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Morphology study of *Toxocara canis* (Werner, 1788) worms by scanning microscope

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Key words: Scanning Electronic Microscope (SEM), *Toxocaracanis*, Nematodes, cervical alae, spicule.

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Abstract

Toxocarias is revealed to the important topic and high risk of polluted with the worm *Toxocara canis* in all Iraq and in Baghdad especially. This requires more studies. The current study aimed to Microscopic study for the adult worm of *T. canis* by scanning electron microscope and compare with the direct digital photo and light microscope. Scientific photography was conducted to adult worms of *Toxocara canis* by Scanning electron microscopic (SEM) which was for first trial in Iraq. It showed the mouth of the worm which was surrounded by three fleshy lips that were one dorsal and two sub ventral each one equipped with small papillae; these worms have a cervical alae that make the anterior end of the worm resemble an arrowhead and reach a point resolution of 300 um using a secondary electron detector(SEI). The tail of the male was usually curved ventrally and finger-shaped showing two spicules and reaches a point resolution of 500 um using a secondary electron detector (SEI). Scanning electron microscopy images were scientific photography featuring science and biomedical microscopy photos were best than the direct digital photo and light microscope photo for adult of *T. canis*.

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Introduction

A scanning electron microscope (SEM) is a type of electron microscope that produces images of a sample by scanning it with a focused beam of electrons.

These electrons interact with atoms of the sample, producing various signals which possess information about the sample's surface topography and composition.

The SEM can achieve resolution better than 1 nanometer. McMullan, (1988) was described the observation of Specimens in high or low vacuum, in wet conditions, in a wide range of cryogenic or elevated temperatures (all environmental of SEM).

The most common SEM mode is detection of secondary electrons emitted by atoms excited by the electron beam. Number of secondary electrons which can be detected depending on the angles at which beams meet the surface of the specimen (specimen topography).(McMullan, 2006).

The total infection rate of *Toxocaracanis* 52% in the domestic and stray dogs (42.4%, 65.5%) respectively in Baghdad City, Iraq**.** (Hadi & Kawan, 2016); that revealed to the important topic and high risk of polluted with this worm. Which requires further studies in the future.

The aim of current study

Microscopic study for adult worm of *T. canis* by scanning electron microscope and compare with the direct digital photo and light microscope.

Materials and methods

A number of adult worms were selected from the author collection in Iraq Natural History Research Center and the Museum, University of Baghdad.

First, the samples were filmed with the digital camera and then a number of samples were put in the Lacto phenol to be clearance for the examination by the compound microscope.

A number of samples were transferred to the research Center at IbnAl-Hathim College, University of Baghdad for scanning electron microscopy.

Scanning electron microscopic

Western Digital Corporation: is an American computer data storage company and one of the largest computer hard disk drive manufacturers (Angstrom advanced, USA), that performed in research center in Ibn Al-Hathim College in University of Baghdad.

Preparation of samples

For conventional imaging in the SEM, samples must be electrically conductive, at least at the surface and electrically grounded to prevent the accumulation of electrostatic charge at the surface (*McMullan, 2006)*.

The specimens are coated with an ultrathin coating of electrically conducting material, conductive materials in current use for sample coating include gold (Suzuki, 2002).

Resolution of SEM can fall between less than 1 nanometer (nm) and 20 nm (Baghaei, 2007).

Results and discussion

Morphological study of Toxocaracanis

Adult worms of *T. canis* which were isolated from dogs, characterized by creamy to white color in the fresh specimen, then tend to be grey.

The male measured about 7- 8 cm in length and the female about 10-11 cm (Fig. 1 & 2).

The morphological identification of adult *T. canis* was investigated on the basis of light and scanning electron microscopic (SEM) observations.

Light microscope

Light microscopic observation showed that the anterior end of *T. canis* worm revealed the presence of cervical alae (Fig. 3) and the posterior end of male tail showed the spicules (Fig. 4) as was described by Bowman, (2009).

Fig. 1. Female adult worm of *Toxocaracanis* in dog.

Fig. 2. Male adult worm of *Toxocara canis* in dog.

Scanning electron microscopic (SEM)

Scientific photography was conducted by Scanning electron microscopy, Angstrom advanced (USA). The mouth of *T. canis* appeared surrounded by three fleshy lips (one dorsal and two sub ventral), Western Digital(WD) =13.1, the resolution conventional (20 kVX840) and reach a point resolution of 50 um using a secondary electron detector SEI (Fig. 5); each lip equipped with small papillae that similar to Kunkel (2004).

T. canis worms have a cervical alae anteriorly that make the anterior end of the worm resemble an arrow head; Western Digital (WD) =13.1, the resolution conventional (20 kV X 220) and reach a point resolution of 300 um using a secondary electron

detector SEI (Fig. 6). The tail of the male was usually curved ventrally and was the finger - like projection showing two spicules, Western Digital (WD) =13.8, the resolution conventional (20 Kv x 94) and reach a point resolution of 500 um using a secondary electron detector SEI (Fig. 7).

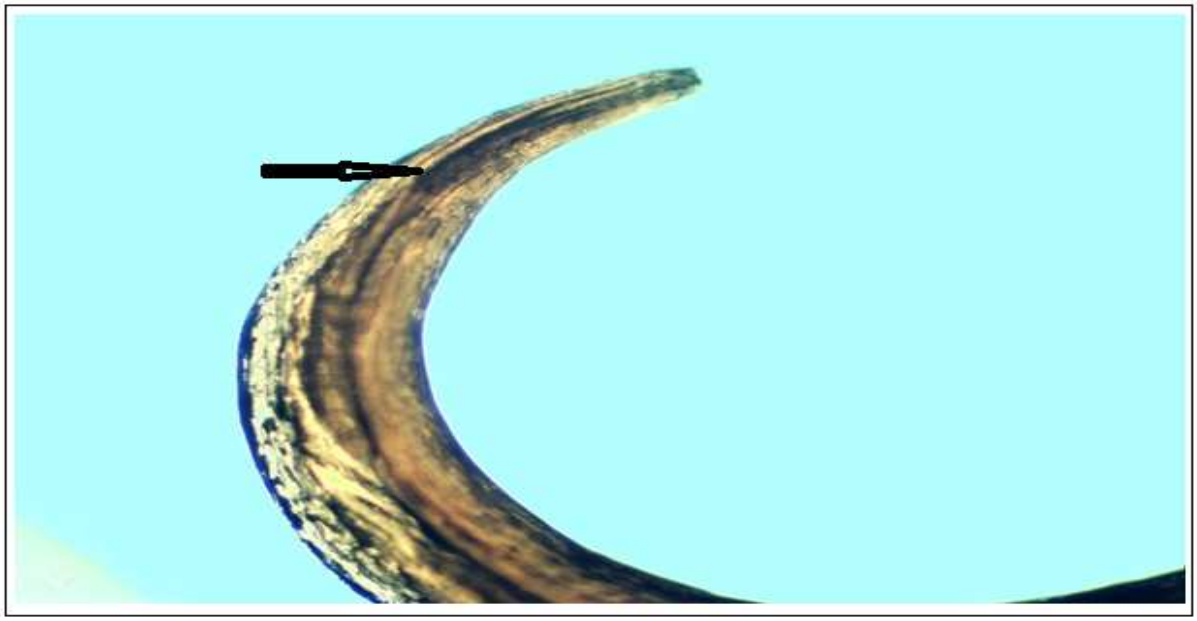

Fig. 3. Cervical alae (arrow) in the anterior end of *Toxocaracanis,* X10.

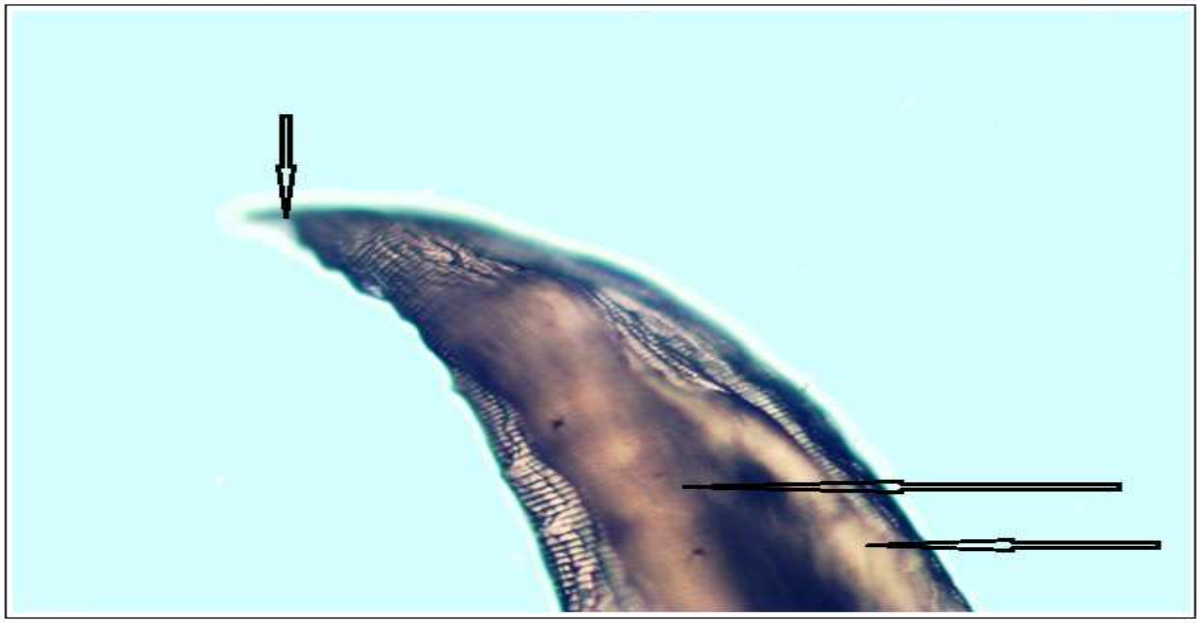

Fig. 4. Finger-like projection (short arrow) and two spicules (long arrows) at the posterior end of male *T. canis*, X10.

Scientific photography of scanning electron microscopy images featuring science and biomedical microscopy photos (Hawkes 2009), for the first time in Iraq for adult *T. canis*.

The most morphological features of the adult worm were observed in SEM were a mouth surrounded by three fleshy lips (one dorsal and two sub ventral) and a cervical alae that make the anterior end of the worm look like an arrowhead and the tail of the male which is usually curved ventrally and in the finger like provided with two spicules.

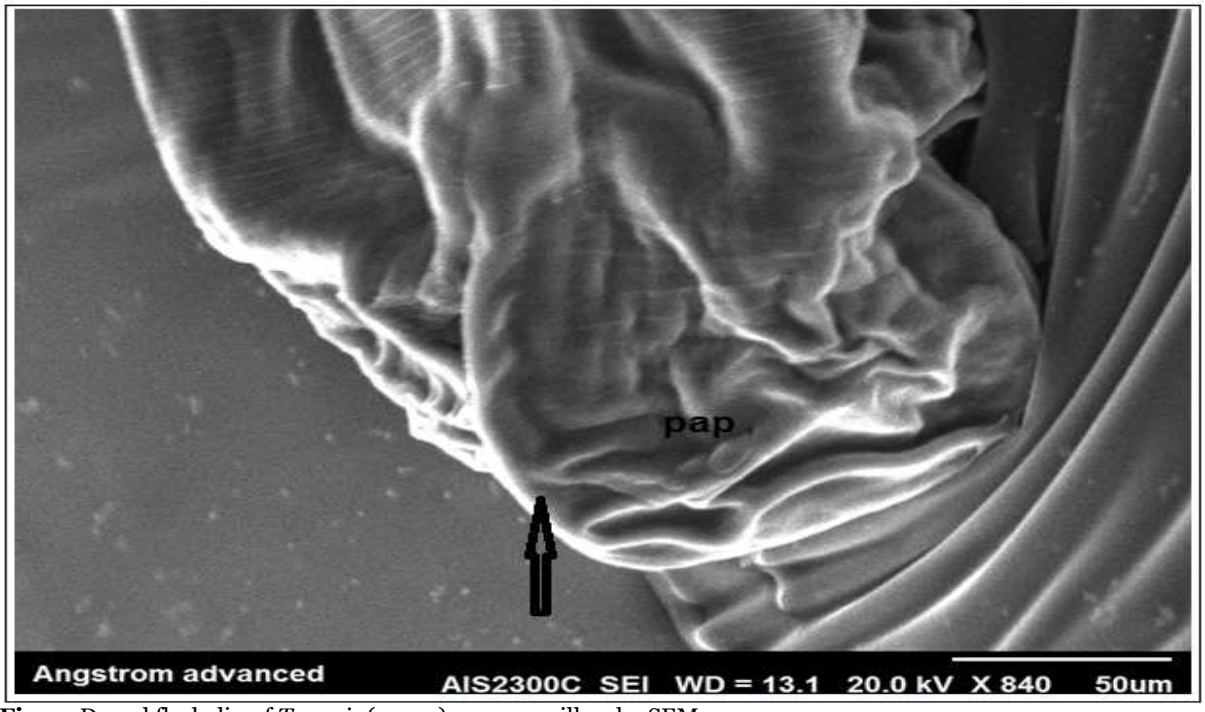

Fig. 5. Dorsal fleshylip of *T. canis* (arrow), pap= papillae, by SEM.

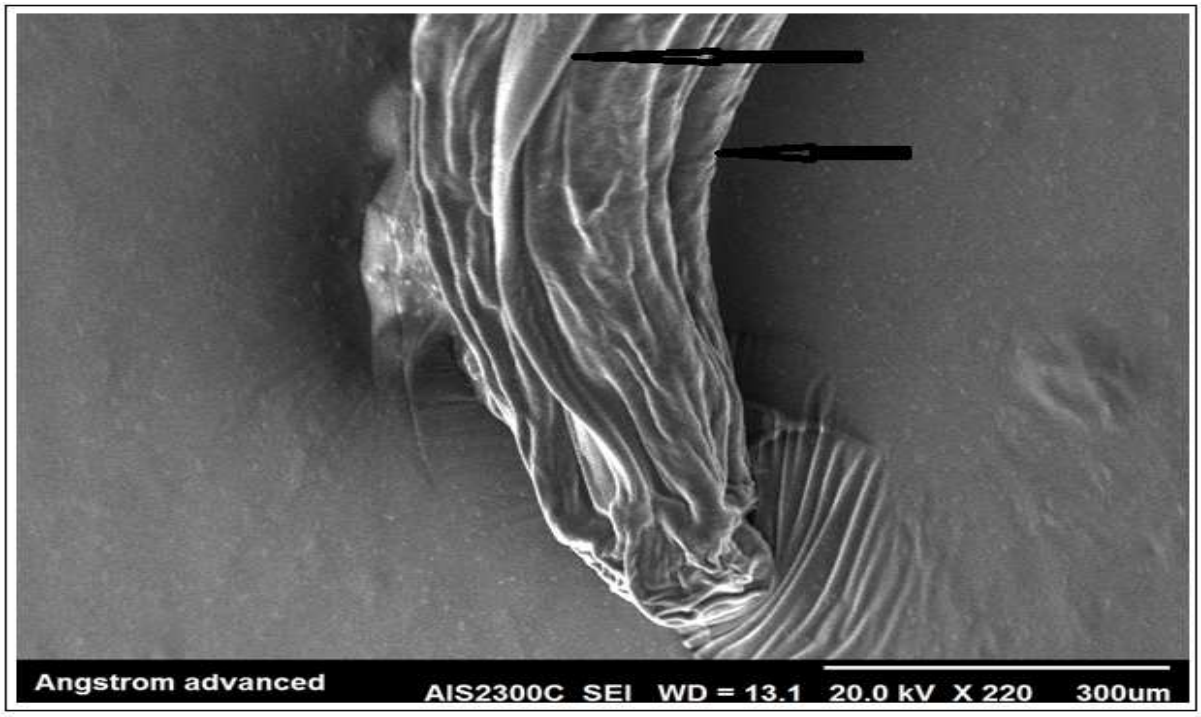

Fig. 6. Cervical alae of the anterior end of *T. canis* by SEM (arrows).

This advanced system depended on the highest resolution conventional that reach to 20 kV in current specimen and reach a point resolution of 50-500 um using a secondary electron detector that acceptance with Baghaei (2007) who reported that the highest resolution conventional (30 kV) SEM can reach a point resolution of 0.4 nm using a secondary electron detector.

The specimens of current study were coated with gold as a conductive material and such process was similar to Suzuki (2002) who reported that the coating with heavy metals (like gold) may increase the Signal/noise ratio for samples of low atomic number.

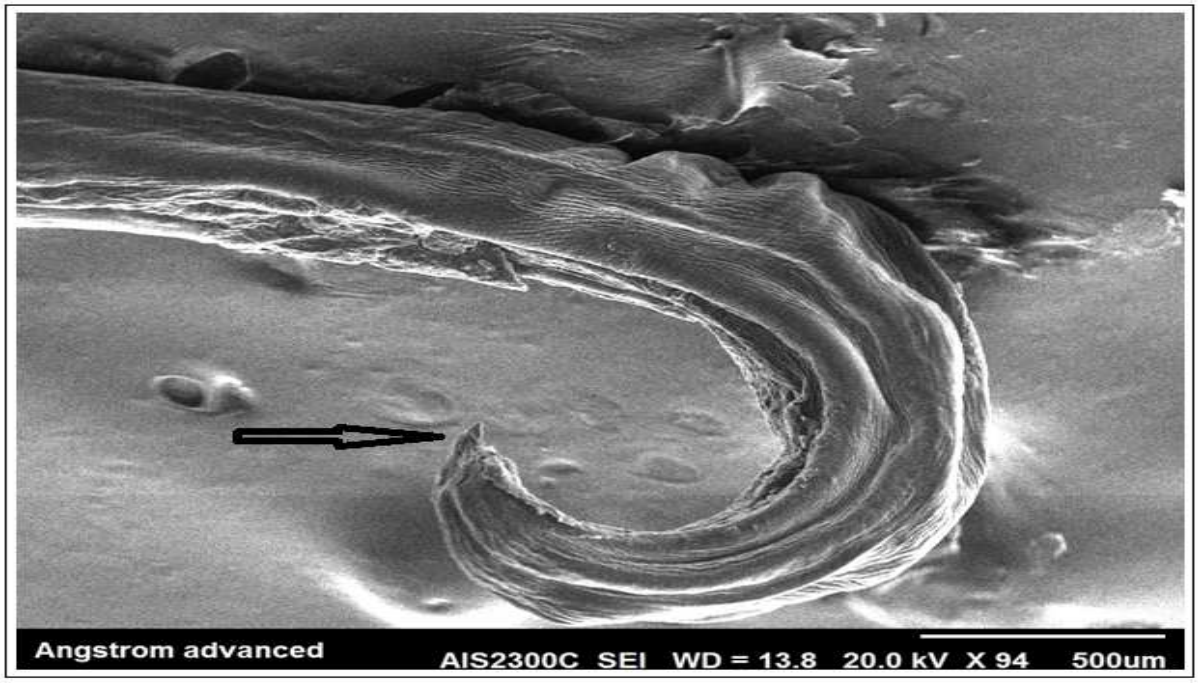

Fig. 7. Finger-like projection and two spicules at the posterior end of male *T. canis* by SEM.

Conclusion

The current study concluded that scanning electron microscopy images were best than the direct digital photo and light microscope photo for adult of *T. canis*.

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