

The lateral neurosecretory cells and mating instinct in male *Dysdercus koenigii* (Hemiptera: Pyrrhocoridae)

M. P. Sinha, S. L. Sahni and D. P. Sinha¹

Department of Zoology, Science College, University of Patna, Patna 5 (India), and Department of Zoology, Magadh University, Gaya (India), 13 April 1977

Summary. 5 pairs of median and 1 pair of lateral neurosecretory cell groups occur in the protocerebrum of male *Dysdercus koenigii*, a hemipteran pest on *Hibiscus esculentus*. The lateral neurosecretory cells (LNSC) are in a state of peak activity when the male engages itself in copulation. 24 h later, the LNSC are found to be inactive, but they again resume their activity 96 h after commencement of copulation. Such males soon start mating if they find another receptive female. It is believed that the secretion of LNSC in male *Dysdercus koenigii* is responsible for the onset of the urge for mating just as in female insects.

Studies on the endocrine control of reproduction in *Dysdercus koenigii*, a hemipteran pest in India on the common ladies finger plant (*Hibiscus esculentus*) have revealed a very interesting relationship between mating and the activity of the lateral neurosecretory cells (LNSC) in the protocerebrum of male insects.

6 paired groups of neurosecretory cells (NSC) occur in the protocerebrum of the brain of both male and female individuals. Apart from 5 pairs of median neurosecretory-cells (MNSC), there is a lateral group of 5 NSC arranged in a linear fashion in the mediolateral position of the protocerebrum. The LNSC first make their appearance in the fifth nymphal instar.

The male insect engages itself in mating 10–48 h after emergence. It moves into the vicinity of the female and exhibits a courting behaviour by moving around her in a circle and making frequent contact with her abdomen. After a few min, the male and the female orient their bodies in such a way as to have their head ends facing in opposite directions and the posterior ends of their abdomen come to lie in close contact facilitating an intimate genital connection. Mating continues for 100–114 h, i.e. until 6–10 h before oviposition by the female. During the first 96 h, the mating individuals are inseparably united, but after this period, the intimacy of sexual union becomes loose and the male separates if disturbed. The mating individuals occasionally separate after 96 h of mating, but such males again copulate with fresh virgin females. After disengagement, the male continues to be very active, flies from place to place in search of a female, and starts copulating after finding a receptive individual. Histological examination of paraldehyde-fuchsin stained sections (6 μ m thick) passing through the protocerebrum

to show the secretory activity of the brain NSC of the male insect has revealed that the LNSC are packed with neurosecretory material and they attain their maximum size as soon as a freshly emerged adult engages itself in copulation. The axons of such cells contain an abundant amount of neurosecretory material. These cells have a small amount of secretion by 24 h after commencement of copulation and this state is maintained until 96 h when they are again seen to be packed with neurosecretory material with evidence of passage of the secretion through the axons. Observations on the LNSC of male *D. koenigii* during its mating activity is recorded in the table. The appearance of LNSC in the 5th nymphal instar, their peak activity in the freshly emerged adult male prior to mating, their inactivity after commencement of mating and resumption of activity 96 h later, when a male can start copulating with another available female is suggestive of the fact that the LNSC secretion induces the urge for mating in the male.

Sharma et al.^{2,3} have shown that in female *D. koenigii*, the LNSC secretion induces the urge for mating, and therefore, the LNSC form the receptivity centre in the female insects. Roth⁴ and Roth and Barth⁵ showed that the female receptivity was not controlled by the corpora allata or the ovaries, and came to the conclusion that a receptivity centre of the brain NSC controlled the acceptance of male by female, and that the act of copulation rendered the receptivity centre inactive. This conclusion finds support in the work of Sharma et al.³, and the present work lends support to the belief that the LNSC secretion induces the urge for mating in both male and female *D. koenigii*.

Observations on the LNSC of male *Dysdercus koenigii* during its mating activity

State of insect	Lateral neurosecretory cells			
	Cell size	Cell No.	No. with NSM	NSM in axons
Freshly emerged male	6.9	10	6	—
h after copulation: 0	8.7	8	6	+++
24	7.0	8	2	—
48	7.0	12	4	—
72	6.7	12	6	—
96	9.3	8	6	+++
120*	7.3	10	6	—
240*	7.3	8	2	—

* Disengaged; cell size, $\sqrt{\text{length} \times \text{breadth}}$, measured in μ m; NSM, neurosecretor material; —, not present; + + +, abundant.

- 1 Magadh University, Department of Zoology, Gaya (Bihar, India).
- 2 Usha Sharma, S. L. Sahni and D. P. Sinha, Curr. Sci. 41, 707 (1972).
- 3 Usha Sharma, S. L. Sahni and D. P. Sinha, Experientia 31, 995 (1975).
- 4 L. M. Roth, J. Insect Physiol. 10, 915 (1964).
- 5 L. M. Roth and R. H. Barth, J. Insect Physiol. 10, 965 (1964).