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Study of morpho-histology of the ovary and oviduct of the earthworm *Ocnerodrilus occidentalis*

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Abstract : Earthworm play an important role in the decomposition of materials and vermicomposting. Ocnerodrilus occidentalis the common Indian earthworm of Indian agro-systgem contributing conversion and elaboration of primary production into subsequent flow and partitioning of fixed carbon between and within trophic levels of consumers of occupying key position in decomposer of subsystem. The morphology, morpho histology, growth, regeneration and reproductive morphology and histology were investigated.

Key words : Ocnerodrilus occidentalis, morpho histology of reproductive part, ovary, oviduct.

INTRODUCTION

Ocnerodrilus occidentalis dominate the soil found biomass in many tropoical and temperate soils and make important contributions in the decomposition of material and vermicomposting (Satchel, 1967, Mishra *et.al.*, 1984,; Senapati *et.al.*1982), a mesophilic process involves ingestion, digestion absorption of organic materials followed by excretion of wastes in the form of castings through worms metabolic system, enhancing the levels of plant-nutrients of organic wastes during their biological activities.

The aim of this research is to report morpho histological characteristics of the vermin composting earthworm *Ocnerodrilus occidentalis* and study of the external reproductive morphology of the Indian *Ocnerodilus occidentalis* dominant in Agro ecosystems. Structure and function of the ovary and the oviduct are investigated through histological slides.

Ocnerodrilus occidentalis were collected from different agroccosystem sites in Ranchi located between $21^0$58' N – $25^0$19'N latitude and $83^0$20' E – $88^0$21' E longitude and at a height of 629m above mean sea level. In laboratory earthworms were kept in a pot and filled with mixture of loamy and humus. The mixture is also supplied with cow dung, leaves and moisture with deoxygenated tap water and kept for ten (10) days. During the period of acclimatization the worms were led with air dried cow dung every 20 days. Earthworms of same size were collected from pots for histological studies.

External Reproductive Morpho histology of *Ocnerodrilus occidentalis* –

O.occidentalis, worms were taken in a small beaker and anaesthetiged using chloroform, after 5 minutes the earthworm were processed using glutaraldehyde and graded series of alcohol like 30%, 50%, 70% and 90% and absolute alcohol and CPD. For SEM observations were made on the external morpho histological characters of the mouth and at anterior segment the position of the spermathecal openings the clitellar segments and the female and male genital openings or aperture. Observation were also made on intersegmental grooves, the dorsal pores and the arrangement of setae.

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The morphology of the ovary and the oviduct – Adult worm e" 4cm clitellate were used for studies, *O.occidentalis* were anaesthetized using a cholorophorm and pinned at anterior and posterior regions on a wax tray. After careful positioning of the worms (a median longitudinal i.e., mid dorsal opening) was made using a fine scissors on the skin above the clitellum thus exposing the body cavity. The body cavity was exposed completely in the anterior region and the skin exposed was accordingly pinned on to the wax tray using needle & forceps.

The alimentary canal was carefully excised to expose the reproductive structures. The wax tray was later shifted on to the direction microscope and detailed observations of the female reproductive structures consisting of the ovaries and oviducts were made.

Histological studies- A pair of ovaries located on the 13th segment (which are palmate) were removed from the clitellar worms on to a clean watch glass and immediately fixed in Bouins and formalin fixatives for histological studies. First of all the ovaries and the oviducts were fixed in Bouins fluid for 24 hrs then washed in running tap water for a new hrs and stored in 80% alcohol for further tissue wax preparations using routine standard laboratory procedures. The ovaries and the oviducts were then processed using step by step dehydration with different grades of alcohols then cleared using xylene.

After cleaning, the tissues were filtered with molten paraffin wax at 55-58c and appropriate sizes of the tissue blocks were prepared. Detailed microscopic observations were done and photographs taken.

RESULTS AND DISCUSSION

The external morpho-histology – The body of the clitellar earthworm *O.occidentalis* is reddish brown in colour, round or cylindrical in shapes and metamerically segmented. The mean individual length and live weight is 6cm and 5 g the arrangement of setae is perichaetine the anterior region shows the prostomium which is epilobus on the ventro lateral surface, the body segments 8,9,10,11 and 12 shows the presence of spermathecal openings, exactly on the 12th segment, a pair of female genital openings is present, segment 13, 14 and 15 forms the unsegmented collar like structures called the clitellum on the 16th segment, pair of male genital openings is present below the clitellum.

Morphology of the ovary – The ovaries are the female reproductive gonads in *O.occidentalis*. A pair of ovaries is located in the 13th segment below the alimentary canal in the coelomic cavity, each ovary is a granular, creamish white, cauliflower like measuring 1-2 cm in size and approximately weighing 0.1mg with rich blood supply.

The morphology of the oviduct- The oviducts are small minute coiled structures found behind the ovaries. The oviduct is about 2-3 mm in length. The anterior part of the oviduct is larger, the oviducal funnel, continues as a coiled tubular structure and opens on the ventral side between 12th & 13th segments as female opening or apertures externally.

Histology of the ovary in *O.occidantalis*-

The ovary is covered by a membranous covering of the germinal epithelium made up of cuboidal cells. Within the ovary there are a large number of ovarian follicles in different stages of development. In between the follicles, there is a connective tissue and rich supply of blood vessels. The larger follicles are seen at the periphery and their number ranges from 20-30 in the section. Each follicle has many layers of follicular cells, the follicular cells are small, oval containing larger muscles measuring 2-3µ. The smaller primary follicles and oocytes are seen at the centre or below the larger follicles and their size varies from 1-1.5µ.

The follicular cells as well as the oocyte show changes. The oocyte membrane show shrinkage and undulated with dense substances evenly distributed in the cytoplasm. The nucleus in them also shows shrinkage and folding in the membrane.

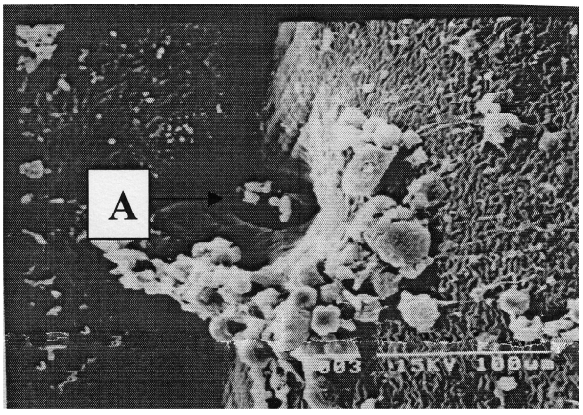

Fig.1. Female genital pore containing ovary (A-female genital pore)

Histology of the oviduct –

The outer covering is composed of cuboidal epithelium and a thin layer of circular and longitudinal muscle layers. A single layer of columnar epithelium surrounds the large central cavity, each columnar cells is tall and ciliated. The posterior part of the oviduct is round and circular and has a diameter of 8-10µ. Histologically this part of the oviduct is similar to that of the anterior part except with regard to the large central cavity and the columnar epithelial cells and little smaller and do not show ciliated condition and presence of sperms in lumen.

DISCUSSION

O.occidentalis is a rich protein producer and helpful in decomposition in great amount good for is agroecosystem. The study is mainly based on the existing information of these earthworms. Clitellar worms *O.occidentalis* were collected from university campus, Ranchi & hostel of Ranchi College, Ranchi. We have recorded the average size and adult weight of body.

On the ventrolateral surface the body segments 8-12 show the presence of spermathecal opening. A pair of female genital opening is present on the 12th segments. Segments 13-15 show unsegmented clitellum which is only present is adult worm. Below the clitellum a pair of male genital openings are present in the 16th segment. Histology of the ovary and oviduct of *O.occidentalis* shows the follicles in different stages of development including the older follicles with degeneration. Histology of the anterior part of oviduct of *O.occidentalis* shows a central large lumen, outer thinner epithelium, circular muscles, columnar epithelial cells. At higher magnification, the posterior part of the oviduct shows the presence of sperms in the central lumen. *O.occidentalis* is a good example of the oviduct showing the presence of sperms in the central lumen. *O.occidentalis* is a good example of earthworm protein production for animal feed hence high body weight of the Indian earthworm would contribute towards higher biomass and protein production (Senapati *et.al.,* 1981).

Vermicomposting, the microbial composting of organic wastes through earthworm activity helps in the disposal of organic wastes from domestic agricultural and economical problems. Hence study of their size, weight lifespan time of reproductive maturity would be very helpful in breeding practices in the Indian agrocoosystem.

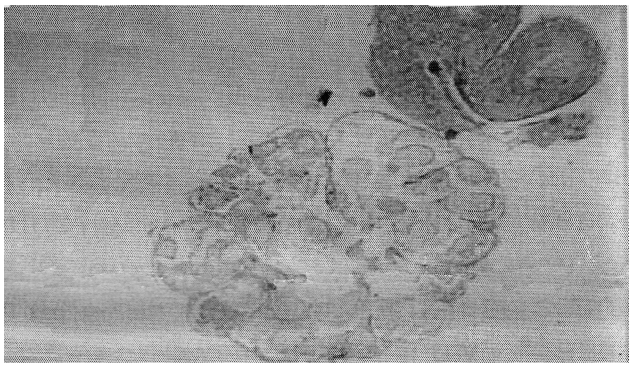

Fig.2. Histology of the ovary in the clitellar region of *O.occidentalis* showing the follicles in different stages of development

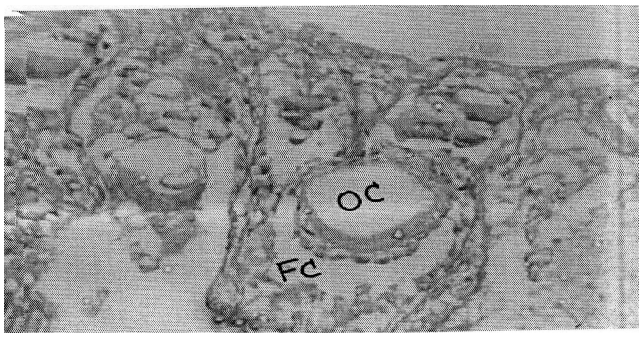

Fig.3. HE staining of the cross section of the ovary showing the older follicles with degeneration. OC- oocyte, FC – follicle cells.

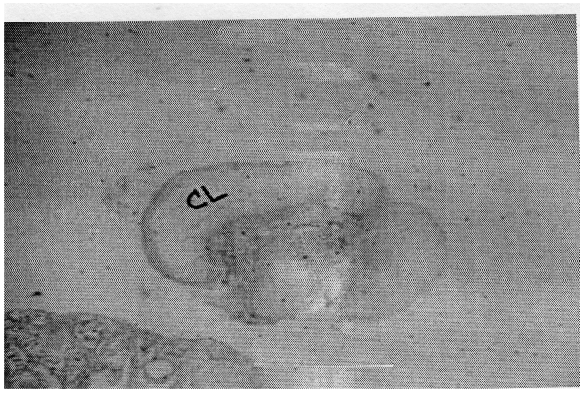

Fig.4. HE staining of the cross section of the ovary in the clietellar region of *O.occidentalis* showing YF – young follicles, OC- oocytes wsith degeneration and FC – follicle cells.

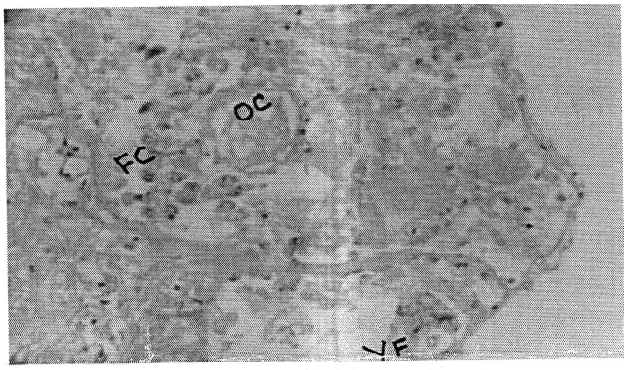

Fig.5. HE staining of the cross section of the oviduct of O.occidentalis showing the outer thinner epithelium. TE, circular muscles – CM, columnar epithelial cells – Ce and large lumen –LL..

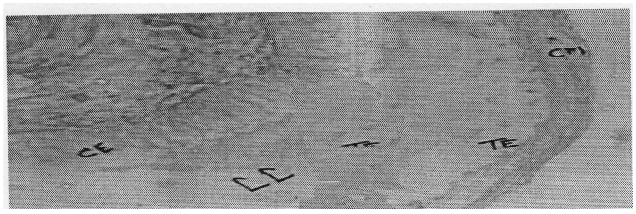

Fig.6. HE staining of the magnified section of the oviduct of *O.occidentalis* from the posterior part of the oviduct showing the presence of sperms in the central lumen-CL.

REFERENCES

***1. Edwards, C.A. and Lofty, J.R. 1972**. Biology of earthworms, Chapman and Hall, London, pp 333.

***2. Odum, E.P. 1959**. Fundamental of Ecology, W.B.Saunders, Philadelphia, pp. 574.

3. Senapati, B.K. and Dash, M.C. 1982. Earthworm as waste conditioners. *Ind.Eng.J.*

***4. Blackburn J.**C. **1985**. External anatomy of earthworm. Science, 207; 2572.

***5. Senapati, B.K.Dash, M.C. 1981**. Effect of grazing on the elements of production in the vegetation of oligochaeta components of a tropical pasture I and *Rev. Ecol. Biol. Soil*. 18: 487-505.

***6. Sinha, M.P. and Srivastava, R. 2001**. Seasonal variation in density and biomass of earthworms Perionyx sansibaricus Micchaelsen in garbage dumping site at Ranchi, India. SUJST VOL. XIII, pp. 64-68.

***7. Golley, F.B. 1961**. Energy values of ecological materials. Ecology, 42: 581-584.

*Additional references consulted.

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