

RESEARCH ARTICLE**CHROMOSOMAL ANALYSIS OF PREDATORY BEETLE, COCCINELLA SEPTEMPUNCTATA (COLEOPTERA: COCCINELLIDAE) FROM JAMMU REGION (J&K), INDIA*****Arshad Ayoub Bhatti., Tripathi, N.K., Anita and Khajuria, M**

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ABSTRACT

In the present study, the chromosomes of a predatory beetle, *Coccinella septempunctata* commonly called seven spotted ladybird beetle were studied from Jammu (J&K). The ladybird beetles are bio control agents for controlling the populations of aphids, scale insects and mealy bugs. The observed diploid number of the species was $2n=20$. Meiotic observations included the stages metaphase I, zygotene, diplotene and anaphase I. The sex chromosomes (Xy) include acrocentric X chromosome and a small rounded y chromosome.

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INTRODUCTION

After first green revolution in India, the fertility of land was exhausted due to excessive use of chemical fertilizers and pesticides including herbicides and insecticides. Heavy treatment of soil with pesticides can cause decline in populations of beneficial soil microorganisms. (Akhtar et. al; 2009). This may lead to decrease in soil fertility. There are some natural bio control agents that are useful in controlling the pests of crop vegetation. The majority of Coccinellids are beneficial predators and have received considerable research attention because of their potential as biological control agents (Helen Roy, Alain migeon, 2010). These coccinellid beetles commonly called as lady bird beetles are beneficial for controlling the populations of aphids, scale insects and mealy bugs (Hoffmann and Botha, 2011). *Coccinella septempunctata* is useful to a large extent in controlling the populations of crop pests (Deligeorgidis et al; 2005). Considering the economical importance of this predatory beetle cytological analysis has been done during present investigation to know about its chromosomal number and male meiosis.

MATERIAL AND METHODS

Adult specimens of *C. septempunctata* were collected from botanical gardens of University of Jammu during May-June 2013. Only adult males were selected for present chromosomal studies. Male beetles were recognised by their small size as compared to the adult female beetles. Slides were prepared by staining method described by Rozek, 1994 with some modifications.

Adult male specimens were anaesthetised and dissected on a glass slide in order to remove testis. Tissue was placed in 0.7% KCl hypotonic solution for 20-25 minutes. After hypotonic treatment, gonads were placed in freshly prepared Cornoy's fixative (3:1 absolute methanol and glacial acetic acid) for 10-15 minutes. Then the slides were prepared by dabbing method and air dried. Dried slides were stained in 2% giemsa phosphate buffer solution (pH=6.8) for 15-20 minutes. Stained slides were scanned under Olympus camera aided

microscope and results were photographed under CH20i BIMF microscope attached with Sony SSC-DC378P camera under 1000x magnification.

RESULTS

Spermatogonial metaphase shows 20 chromosomes i.e. $2n=20$ (fig.1). The complement consists of 14 metacentric chromosomes, 2 submetacentric chromosomes, 3 acrocentric chromosomes and a minute spherical body as y chromosome. Most of the metacentric chromosomes are C-shape in morphology. The sex chromosomes include acrocentric X chromosome and a minute spherical body that may be acrocentric as y chromosome, so the sex pair is Xy. The diploid chromosome number is also confirmed through the bivalent metaphase I stage (fig. 3-A) in which 9 autosomal bivalents are present and a sex bivalent Xy showing parachute type morphology. The metaphase I of meiosis shows that the autosomal bivalents become highly condensed and their chiasmata seems to be terminalised. The haploid complement (Fig. 3-A) consists of 9 dumbbell shaped autosomal bivalents and a heteromorphic Xy complement showing parachute type morphology (Fig. 3A arrow).

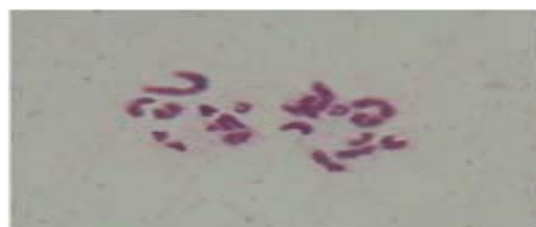


Figure 1 *C. septempunctata*. Spermatogonial metaphase.

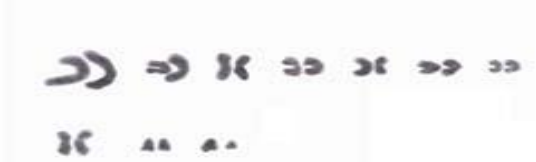


Figure 2 Karyotype of *C. Septempunctata*

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Table 1 Morphometric data of karyotype of male *Coccinella septempunctata* showing $2n=20$ (14M+2SM+2A+Xy)

Chromosome pair number	Mean length of the short arm (p) in μm	Mean length of the long arm (q) in μm	Absolute length of the chromosome (p+q) in μm	Arm ratio (q/p)	Centromeric index	Nomenclature
1	1.2	1.3	2.5	1.08	48	Metacentric
2	0.81	0.84	1.65	1.03	49	Metacentric
3	0.65	0.69	1.34	1.06	48.50	Metacentric
4	0.44	0.81	1.25	1.84	35.2	Sub-metacentric
5	0.55	0.60	1.15	1.09	47.82	Metacentric
6	0.45	0.48	0.93	1.06	48.38	Metacentric
7	0.44	0.46	0.90	1.04	48.88	Metacentric
8	0.36	0.39	0.75	1.08	48	Metacentric
9	0.11	0.40	0.51	3.63	21.5	Acrocentric
X	0.10	0.35	0.45	3.5	22.22	Acrocentric
y	-	-	-	-	-	-

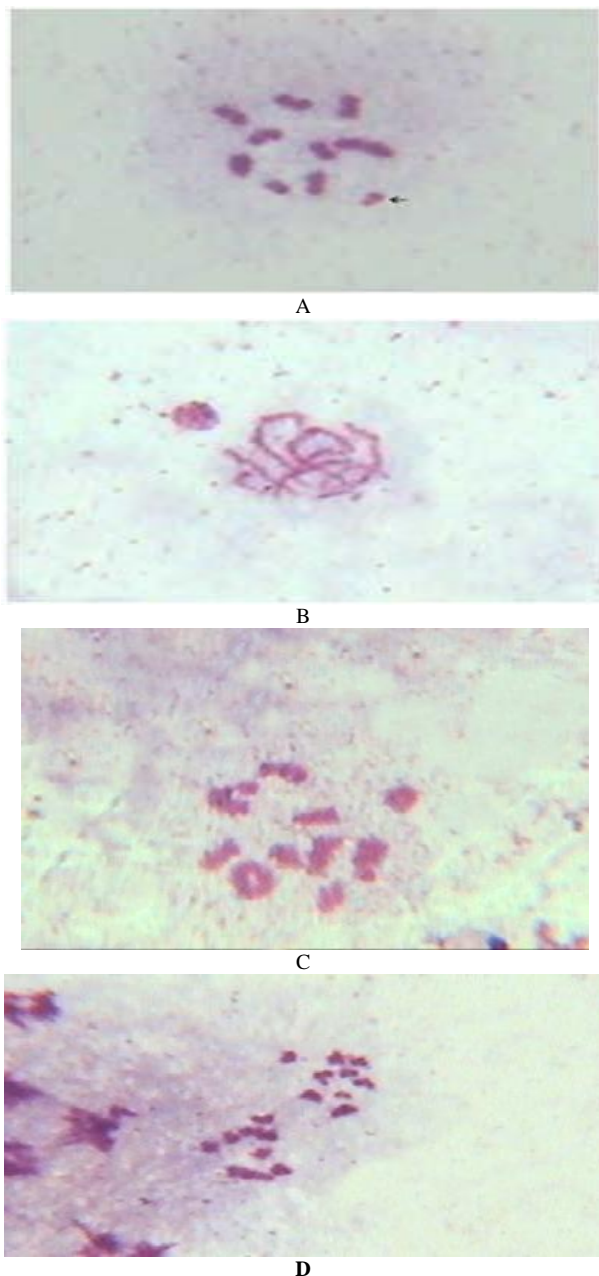


Figure 3 *C. septempunctata* meiosis. A- metaphase I (bivalent stage), arrow showing parachute type sex chromosome pair, B- zygotene, C- diplotene, D- anaphase I.

DISCUSSION

Coccinella septempunctata presented a chromosome number of $2n=18+Xy$ for males. The chromosome number and the “parachute” configuration during metaphase I agree with the descriptions for most coleoptera species, probably

representing the typical karyotype, especially in the polyphaga suborder (Smith, 1950; Smith and Virkki, 1978). Chromosomal data on several members of family coccinellidae had been described (Smith, 1953).

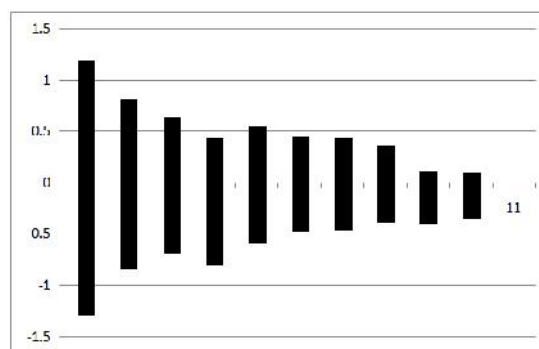


Figure 4 Idiogram of *Coccinella septempunctata*

The chromosome number of 76 coccinellid beetles including the present studied species were reported (Takenouchi, 1976). Chromosomal work on *C. Septempunctata* was carried by Uma Agarwal (1961). Most of the metacentric chromosomes were V or J shaped (Agarwal, 1961). Agarwal (1961) observed the presence of a minute spherical body as y chromosome but the size of the y chromosome shown by the author is somewhat larger and seems to be acrocentric. The diploid number of 20 was also reported from another genus, *Epilachna* of family coccinellidae (Bisoi and Patnaik, 2014).

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