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Address for correspondence:

Dr. Maske Ranjit Bansidharrao
Assistant Professor of Zoology,
Vaishnavi Mahavidyalaya,
Wadwani, Tq. Wadwani, Dist. Beed
(M.S.)
Email:
dranjitmaske74@gmail.com

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Histological Study of Female Reproductive System of Blister Beetle, *Mylabris Pustulata T.* from Marathwada Region

Dr. Maske Ranjit Bansidharrao

Assistant Professor of Zoology, Vaishnavi Mahavidyalaya, Wadwani, Tq. Wadwani, Dist. Beed (M.S.)

Abstract

In the agriculture research beetles are the emerging subject for research. The name "Blister beetle" itself suggests that their secretion causes blisters on the human skin. A pharmaceutical product called "Cantharidin" is reported to be prepared from the dried insects, mainly from the elytra, the ovaries and the special glands connected with the genital organs of the males, of the species of *Enicauta*, *Lyta*, *Cylindrothorax* and *Mylabris*. Interesting it is that the blister beetle *M. pustulata T.*, attracted my attention being available in very great numbers. *Mylabris pustulata* the sexes are separate, exhibited marked characteristics. The female reproductive system consists of a pair of ovaries, two lateral oviducts, converging posterior from the ovaries, a median oviduct opening posterior to the exterior by a gonopore. In addition to these primary parts, there is a spermathecal capsule for the reception and storage of spermatozoa, an accessory gland and a tubular passage, the median oviduct, known as vagina. The whole of the reproductive system extends from the third abdominal segment to the last. The number of the ovarioles in each ovary vary from hundred to hundred and fifteen, as observed in this beetle. The number of the ovarioles in each ovary vary from hundred to hundred and fifteen, as observed in this beetle. The present research work concluded that the Histological Study of Female Reproductive System of Blister Beetle, *Mylabris Pustulata T.* from Marathwada Region work is very beneficial for further investigations in the Meloid beetles entomological and agriculture research.

Keywords: Histology, Female Reproductive System, Blister Beetle, *Mylabris Pustulata T.*

Introduction:

Various crops, ornamental plants and flowering plants particularly yellow coloured flower are attacked in this region by a number of insect pests, of which majority belong to the order Coleoptera. Of the many families of this order, Meloid beetles, especially the species of the genera *Epicauta*, *Lytta*, *Mylabris* and *Cylindrothorax* cause considerable damage. During the survey, I have been able to collect a very great number of Coleoptera including those belonging to family Meloidae. Naturally this huge collection could not be worked out because of a variety of limitations. Interesting it is that the blister beetle *M. pustulata T.*, attracted my attention being available in very great numbers I had concentrated more on this beetle keeping away all my collection to be worked out in future. Again this beetle upto now considered as a minor pest in many parts of our country is also reported to be severely attacking the tender shoots of many crops like Bajara, Jawar and few ornamental and flowering plants particularly yellow coloured flowers. More recently it is observed as a serious pest of economic crops like Jowar Sorghum vulgare Pears) Paddy (*Oryza sativa* Linn.) in this region. It appears from the literature that the earliest work on Coleoptera was that of Muralt in the seventeenth century, who studied anatomy of beetles in general and noted the pumping mechanism in the heart of *Melolontha vulgaris* (Hanneton). Nearly three-fourths of a century later, Swammerdam described the structure of several European beetles.

Shrivastava (1953) published his work on the post embryonic development of male genital organs of *Tribollum castaneum* (Herbst). Debhnakta (1953) dealt with the early embryonic development up to the germ band formation of *Mylabris pustulata* (Thumb). He also figured out the different stages during this course and thus initiated the study of this species in India first time. Selander (1964) has concentrated on the study of various aspects of Meloid beetles. His valuable papers deal with the bionomics, systematics, phylogeny and also sexual behaviour in different genera of the family. Gupta (1965, 66a,c, 1967, 1971) published a series of papers dealing with the digestive, reproductive and external and internal anatomy of the genitalia and their significance on the higher classification of the several genera of Meloid beetles. His work is of much importance in the light of the present trends of the anatomical, morphological and taxonomic studies of the order.

Very little is known about the morphology and anatomy of the Meloid beetles in India except for the work of Saxena (1955) on the species *Mylabris pustulata* (Thunb). The work contains the results of the investigation, carried out during the last two years period on the detail study of morphology and anatomy of *Mylabris Pustulata* T.

Systematic Position

Order: Coleoptera

Sub-order: Polyphaga Emery

Super-family: Mordelloidea Leng

Family: Meloidae Thomson

Sub-family: Meloinae Denier

Tribe: Mylabrini Kaszab

Genus: *Mylabris* Thunb

Species: *pustulata* Thunb

Class: Insecta Linnaeus

Sub-class: Pterygota Braun

Division: Endoptengota Sharp



Fig. Female

***Mylabris Pustulata* T.:** Family Meloidae is one of the larger families of Heteropterous Coleoptera and most compact and distinctly isolated a group, biologically as well as morphologically. The members of this family are found throughout the warmer and temperate parts of the world. It includes medium sized, soft bodied beetles often with the elytra loosely connected. These beetles are mostly yellow colour.

The Meloid beetles exhibit extremely varying morphological structures and habits. Many authors attempted to classify the family. Beaugard, was the first to study the comparative morphology and anatomy of the members of this family. On the basis of his work, he classified the family, which proved helpful for the subsequent workers to make later elaborations. This system of Beaugard was altered by Wellman (1916). However, he did not give proper explanation or justification for the alteration.

Economic Importance:

The name "Blister beetle" itself suggests that their secretion causes blisters on the human skin. A pharmaceutical product called "Cantharidin" is reported to be prepared from the dried insects, mainly from the elytra, the ovaries and the special glands connected with the genital organs of the males, of the species of *Enicauta*, *Lyta*, *Cylindrethorax* and *Mylabris*. Various preparations of these insects are used for plasters and ointments. Its tincture is administered internally for certain diseases such as spermatorrhoea. It is also used in cosmetics, hair, oils, pomades, etc.

Among these *Mylabris pustulata* T. feeds on the ear-heads of the economic crops like Jawar, Bajara, Paddy etc. in Marathwada region of Maharashtra State, and has become a major pest in recent years. These beetles swarm annually when the above mentioned plants blossom in the rainy season and are responsible for the destruction of the agricultural crops. It is noticed that these occasionally effect forest plants also.

Material and Methods:

Large numbers of the beetles were collected in the field, on the ear heads of agricultural crops like Jowar (*Sorghum vulgareae* Pers.) and Bajara (*Pennisetum typhoidum* Rich.). Few of them were also collected at light in the nearby forest area and gardens. These beetles were abundant during August to October each year.

Mostly live beetles were used in dissections. Preserved specimens were however used in the off season. It was observed that the preserved specimens suited better for the study of musculature, nervous and reproductive systems and skeleton, than the fresh specimens. But fresh material was found to be more suitable for dissections of other systems.

Dissections were done under a stereo binocular micro- scope. A glass petridish, 1.5 Cm, high and about 8 CMs. in diameter was used as a dissecting tray in which melted wax was poured and was allowed to get hardened. The insect was fixed in wax in the desired position in the petri dish. Small triangular pieces of blades fixed to a

holder were used as scalpels. Entomological pins of sixteen to twenty numbers, fixed in handles were used as needles.

The reproductive system was studied in preserved specimens. The internal organs of reproduction were taken out along with the ducts and associated glands. These were dehydrated and mounted on slides. The sections of the organs were taken and stained as stated before. Preserved specimens were used for the study of nervous system. The entire system was taken out after the dissection and mounted on slide. Sections of the brain were taken at 8 u and stained with Mann's stain. This showed the internal structure very clearly.

Female Reproductive System:

In *Mylabris pustulata* the sexes are separate, exhibited marked characteristics. The female reproductive system (Fig. 34) consists of a pair of ovaries (Fig. 34 a), two lateral oviducts (Fig. 34 b), converging posteriorly from the ovaries, a median oviduct (Fig. 34 c) opening posteriorly to the exterior by a gonopore (Fig. 34 a). In addition to these primary parts, there is a spermathecal capsule (Fig. 34 a) for the reception and storage of spermatozoa, an accessory gland (Fig. 34 f) and a tubular passage, the median oviduct, known as vagina (Fig. 34 g). The whole of the reproductive system extends from the third abdominal segment to the last.

The Ovaries:

There are two prominent ovaries (Fig. 34 a) one on either side, dorsal to the ventricular part of the alimentary canal, as shown in (Fig. 34 A). These are embedded in the fat bodies filling completely the abdominal cavity. Each ovary is a large elongated structure, 4.5 x longer than broad, consisting of a large number of ovarioles (Fig. 34 h) and a calyx (Fig. 34 i) which is continued posteriorly into a lateral oviduct. The anterior part of the ovariole has a thread like filament and all these filaments in each of the ovaries are united to form a long suspensory ligament (Fig. 45 k). This suspensory ligament ends in the neighbouring fat tissue. The number of the ovarioles in each ovary vary from hundred to hundred and fifteen, as observed in this beetle.

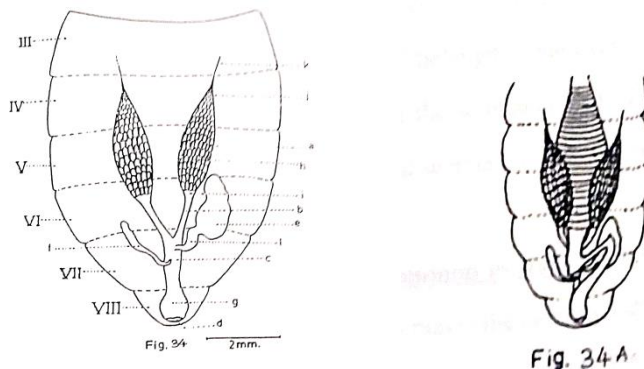
Structure of the ovariole Each ovariole :

(Microphotograph No.11), consists of three parts: a terminal filament, the middle cylindrical broad egg-tube and the basal supporting stalk, the pedicel. The main part is the egg-tube which contains the germ cells. The pedicel is the duct of the ovariole connecting the egg-tube with the lateral oviduct. Each ovariole (Microphotography No. 11), is lined externally by a very thin epithelial sheath which extends to cover all the parts of the ovariole. This is the tunica propria. The slender, thread like filament which forms the anterior part of an ovariole is a solid strand of cells with several nuclei scattered in an irregular fashion. The egg-tube is distinguished into two parts. The anterior end is a region containing the germ cells, the germarium. Below the germarium is the region called the vitellarium in which the egg-cells grow and attain their maturity. The germarium is composed of germ cells and the trophocytes. Anteriorly it is divided from the terminal filament by a transverse septum. Posteriorly it gradually merges into the vitellarium.

Fig. 34 : The Females Reproductive system

- a: ovary,
- b: lateral oviduct, c; median oviduct,
- d: gonopore,
- e: spermathecal capsule,
- f: accessory gland,
- g: vagina,
- h: ovarioles,
- i: calyx,
- k: suspensory ligament and its diverticulum

Fig. 34 A: The female reproductive system in situ (diagrammatic)



The vitellarium consists of several follicles with oocytes, of which the anterior ones are the youngest and the posterior, the eldest. Each successive follicle is separated from the preceding one by a thin mass of interfollicular tissue. Each ovariole opens into the calyx by a short tube, the pedicel (Microphotograph No. 12). The pedicel develops a lumen lined by epithelium which is formed by a single layer of cuboidal cells. The pedicel epithelium is folded internally to allow expansion during process of ovulation.

The lateral oviducts (Microphotograph 12): The anterior end of each oviduct is slightly expanded forming a thalamus known as calyx, into which the pedicels of the ovarioles open. The oviduct is a simple narrow tube, 7 x longer than broad, without any accessory structure and is much elongated in this beetle, about half the length of the ovary. The oviducts of the two sides loop round the alimentary canal and join under it in the seventh abdominal segment to form the common oviduct or uterus.

The common oviduct (Microphotograph 11): This runs below the rectum in the seventh abdominal segment and opens posteriorly into the vagina, which lies in the eighth abdominal segment and is continuous with the median oviduct. It has a cuticular lining internally and the entire epithelial tube is surrounded by a strong muscular sheath.

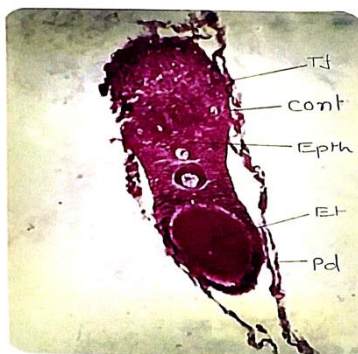
M.Ph. No. 11: T.S. ovary

Cont. - Connective tissue Epithelium

Epth- Epithelium



M. Ph. NO. 11



M. Ph. NO. 12

M.Ph. No. 12: L.S. of ovary

Cont. - Connective tissue Epithelium

Epth- Epithelium

Et- Rgg tube

Pd- Pedicel

Tf - Terminal filament

The spermathecal capsule (Microphotograph No. 11) is a well developed sac-like structure which opens dorsally into the common oviduct near its base. The capsule is 2.75 x longer than broad and extends from the middle of the seventh abdominal segment to the anterior margin of the sixth segment. It has a well developed basal diverticulum (Microphotograph 11) in the tubular form which is half the length of the capsule. The spermatozoa are stored in the spermathecal capsule after copulation

An elongated accessory gland of vesicular type (Microphotograph 11), also opens dorsally into the common oviduct behind the spermathecal opening. It is 10 X longer than broad and extends from the middle of the seventh abdominal segment to the posterior part of the sixth segment. As in other insects, it secretes the substance which forms the egg shells during oviposition. The vagina, the seminal passage and the copulatory pouch collectively form the genital chamber.

Conclusion:

The present research work concluded that the Histological Study of Female Reproductive System of Blister Beetle, *Mylabris Pustulata* T. from Marathwada Region work is very beneficial for further investigations in the Meloid beetles entomological and agriculture research.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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