 1c : Histogram of Male *Psyche casta.*

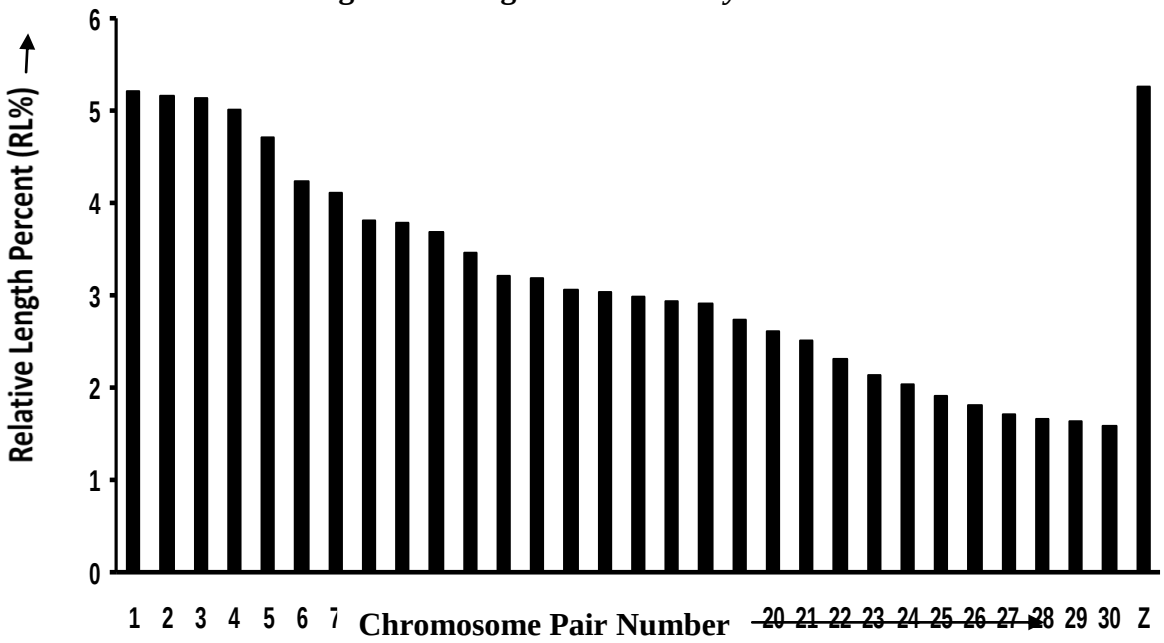


Fig. 2c : Histogram of Female *Psyche*