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Morphology Of Haemonchus Species (Nematoda: Trichostrongylidae)

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Abstract: The morphological features of the nematodes of the genus Haemonchus Cobbold, 1898, which is represented by two species of H. contortus Rudolphi, 1803 and H. placei Place, 1893, were studied. Based on morphological studies, the independence of two species of gemonchus, Haemonchus contortus and Haemonchus placei parasitizing in sheep and cattle, was determined.

Key words: Nematode, Morphology, Larva, Morphometry, Cattle, Sheep, Haemonchus Contortus, Haemonchus Placei.

Representatives of the genus Haemonchus differ significantly from other trichostrongylids in their relatively large size [3]. In ruminants of Uzbekistan, hemonchies of the following species have been registered: *Haemonchus contortus*, *H. placei*, and *H. longistipes* [1].

The development of these species proceeds without the participation of an intermediate host, that is, according to the strongylid type. Females lay numerous eggs, which are excreted with feces into the external environment. As studies have shown, at a temperature of 25-30°C, larvae form in them, which leave the shell shell after 8-10 hours. The hatched larva of the 1st stage within 3-5 days becomes invasive, capable of infecting animals [2].

The morphological features of eggs and larvae are presented in Figures 1 and 2. It is not possible to differentiate the types of hemonchids by the structure of eggs and larvae of the 1st stage. For these purposes, the morphological signs of invasive larvae of the 3rd stage are used. According to the discovered features, the nematodes belonging to a certain genus are established.

The purpose of this article is to study the comparative morphology of two species of nematodes of the genus Haemonchus - parasites of sheep and cattle in Uzbekistan.

Morphology of eggs and invasive hemonch larvae. The size of the eggs of nematodes for the most part depends on the characteristics of their development. The eggs of hemonchids do not contain a large amount of nutrient material, since development in them proceeds only until the appearance of larvae of the 1st instar (larvae of the 1st stage). Egg sizes: length 82.3 ± 0.35 and width 41.9 ± 0.34 μm (Fig. 1).

The hemonch eggs do not have a protein shell. Eggs are characterized by strong shells that undergo long-term development in the external environment. It plays a protective role, protecting the egg from the effects of a number of adverse factors and, first of all, drying. The larvae developing in such eggs can remain viable for a long time. Hemonch eggs have a thin shell, although it also consists of several shells. The larvae in such eggs develop for several days, after which they enter the environment, where they develop until the invasive stage.

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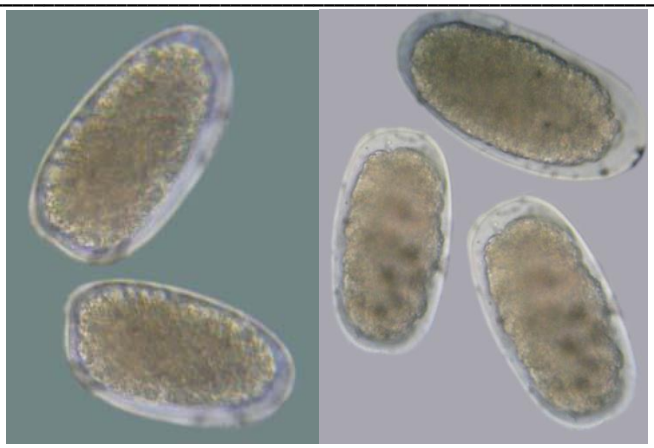

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Fig.1. Eggs *Haemonchus contortus* Rudolphi, 1803 (a), *H. placei* Place, 1893 (b) (about 10, rev. 100) (original)

Invasive hemonchus larvae are characterized by the following features: the size of the esophagus, intestine and tail end, the number and shape of intestinal cells.

The larvae are small , 0.7–0.8 mm long, with a filiform tail end (Fig. 2). The esophagus is relatively short and measures 0.15–0.17 mm. Intestinal cells 14, triangular in shape. The last two intestinal cells are of unequal length, spindle-shaped. The excretory opening is located at the posterior end of the body.

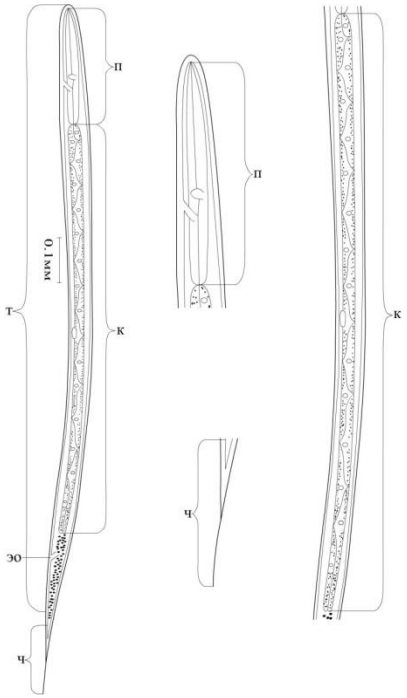

Fig.2. Invasive larva of *Haemonchus contortus*: t-body, p-esophagus, k-intestine, eo-excretory foramen, h-cap (original)

Morphology of male and female hemonchs: *Haemonchus contortus* Rudolphi, 1803 and H. placei Place, 1893. Male *Haemonchus contortus* Rudolphi, 1803. Body length 20.31±0.43 mm, maximum width near the bursa base 351±10.52 μm. The length of the esophagus is 1.82 ± 0.04 μm. The nerve ring is located at a distance of 261 ± 7.62 μm, and the excretory opening is 301.3 ± 7.47 μm from the anterior end of the body (table). The genital bursa is well developed, with two large lateral lobes and a small clearly outlined dorsal lobe, which may be asymmetric (Fig. 3).

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The ventral ribs begin with a common trunk and, diverging at the apices, are directed forward. The lateral ribs also begin with a common trunk, with the posterolateral one extending first and directed, like the medio-lateral, backward. The externo-dorsal ribs are thin, long, and separate from the dorsal rib, which is small and bifuciates in the distal part. The spicules are brown in color, their greatest width is near the proximal end; towards the distal end, they are narrowed, strongly thinned, and end with a characteristic swelling (Fig. 3).

The length of the left spicule is 509.9 ± 7.95 μm, and the length of the right one is 511.5±7.91 μm. Each spicule has in its tapering part one sharp, like a harpoon spine, located at different distances from the distal end: in the right spicule, 53 ± 0.72 μm, and in the left, 22.2 ± 0.47 μm. The roll is brown , somewhat lighter than spicules, shuttle-shaped, 271.7 ± 5.21 μm in length.

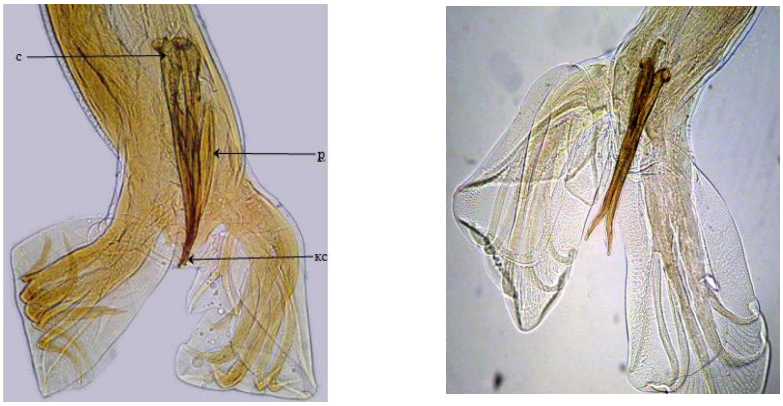

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Fig.3. Tail end of the male *Haemonchus contortus* Rudolphi, 1803 (a), *H. placei* Place, 1893 (b): p – rulek, cc — end of spicule, c — spicule (about 10, ob. 40)

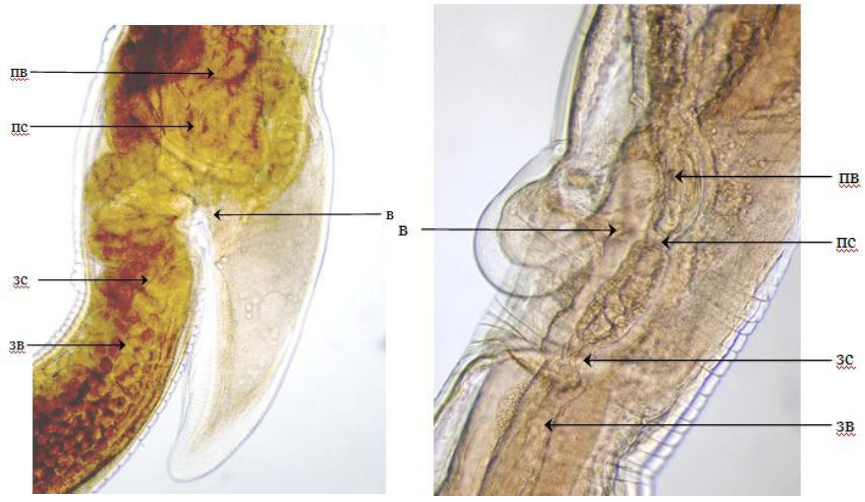

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Fig.4. Vulva area of female *Haemonchus contortus* Rudolphi, 1803 (a), *Haemonchus placei* Place, 1893 (b): ps — anterior sphincter, pv — anterior funnel, star — posterior funnel, zc — posterior sphincter, c — vulva (about 10, ob. 40)

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Table
Morphometry of *Haemonchus contortus* Rudolphi, 1803 and *Haemonchus placei* Place, 1893

Signs	*n*	*Lim*		*M ± m*		*Cv*	
		H. contortus	*H. placei*	*H. contortus*	*H. placei*	*H. contortus*	*H. placei*
Males							
Body length	20	17.4-23.1	18.2-22.8	20.31 ± 0.43	20.37± 0.35	9.55	7.64
Body width	20	280-420	300-410	351 ± 10.52	368.25± 8.87	13.4	10.8
Esophagus length	20	1.55-2.1	1.6-2.15	1.82 ± 0.04	1.69± 0.04	9.19	9.68
Distance to: nerve ring *	20	210-315	220-326	261 ± 7.62	282.7 ± 7.42	13.2	11.7
excretory opening *	20	255-360	280-360	301.3 ± 7.47	310.7± 4.97	11.2	7.16
Handle length	18	240-305	200-290	271.7 ± 5.21	243.24±7.35	8.14	12.5
Left spicule length	17	465-560	490-580	509.9 ± 7.95	539.7± 6.56	6.43	5.16
Right spicule length	17	465-560	490-580	511.5 ± 7.91	540.2± 6.42	6.37	5.04
Length of the left spicule from the hook to its distal end	17	20-26	24-34	22.2 ± 0.47	29.67± 0.74	8.64	10.6
Length of the right spicule from the hook to its distal end	17	50-60	52-66	53 ± 0.72	58.94± 0.91	5.62	6.54
Females							
Body length	20	26.5-33.2	25.1-33.1	29.6 ± 0.51	29.8 ± 0.53	7.75	8.01
Body width	20	550-785	530-725	647 ± 16.07	644.5 ± 13.1	11.1	9.06
Esophagus length	20	1.8-2.65	1.75-2.65	2.2 ± 0.07	2.24± 0.05	13.4	11.6
Distance to:							
nerve ring *	20	230-352	220-340	285.1 ± 7.88	282.25± 7.89	12.4	12.5
excretory opening *	20	270-355	250-385	309.5 ± 5.93	325± 7.78	8.56	10.7
vulva **	20	3.35-4.85	5.9-7.05	4.05 ± 0.11	6.5± 0.09	11.7	5.92
Front funnel length	17	200-400	230-425	309.6 ± 14.31	334.8 ± 15.71	19.1	19.9
Rear funnel length	17	180-350	200-345	286.3 ± 15.04	272.2± 10.2	21.7	15.9
Anterior sphincter length	17	145-280	160-280	205.9 ± 10.51	219.4± 8.56	21.1	16.6

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Female *H. contortus* Rudolphi, 1803. Females of hemonchids, like other nematodes, are distinguished by monotonic morphology (Fig. 4.). Body length 29.6 ± 0.51 mm, maximum width 647 ± 16.07 μm. The length of the esophagus is 2.2 ± 0.07 mm. The nerve ring is located at a distance of 285.1 ± 7.88 μm, and the excretory foramen is 309.5 ± 5.93 μm from the anterior end of the body (table).

The vulva is located at a distance of 4.05 ± 0.11 mm from the posterior end of the body; it is equipped with a powerful lingual valve (Figure 4). The length of the anterior funnel is 309.6 ± 14.31 μm, and the length of the posterior funnel is 286.3 ± 15.04 μm. The length of the anterior sphincter is 205.9 ± 10.51 μm, the posterior sphincter is 206.2 ± 10.28 μm. The eggmeth is well developed, 398.1 ± 3.6 μm in length. Tail length 449.5 ± 31.12 μm. The eggs are 82.3 ± 0.35 μm long, 41.9 ± 0.34 μm wide (Fig. 4).

Male *H. placei* Place, 1893. Body length 20.37 ± 0.35 mm, maximum width (near the bursa base) 368.25 ± 8.87 μm (table). The length of the esophagus is 1.89 ± 0.04 μm. The nerve ring is located in the anterior part of the body and is 282.7 ± 7.42 μm in size. Excretory foramen 310.7 ± 4.97 μm. Shank length 243.24 ± 7.35 μm. The length of the left spicule is 539.7 ± 6.56 μm, and that of the right spicule is 540.2 ± 6.42 μm (Fig. 3).

Each spicule has a spine. The length of the left spicule from the hook to its distal end is 29.67 ± 0.74 μm, while that of the right spicule is 58.94 ± 0.91 μm.

Female *H. placei* Place, 1893. Body length 29.8 ± 0.53 mm, maximum width 644.5 ± 13.1 μm. The length of the esophagus is 2.24 ± 0.06 mm. The nerve ring is located at a distance of 282.25 ± 7.89 μm, and the excretory foramen is 325 ± 7.78 μm from the anterior end of the body (table). The vulva is located 6.5 ± 0.09 mm from the posterior end of the body. The length of the anterior funnel is 334.8 ± 15.71 μm, and the length of the posterior one is 272.2 ± 10.2 μm (Fig. 4).

The length of the anterior sphincter is 219.4 ± 8.56 μm, the posterior sphincter is 220.2 ± 8.33 μm. The length of the ovum is 540 ± 7.63 μm. Tail length 416 ± 4.15 μm. The eggs are 82.1 ± 0.32 μm long and 41.6 ± 0.36 μm wide (Fig. 4).

Thus, according to our studies, in H. contortus, the length of the left spicule was 509.9 ± 7.95 μm, and the length of the right one was 511.5 ± 7.91 μm. Each spicule has one sharp, harpoon-like spine in its tapering part, located at a different distance from the distal end: 53 ± 0.72 μm in the right spicule, and 22.2 ± 0.47 μm in the left one. Whereas in H. placei, the length of the left spicule is 539.7 ± 6.56 μm, and that of the right spicule is 540.2 ± 6.42 μm. The spine is located at different distances from the distal end: in the right spicule, 58.94 ± 0.91 μm, and in the left one, 29.67 ± 0.74 μm.

Investigating the morphological features of hemonchus, we found that in H. placei the spicules are curved slightly to the right and the outer edge from hook to tip of the left spicule is convex, while in H. contortus the spicules are straight, and the outer side from hook to tip of the left spicule is concave. As for females, in H. placei the majority of individuals with a hemispherical outgrowth on the side of the vulva, while in H. contortus, females with a lingual valve predominate. There are other types of females, like in H. placei. In H. placei females, compared to H. Contortus females, the ovum is longer than 540 ± 7.63 μm (= ovum reservoir with sphincters), and further from the tail end of the body, the vulva and anus are located.

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