

Optical and Scanning Electron Microscope Description of the Tapeworm *Diplogynia americana* (Fam: Hymenolepididae) in *Streptopelia senegalensis*

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ABSTRACT

Hymenolepididae are a family of cyclophyllid tapeworms. Its few testicles (one to four) are what set it apart. Easy identification is made possible by the big external seminal vesicle and unilateral genital follicles. The majority of organisms are tiny, transparent, and simple to research. The family has over 90 genera and over 900 species, with mammals (approximately 250 species) and birds (about 700 species) serving as the primary hosts. The majority of them live in their definite hosts' intestines. Arthropods serve as intermediate hosts for most species whose life cycles are known. *Diplogynia americana*, which has been found in birds worldwide. This kind of tapeworm was isolated from the small intestine of *Streptopelia senegalensis* in Najaf, Iraq. The scanning electron microscope and optical microscope showed The Rostellum has two rows of identical hooks at its head, The attackers are unarmed.

Keywords: *Diplogynia americana*, Tapeworm, *Streptopelia senegalensis*, Hymenolepididae, Scanning electron microscope.

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INTRODUCTION

Diplogynia americana is a type of parasitic worm belonging to the Hymenolepididae family, specifically tapeworms. These parasites typically infect the digestive tract of humans or animals, feeding on nutrients within the intestines (1,2).

Its effects on human health include , Digestive disorders (Frequent or mild to moderate diarrhea) Abdominal pain and bloating , Occasional nausea and loss of appetite , Weight loss and malnutrition Due to the parasite absorbing nutrients from the intestines. Can lead to vitamin and mineral deficiencies in chronic infections.(3,4,5)

Diplogynia americana At the head the Rostellum is armed with a double row of

similar hooks. The attackers are unarmed. The reproductive organs are single, unilateral ducts, passing between the external longitudinal vessels. Periosteal pod without seminal vesicle, very long, extending into or beyond the extraorbital canals on the temporal side in some mature pieces. Many testicles in the posterior region of the cut. The longitudinal abdominal excretory ducts are wide, the dorsal vessels are narrow and tortuous [6,7]. The uterus is cystic, deeply lobed, not disintegrating into egg capsules. Their strobella are incomplete, the length of the front of the body is 28 cm. Which includes the head, neck, and about 134 body parts. The maximum width of the end pieces is 1.8 mm. 3.72 mm long, unsegmented neck

3.50 mm long. The first parts of the strobella are minute and indistinct. The reproductive ducts pass from the back to the excretory ducts [8,9]. The nerve fibers are not visible. The reproductive organs are doubled in each segment. The genital pores open laterally near the middle of the cutting margins. Slender periosteals, reach into the excretory ducts in the younger, more mature segments, but are shorter in the mature ducts. Relatively thick, 3.8–4.64 in diameter, densely surrounded by spines about 4 mm in length with a curved end. [10].

Based on the current study, the emergence and spread of these new tapeworm species in Iraq is attributed to travel and the importation of food and birds from countries similar to those affected by the tapeworms studied. These products and food, contaminated with their eggs, were brought into Iraq by hand, along with infected birds. This study provides an important database for researchers to identify new tapeworm species currently present in Iraq, particularly in the Najaf Governorate, and to study their introduction, risks to wild and domestic animals, and their medical and economic impact on both animals and humans.

MATERIAL AND METHODS :

Sample collection:

This study was conducted During February to June 2022, a total of 70 specimens of pigeon were *Columba livia* captured and purchased from the store designated for the sale of birds. from Al-Najaf city in Iraq. Birds were examined for the cestode immediately or within a few hours of slaughtering.

Bird examination:

After slaughtering the birds, they were brought to the laboratory of the Department of Life Sciences / College of Education for Girls. The examination process was carried out by dissecting the birds according to the method of [10] by opening the bird's body

longitudinally using a very sharp scalpel from the compound passing through the abdomen and chest after removing its feathers. Conducting a macroscopic examination of the alimentary canal to note any damages that may be present on the outer surface of the alimentary canal of the bird, then the alimentary canal was separated from the body and placed in a petri dish containing saline solution (9%) at 37 °C to preserve it in its natural state, and examining the body cavity with a manual magnifying lens in search of parasites Or its larval stages, the alimentary canal was divided into four parts, which are the trachea, liver, esophageal bile sac, crop, gizzard, small intestine, large intestine, and the complex area, so that each part is separate, then each part was opened longitudinally by means of sharp scissors in a petri dish placed on a black background [11]. Once these four sections have been opened, the inspection and search for intestinal worms starts. Large and medium-sized worms are isolated using a dissecting microscope and a magnifying lens. A tiny needle is used to separate tiny worms.[12, 13].

Visual examination: After isolating the different worms, they were classified according to shape and with the help of a dissecting microscope, where their numbers were counted and kept in small plastic bottles containing 70% ethyl alcohol and glycerin after washing them with tap water to remove impurities and mucous materials attached to them.

Tapeworm isolation: The tapeworms extracted from the intestine of the palm treptopia seengalensis were removed and the tapeworms were washed with tap water, then placed in a solution of Vezlji, then I kept a section of worms in a bottle containing an ethical alcohol 70%, in addition to a few drops of kliserin for the purpose of fixing and later dyeing them for the purpose of diagnosing optical microscope [14]. I

preserved a section of worms in a bottle containing 10% until the electronic microscope was diagnosed. I preserved a section of worms in bottles containing absolute ethnic alcohol and placed in the strawberries until the molecular diagnosis [15].

Microscopic examination of tapeworms:

After measuring the lengths of the tapeworms by means of a ruler, they were cut into suitable pieces and then dyed using the ready-made acetocarmine, where several drops of this dye were placed on the samples by means of a dropper in a watch bottle and with continuous examination of the dyed samples until they acquired the appropriate redness, and in the event that the sample acquired a dye It is shortened by adding several drops of hydrochloric acid (HCL) 10%. It is placed on the dye away from the model, after which the head is isolated from it. As for the rest of the dyed pieces, they were placed between two strips and tied using rubber bands and placed in 70% ethyl alcohol for 24 hours at room temperature.

After that, the compressed forms were opened and placed in ascending concentrations of alcohol: 70% (10-15 minutes), 80% (5-10 minutes), 90% (5 minutes), and then absolute alcohol (100%) for one minute, then into absolute alcohol and xylol at a ratio of (1:1) for one minute, then transferred to xylol for one minute to clarify the internal structures of the parasite. Finally, permanent segments of the parasite were prepared by loading it onto a slide using Canada balsam [16, 12]. Pictures were taken

with a digital camera that diagnosed the worms based on the diagnosis of the Natural History Museum and Research Center / University of Baghdad.

Scanning electron microscope examination of worms:

Samples were examined at the University of Kufa / College of Science, supervised by Dr. Ahmed Hussein Muhammad Al-antaki. Whereas, after the drying process, the sample is loaded on the sample holders through a double -faced adhesive tape and then placed in the gold cover room that works to cover it by measuring the nanometer to keep the sample from damage due to the enormous energy from the electrons involved from the device. The samples are placed in their places to examine the use of Scanning electron microscope (SEM)/Inspect S50/FEI company. made in Netherland [17, 18].

RESULTS AND DISCUSSION

Optical microscope description of the tapeworm *Diplogynia americana* isolated during the current study:

This type of tapeworm was isolated from the small intestine of the tori pigeons and the palm anthers. The body length was 15 cm. The heads contained four muscular fascicles with a diameter of 8 micrometers under the power of 10x. The heads contained a Rostellum with a diameter of 20 micrometers under the power of 10x. (Fig. 1). the mature segment is 15 µm long and 52 µm wide under 10x force (Fig. 2).): The pregnant piece is 0.32 mm long and 0.31 mm wide under a force of 10 times(Fig.3).



Figure (1): Heads in *Diplogynia americana* (R) Rostellum (S) muscular retractors (H) hooked Rostellum . 10x magnification power

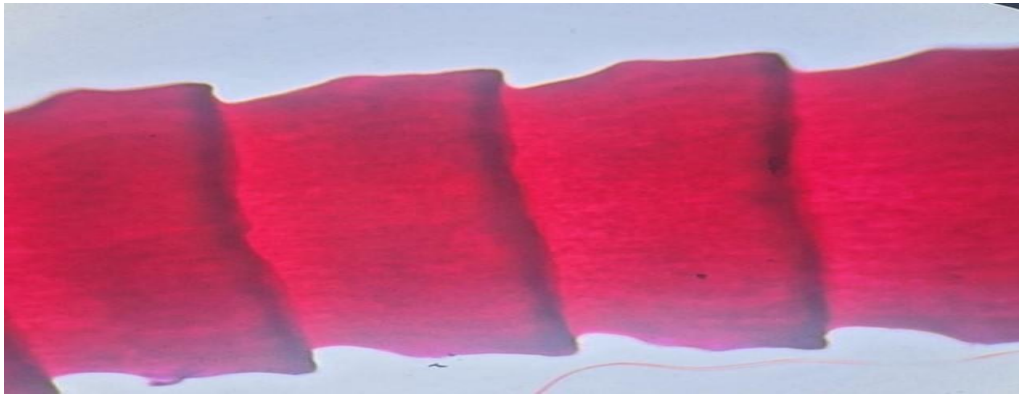


Figure (2): The mature segment of *Diplogynia americana* i (P) genital orifice, 10x magnification.

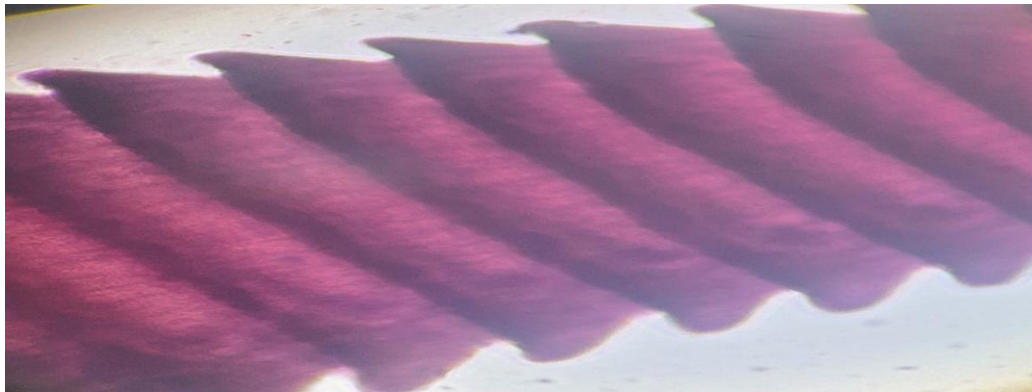


Figure (3): The pregnant piece, *Diplogynia americana*. Host *Vakhtia* palm 'host phase pigeons, magnification power 10x.

A scanning electron microscope described the isolated *Ophryocotyloides proteus*

During the current study: The scanning electron microscope showed in *Diplogynia americana* the heads are almost pear-shaped Figure (4) . The heads contain a small, retractable Rostellum 19 µm long with a row of hooks 7 to 9 µm long. Figure (5) and

Figure (6) and contain the heads On four spherical cups, the diameter of the size is 44 micrometers, armed with a number of rows of hooks, Figure (6) and Figure (7). the mature segment is 0.41 mm long and 0.22 mm wide. Figure (8), (9). The pregnant piece resembles a vase, 0.32 mm long and 0.31 mm wide, Figure (10).

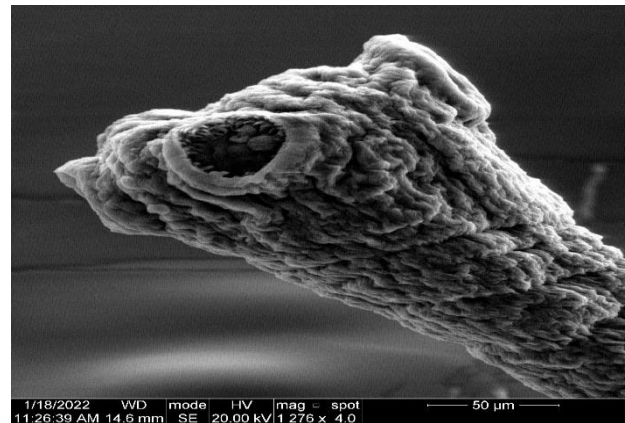
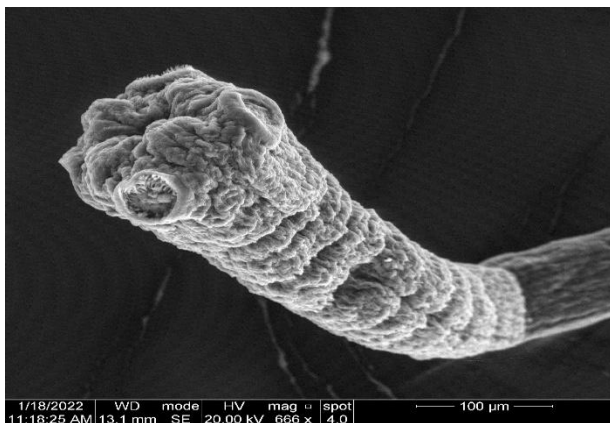


Figure (4): Head and neck in *Diplogynia americana* (R), Rostellum (S), suckers (H), hooks, front view, Bar=100µm Bar=50µm

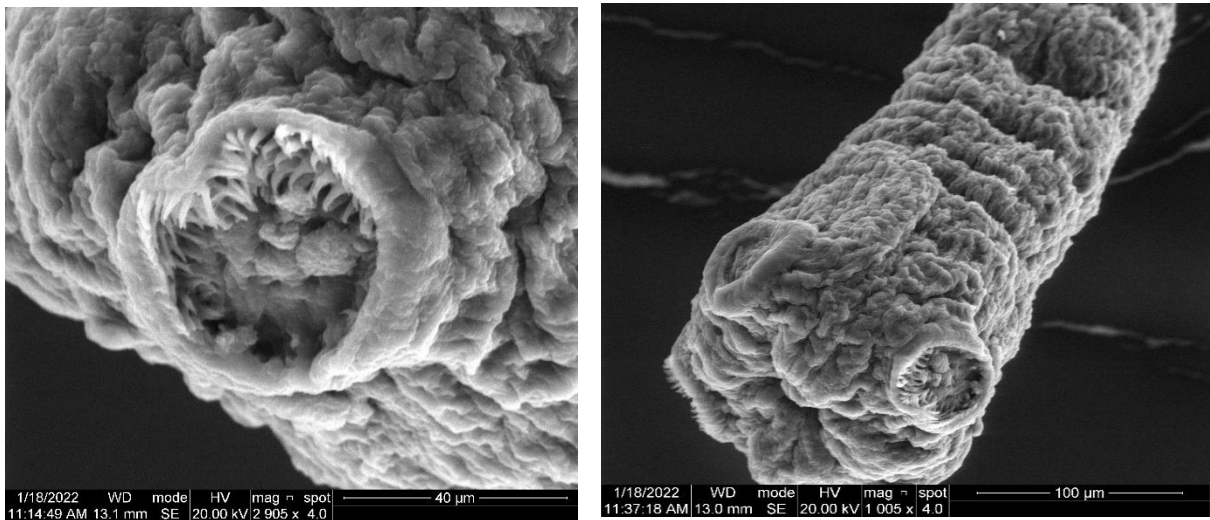


Figure (5): (S) scaler (H) hooks in *Diplogynia americana* Bar=100µm(1) Bar=40µm.(2)

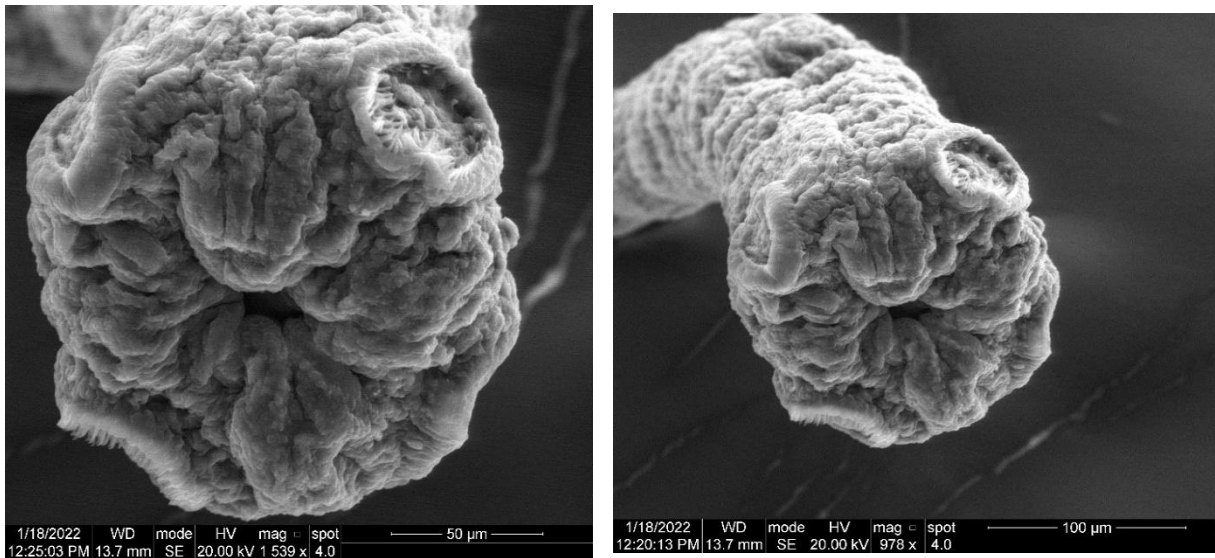


Figure (6): Head in *Diplogynia americana* (R) Rostellum (S) suckers (H) hooks, lateral view Bar=100µm Bar=50µm.

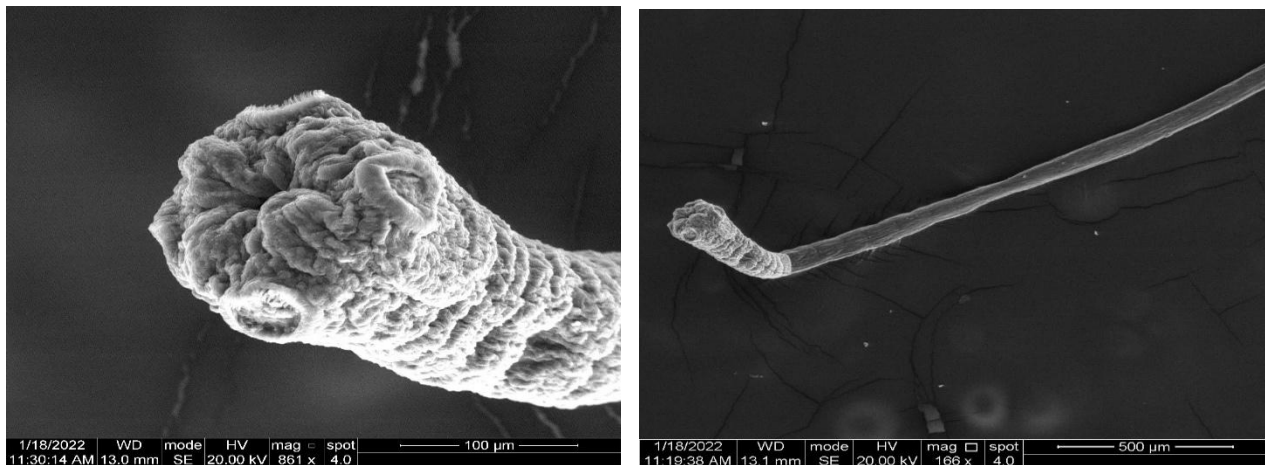


Figure (7): Head in *Diplogynia americana* (R) Rostellum (S) suckers (H) hooks, front view Bar=500µm Bar=100µm

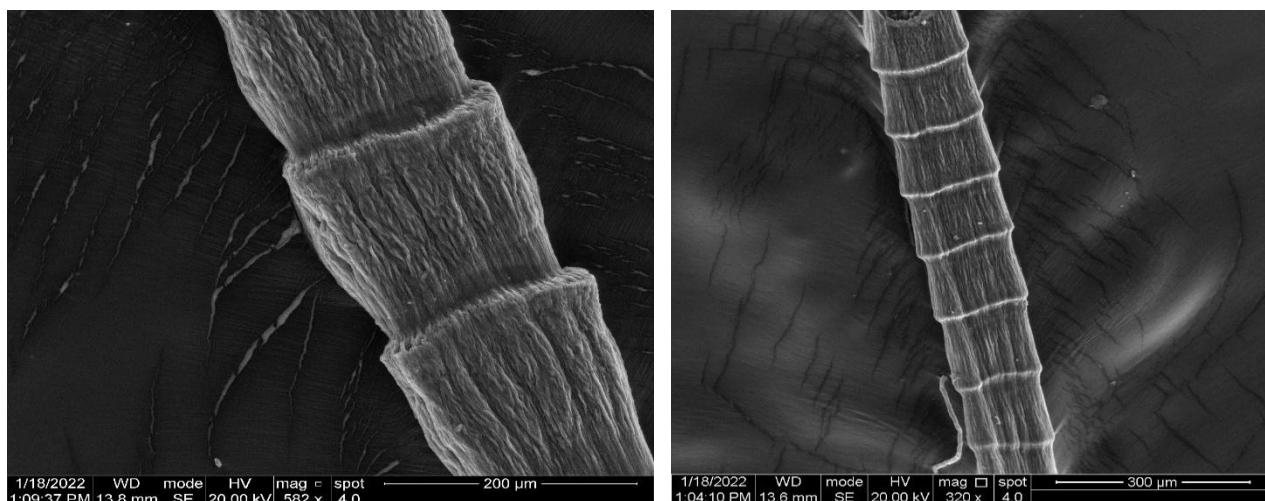


Figure (8): the mature segment of *Diplogynia americana*, Bar=200μm. Bar=300μm.

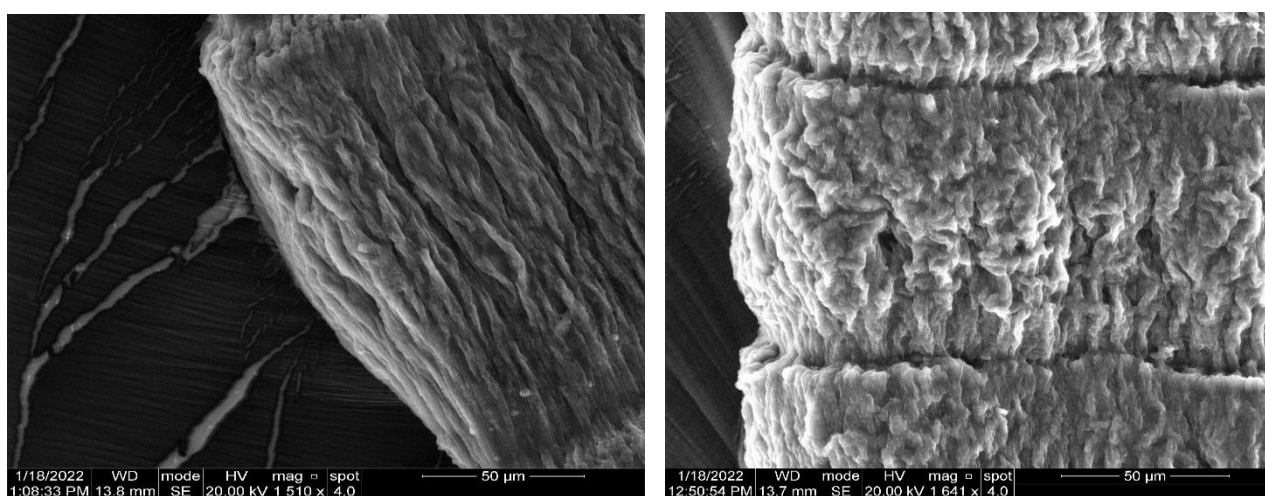


Figure (9): the mature segment of *Diplogynia americana* Bar=50μm(1) Bar=50μm(2).

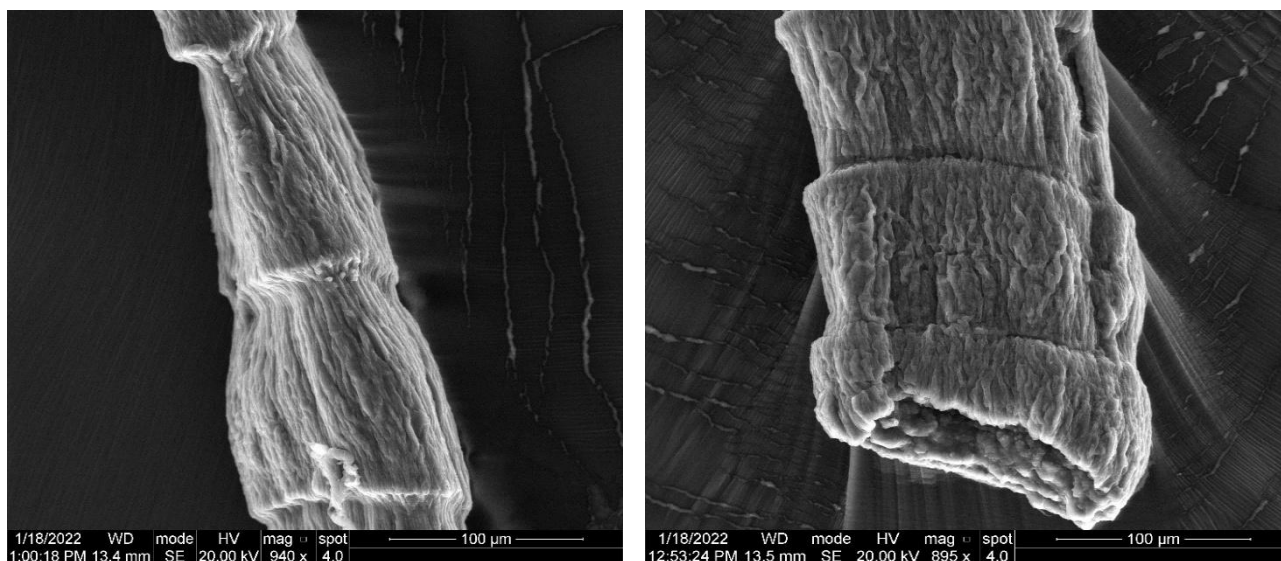


Figure (10): The gravid segments in *Diplogynia americana* Bar=100μm(1) Bar=100μm (2)

Diplogynia americana was recorded for the first time in Iraq in this current study and was not previously discovered in Iraq. The current study of *Diplogynia americana* agreed in most of the traits with [6, 19].

Diplogynia americana in the current study, the strobella is incomplete and the length of the front of the body is 30 cm, which includes the head and neck, and about 138 body segments. The number of body pieces is 143 and the neck is 356 mm [20, 22]. *Diplogynia americana* In the current study, the head is round, 3.20 mm long, 3.40 mm wide, and provided with four sockets located near the frontal part. While *Diplogynia oligorichis* has a large head and contains an internal groove that divides the inner part of the head into two parts [21,18]. *Diplogynia americana* In the current study, the Rostellum is beaked, retracted, and conical in shape, armed with a single row of hooks, the number of which ranges from 11-40. While *Diplogynia oligorichis* the Rostellum has a circle of hooks arranged in a crown shape, the length of the hooks is 34 μ m [20].

Diplogynia americana, in the current study, the body is not equipped with crystal rods. While *Diplogynia oligorichis* The body is equipped with crystal rods on each side of the body starting from the immature segments behind the head from the beginning to the end of the segment, and the characteristic characteristic of this genus is in addition to the length of the hooks, and no function was mentioned for these rods [21, 22].

Diplogynia americana In the present study the reproductive organs are doubled in each segment and the genital pores open laterally near the middle of the segment margins [13, 19].

While *Diplogynia oligorichis* has paired genital openings, it has a two-hole system. The ovary is small in size. The uterus is a

transverse sac and a few testicles divided into groups [14, 21].

D. acuminatom, and this worm was described as having no hooks, unlike *Diplogynia americana* in the current study. And also, this current study of the worm agrees with [7, 22]. It does not contain crystal bars.

CONCLUSIONS

Tapeworms *Diplogynia americana*, It infects the small intestine of *Streptopelia senegalensis*, and by visual examination, we find that this infection led to severe inflammation and bleeding. It was detected by light microscopy and scanning electron microscopy. The morphological characteristics of this worm showed that it has At the head the Rostellum is armed with a double row of similar hooks. The attackers are unarmed. The reproductive organs are single . Many testicles in the posterior region of the cut. The longitudinal abdominal excretory ducts are wide, the dorsal vessels are narrow and tortuous .

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