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Relative studies on the median neurosecretory cells and primary oocytes in the female *Dysdercus cingulatus* (Hemiptera: Pyrrhocoridae)

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Abstract :*Dysdercus cingulatus* is a common pest of cotton plants. The neurosecretory cells are found in the Protocerebrum of the brain. The median neurosecereteory cells (MNSC) of female *Dysdercus cingulatus* is one of the most important neuroendocrine glands which play a central role in the development of oocytes in the ovariole. The relative studies on the development of median neurosecretory cells and the development of primary oocytes were investigated from freshly moulted female to oviposited female *Dysdercus cingulatus*. The median neurosceretory cells have increased activity in relation to the development of primary oocytes in the ovariole of the female. In freshly moulted female, the median neurosecretory cells contained little statiable neurosecretory material (NSM) and the primary oocytes have grown minimum in size with little amount of yolk. In seven days to nine days old female, the median neurosecretory cells and the primary oocyte also developed with increased amount of yolk. In twenty four days old female, the median neurosecretory cells and the primary oocytes were attained maximum in size but neurosecretory cells contained sparse amount of neurosecretory material (NSM) in their perikarya during the oviposition. The median neurosecretory cells shows increased activities during the entire period of the maturation of primary oocytes and formation of eggs in the ovaries of female *Dysdercus cingulatus.*

.**Keywords: Median neurosecretory cell, Primary oocyte, Neurosecretory material, Oviposition, Egg.**

INTRODUCTION

Dysdercus cingulatus is commonly known as Red cotton bug. This insect is a pest of cotton, okra and lady's finger. It is a fast breeding Hemipteran insect. Fuseini and kumar (1975) have described the Ecology and morphology of cotton stainer. Dogra and Srivastava (1977) have describe the morphological and histological studies on the neuroendocrine system of the sugarcane leaf hopper. Khan et.al (1978) have described the four group of NSC in the brain of the larvae of calliphora. Agarwal and Faruqui (1978) have described the cerebral neurosecretory cells with their histology in the adult male of *p.picuts.* Ahmad (1980) has investigated the cytological effects of tepa on the reproductive organs of *Dysdercus cingulatus*.

Panov (1980) and perihar (1984) have described the structure of neurosecretory cells with their NSM and structure of eggs in insect. Partridge et.al (1987) describe the effect of NSM on the egg production rate of female *Drosophila melanogaster.* Bhide (1987) describe the histopathology of the ovaries in *Dysdercus similis*. Kasule (1991) has studied on the size of eggs with maternal age in the cotton stainer bug, *Dysdercus fasciatus.* Happ (1992) has studied on the maturation of the male reproductive system and its endocrine regulation in insects. Frank and Axel (1996) have studied on the yolk formation and deposition of lipids in the telotrophic meroistic ovariole of *Dysdercus intermedius.* Venugopal and Kumar (2000) had described the role of Juvenile hormone in the Synthesis of vitellogenesis in the red cotton stainer. Kohno and Thi (2004) have described the effect of host plant on the

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development of reproductive organs in *D.cingulatus*. Hassan et al (2012) describe the neuroendocrine activity in relation to oocyte development in *P.pictus.* Sahayaraj and Belsigladis (2012) have studied on impact of Sea water on the development and reproduction of red cotton bug, *D. cingulatus*.

Hence in the present studies the median neurosecretory cells and their NSM were attempted to determine the active role of on the growth and development of primary oocytes of female *D.cingulatus.*

MATERIALS AND METHODS

The male and female *Dysdercus cingulatus* were collected from their natural habitat and reared in the cage of laboratory at room temperature 30^0C to 32^0C and R.H 80 to 82 percent. Adult males and females of *D.cingulatus* of known ages were obtained from the laboratory cage for research work. The freshly moulted, copulated and oviposited females were selected for the investigation of the median neurosecretory cells and primary oocytes. After observation, the brain and the ovaries were dissected out at different intervals of the time and fixed in fixative (Bouin's fluid & Carnoy's fluid). The brain along with neurosecretory cells and the ovarioles were cut at 7µ to 8µ and stained with paraldehyde Fuchsin (PF) stain for studies of neurosecretory cells. The section of oocytes were also stained with Eosin and haematoxylene stain for studies of primary ooctyes of *D. cingulatus.*

RESULTS AND DISCUSSION

In freshly moulted (1 day old) females, ten (10) median neurosecretory cells (MNSC) were observed in the protocerebrun of *Dysdercus cingulatus*. Out of ten MNSC, 3-MNSC contained sparse neuro sectetory material (NSM), 2 MNSC contained moderate and 5-MNSC contained abundant amount of NSM. The average size of MNSC were measured 18µ to 20µ and the size of nucleus was 8µ to 10µ at large cross section area (Fig.-1a). At this stage, the primary oocyte was less developed and measured 0.30 mm to 0.50 mm in diameter (Fig-2a). In three (3) days old females, 14-MNSCs were found in the brain. In which, 5-MNSC contained sparse amount, 4-MNSC contained moderate amount and 5 MNSC have abundant amount of NSM in the perikarya. The size of MNSC were measured 20µ to 22µ and size of nucleus 10µ to 12µ at large cross section area. At this stage, the primary oocyte was developed and measure 0.60 mm to 0.80 mm in diameter (Tab.-1).

In Six (6) days old females, the MNSC were observed eighteen (18) in number of the brain. Out of these, 4-MNSC had sparse amount, 6-MNSC had moderate amount and 8 MNSC had abundant amount of NSM. The size of MNSC were measured 24µ to 26µ and nucleus measured 14µ to 16µ in diameter. At this stage, the primary oocytes was developed and measured 1.00 mm to 1.20 mm in diameter (Fig.-4).

In nine (9) days old females, the twenty two (22) MNSC were observed in the brain of mated female. Out of 22-MNSC, 4-MNSC had sparse, 8-MNSC had moderate and 10-MNSC had observed abundant amount of MNSM in their Perikarya. The size of MNSC was measured 28µ to 30µ and the size of nucleus measured 18µ to 20µ in diameter. (Fig.-1b) At this stage the size of primary oocyte were measured 1.50 mm to 1.70 mm in diameter (Fig.-2b). In twelve (12) days old females, the twenty four (24) MNSC were observed in the brain of the insect. Out of these cells, 2-MNSC had observed sparse, 8MNSC had moderate and 14 MNSC had abundant amount of NSM the size of MNSC were increased and measured 34µ to 36µ and the size of nucleus also increased and measured 24µ to 26µ in diameter (graph-1). At this stage, the primary oocytes were also developed and measured 1.90 mm to 2.10 mm in diameter.

In fifteen (15) days old females, the number of MNSC were decreased and counted twenty (20) in number. Out of these cells 2MNSC had sparse amount, 8-MNSC had moderate amount of NSM and 10-MNSC had abundant amount of NSM. The size of MNSC was also increased and measured 38µ to 40µ and size of nucleus measured 20µ to 30µ in diameter (Fig.-1c). At this stage, the primary oocyte were also increased in size and measured 2.30 mm to 2.50 mm in diameter (Fig.-2c). In eighteen (18) days old female, the number of MNSC were also decreased and counted sixteen (16) cells. Out of these cells, two (2) MNSC had sparse, 4 MNSC had moderate and 10-MNSC had abundant amount of NSM in their Perikarya. The size of MNSC was increased and measured 42µ to 44µ in diameter and nucleus size was 32µ to 34µ. At this stage, the primary oocytes was also increased and measure 2.8 mm to 3.00 mm in diameter. In Twenty one (21) days old female, the number of MNSC were also

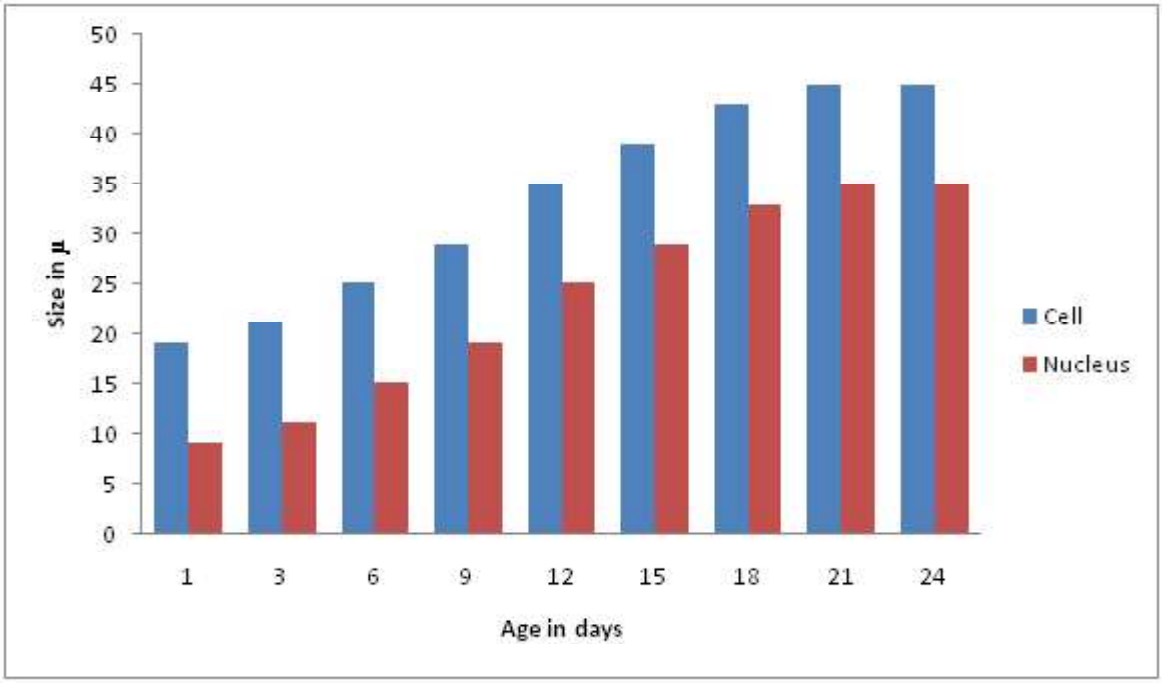
decreased and counted fourteen (14) cells (Table-1). Out of these cells, 3 MNSC contained sparse amount, 4-MNSC contained moderate amount and 7-MNSC had abundaut amount of NSM. The size of MNSC was less increased and measured 44µ to 46µ and the size of nucleus was 34µ to 36µ in diameter (Fig.-1d). At this stage, the size of primary ooctye was also increased and measured 3.00 mm to 3.2 mm in diameter (Graph-2). It was now got fully matured with chorion and abundant amount of yolk in primary oocyte (Fig-2d). In Twenty four (24) days old female, the number of MNSC had same number and they also contained same sparse, same moderate and same abundant amount of NSM as 21 days old female. The size of the cell and nucleus were also similar as twenty one days old female. At this stage, the primary oocyte was fully mature and formed an egg. The egg was measure 3.2 mm to 3.5 mm in diameter of the female *Dysdercus cingulatus.*

Present studies on median neurosecretory cells and primary oocytes in the female *Dysdercus cingulatus* have great resemblance with Thomsen (1952), Philip (1986) and Bag well et al. (2008) in Calliphora. The number and size of median neurosecretory cells were increased as well as increased the size of primary oocyte in different ages of the *D.cingulatus*. These activities were indicated with the studies of the insect of strong (1965), Leopard (1976) and Panov (1980) and supported the present research work.

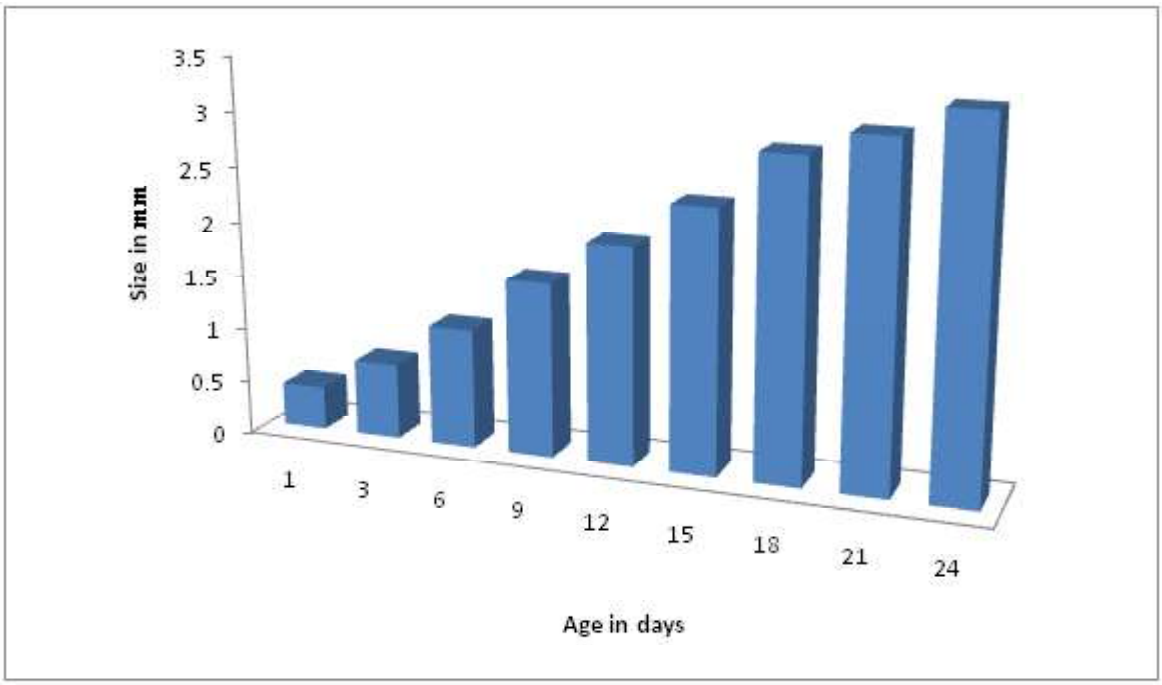
Relative studies on the median neurosecretory cells and primary oocytes of *D.cingulatus* indicated close resemblance with Elliatt & Stay (2007) in *R. flavipis*. Kiyoto Makewa et. al (2009) and Bifano et. al (2010) in R. speratus *P.pictus*. The median neurosecretory cells (MNSC) and their neurosecretory material (NSM) have increased and positive effect on the development of primary oocytes of the female *D.cingulatus.*

Table 1:Morphometary of median neurosecretory cells (MNSC) and primary oocyte in different ages of the adult female *D. cingulatus*

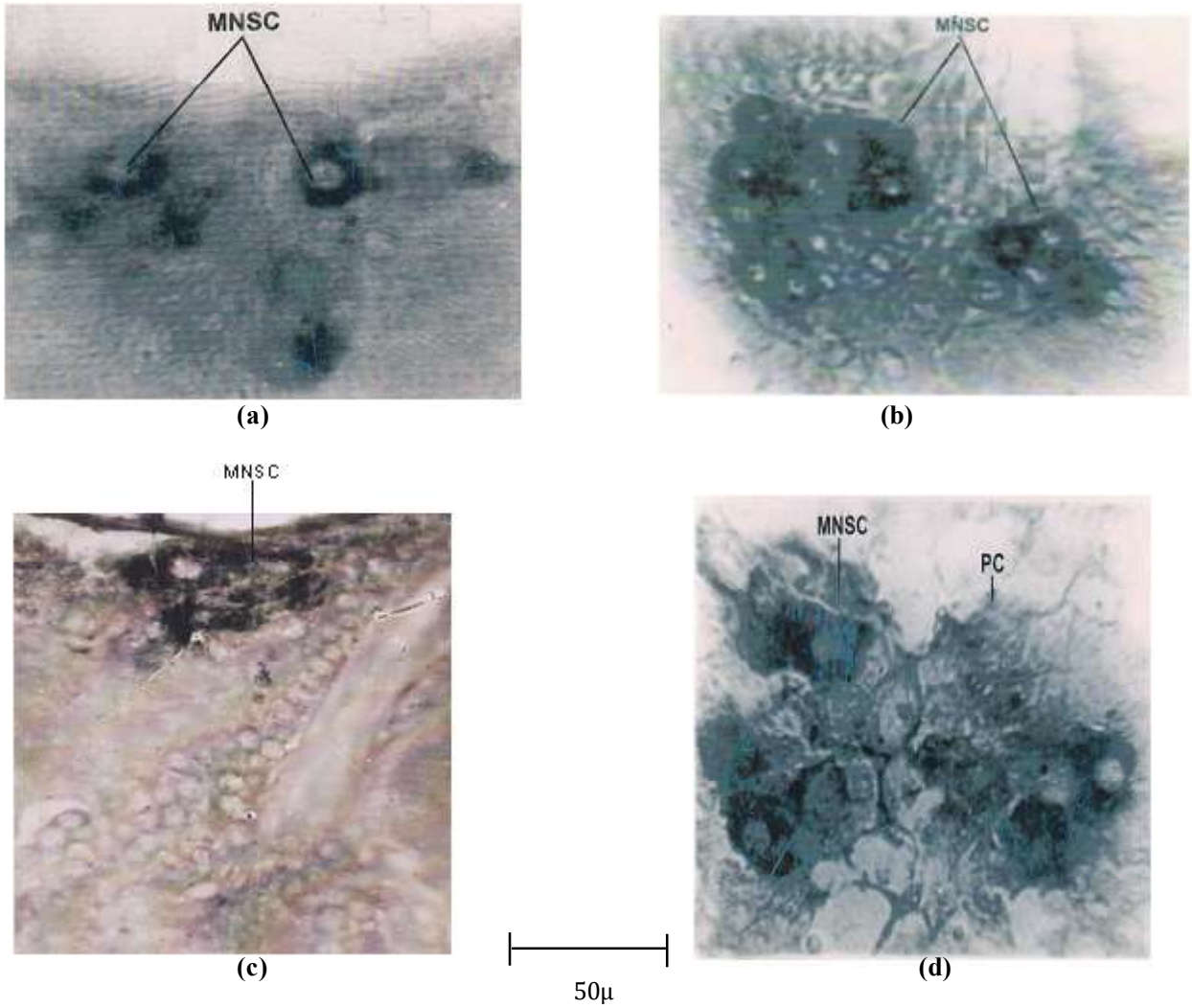
Age of Females	No. of MNSC	No. of sparse NSM Cells	No. of moderate NSM Cells	No of Abundant NSM Cells	Size of MNSC (µ)	Size of Nucleus (µ)	Size of Primary oocyte (mm)
1-day	10	3	2	5	18-20	8-10	0.3-0.5
3- days	14	5	4	5	20-22	10-12	0.6-0.8
6- days	18	4	6	8	24-26	14-16	1.0-1.2
9 -days	22	4	8	10	28-30	18-20	1.5-1.7
12- days	24	2	8	14	34-36	24-26	1.9-2.10
15-days	20	2	8	10	38-40	28-30	2.3-2.5
18-days	16	2	4	10	42-44	32-34	2.8-3.0
21-days	14	3	4	7	44-46	34-36	3.0-3.2
24-days	14	3	4	7	44-46	34-36	3.2-3.5



Graph 1: showing the size of cell & Nucleus of MNSC in adult female *D.cingulatus*

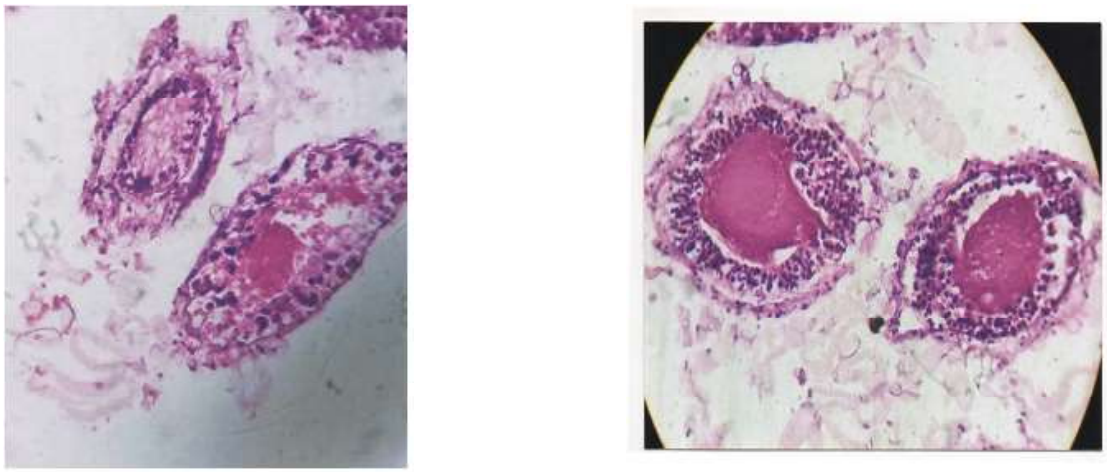


Graph 2: Showing the size of primary oocytes in adult female *D.cingulatus*

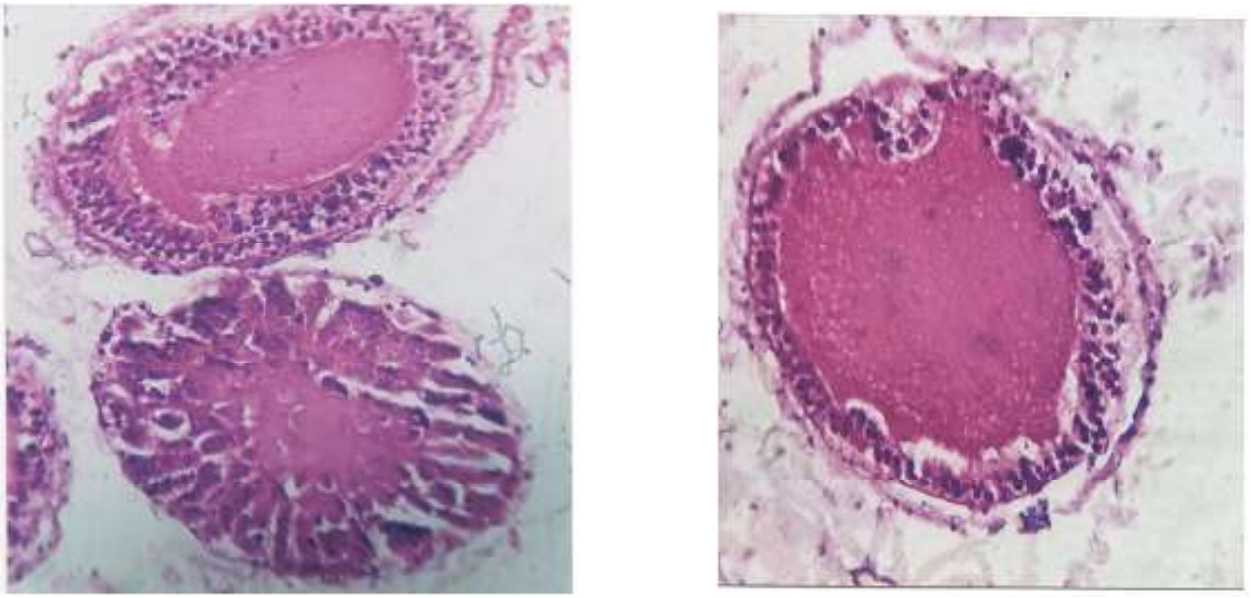


(a) **(b)** **(c)** **(d)**

Fig. 1 – Photo micrograph of MNSC in (a) 1 day, (b) 9 days, (c) 15 days & (d) 21 days old female *D.cingulatus*



(a) **(b)**



(c) **(d)**

Fig. 2 – Photomicrograph of Primary oocytes in (a) 1 day, (b) 9 days, (c) 15 days & (d) 21 days old female *D.cingulatus*

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