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Chromosomes in A Lady Bird Beetle Menochilus Marathi Sp. Nov. (Coleoptera: Coccinellidae)

KEYWORDS

S. S. Patil	T. V. Sathe
Department of Zoology, Shivaji University, KOLHAPUR (M.S.), India	Department of Zoology, Shivaji University, KOLHAPUR (M.S.), India

ABSTRACT *A lady bird beetle Menochilus marathi sp. nov. (Coleoptera: Coccinellidae) is biocontrol agent of several homopterous insect pests. Therefore, karyological investigations were carried out in adult male of M. marathi sp. nov. The diploid number of 12 chromosomes was depicted by the spermatogonial metaphase. The karyotypes comprise of 5 pair of autosomes and X and Y sex chromosomes.*

INTRODUCTION

Menochilus marathi sp. nov. (Coleoptera: Coccinellidae) is a potential biocontrol agent of many homopterous pests of agricultural and horticultural crops. Menochilus species have different colour patterns and elytral spots. Hence, any advance knowledge on chromosomes will add great relevance in confirming species diversity of the genus Menochilus. In India, five species of Menochilus have been reported (Sathe and Bhosale, 2001 and Patil and Sathe, 2003). The review of the literature indicates that chromosomal diversity has been studied by Bione et al., (2005a,b) Cabral-de-Mello et al., (2007, 2008) and Colomba et al., (1996) Duff (1970), Beauchamp & Angus (2006) and Dange and Rathore (2010).

MATERIALS AND METHODS

For chromosomal studies, lady bird beetles, M. marathi sp. nov. have been collected from agricultural and horticultural ecosystems and reared in the laboratory (25 ± 10C, to 70 – 75 RH % 12 hrs photoperiod). The methodology adapted in the present study is similar to Ray Choudary and Pyne (1954). Except certain alterations, brief method is given below,

- Injection of 0.01 to 0.03 ml of 0.05 % colchicines to the beetles and keeping them for 6 to 7 hrs at room temperature.
- Dissection of testes separately in 0.067 % NaCl.
- Transfer of the tissue to 0.56 % KCl for 15 to 30 min.
- Treatment to the tissue with 0.09 % Sodium citrate for 60 to 90 min.
- Transfer of the tissue to freshly prepared fixative, allow tissue fixing to 15 to 30 min. material may be stored in this fixative for 2 to 3 months at 40C.
- Transfer of the fixed material to 15 % acetic acid to soften the tissue for 5 to 10 min.
- Softening of tissue with 50 % acetic acid in watch glass and macerating with glass rod.
- Macerating tissue on the slide with the help of glass rod, remove acetic acid with the help of blotting paper.
- Staining the tissue with aceto-orcine for not more than 5 min, put the cover slip, press it gently with thumb finger to spread the tissue.
- Blotting the slide to remove the excess stain, seal the cover slip with the help of nail paint, protect the slid from dust and store at 40C for overnight.

RESULTS AND DISCUSSION:

Results are represented in Figs. 1-5. In M. marathi sp. nov. the diploid number of 12 chromosomes was depicted by the spermatogonial metaphase. The karyotype showed of 5 pair of autosomes and X and Y sex chromosomes. Autosome number 1, 3, 5 to 10 and X and Y sex chromosomes were metacentric while autosome number 2 and 4 were sub metacentric.

The sub family scarabaeinae was studied with respective variations in diploid number by Smith and Virkki (1978) and reported that the sub family scarabaeinae is most karyotypically divers and sex determining mechanism. Hence, supposed to be primitive in the family Scaraeibidae. In Heliocorpris bucephalus (Fabricius), Gymnopleurus dejeani Castelnau, G. gemmatus Harold the diploid number of 20 chromosomes was depicted by the spermatogonial metaphase. Similarly in G. miliaris (Fabricius) the diploid number of chromosomes was 18. In the present form, M. marathi sp. nov. (Coccinellinae; Coccinellidae) the diploid number of 12 chromosomes was depicted by the spermatogonial metaphase.

In the H. bauceohalus the karyotype comprised of 9 pair of autosomes and X and Y sex chromosomes. Autosome pair 1 was metacentric and autosome pair 2 – 9 and X and Y sex chromosomes were sub metacentric. In the present form the karyotype comprised 5 pair of autosomes and X and Y sex chromosomes. Autosome number 1, 3, 5 to 10 and X and Y sex chromosomes were metacentric while autosome number 2 and 4 were sub metacentric.

The smallest diploid number 2n = 3 + neo xy was depicted in Erysternus caribaeus (Carbal -de-Mello, et al, 2007). According to Dange and Rathore (2010) the relative large size of pair 1 was corresponded to the largest elements of the complement, characterized a karyotypic asymmetry in the species. Chromosomal evolution in scarabaeidae has been studied by Bione et al, (2005 a,b,), Cabral-de-Mello et al, (2007, 2008) and Yadav and Pillia, (1979) and stated that the reduction of the diploid number to 2n = 18 and relatively large size of pair 1 when compared to the other chromosomes of the karyotype suggest the occurrence of a peri-centric inversion followed by a fusion between autosomes from an ancestral karyotype with 2n = 20. According to Virkki (1957) the sub family Geofrupinae is anatomically close to Corprinae than any other sub family. However, family Coccinellidae and its sub families are not attempted widely except the work of Beauchamp and Angus (2010) wherein they studied 4 British species of the lady bird beetles, Coccidula rufa (Herbst), C. siutellata (Herbst), Rhyzobius chrysomeloides (Herbst) and Rh. Litura (F.). In C. rufa and C. siutellata 9 pairs of autosomes and sex chromosomes XYp (♂) and XX ♀were reported with sex chromosomes X and Y.

The present work will be helpful for confirmation of morphologically identified species and also to study anatomical evolution of the family Coccinellidae, which is economically very important and provides bio-control agents for insect pest control by biological means as eco-friendly control.

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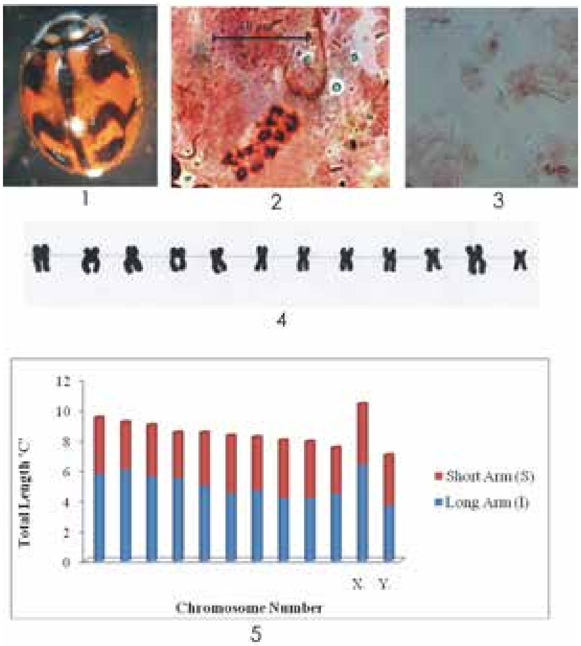

Fig.- 1 : Menochilus marathi, Fig.- 2 :Spermatogonia mitotic metaphase-I
Fig.- 3 : Permatogenic meiotic metaphase-I, Fig- 4 : karyograph,
Fig.- 5 : Ideograph.

Table 1
Morphometric characteristic of the chromosomes of Menochelus marathi sp. nov.

Chromosome No.	Long Arm (l)	Short Arm (S)	Total Length (C = l + S)	'd' Value (l – S)	'r' Value (l / S)	'i' Value (S / C X 100)	Centromeric position
1	5.8	3.7	9.5	2.1	1.5675	38.9473	M
2	6.1	3.1	9.2	3.0	1.9677	33.6955	SM
3	5.6	3.4	9.0	2.2	1.6470	37.7777	M
4	5.5	3.0	8.5	2.5	1.8333	35.2941	SM
5	5.0	3.5	8.5	1.5	1.4285	41.1764	M
6	4.5	3.8	8.3	0.7	1.1842	45.7831	M
7	4.7	3.5	8.2	1.2	1.3428	42.6829	M
8	4.2	3.8	8.0	1.5	1.1315	47.5000	M
9	4.2	3.7	7.9	1.5	1.1351	46.8354	M
10	4.5	3.0	7.5	1.5	1.5000	40.0000	M
X.	6.4	4.0	10.4	2.4	1.6000	38.4615	M
Y.	3.7	3.3	7.0	0.7	1.1212	47.1428	M

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