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The Development of Spicular and Floating Characteristics of the Insect Eggs of the *Trichocephalus ovis* Parasitic to Goat

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Abstract The development of spicular of the *Trichocephalus ovis* parasitic to the goats and the changing process of its form in degrade was clarified and the specific gravity of the insect eggs in the various developmental stages was investigated to the float method by sugar solution.
According to research result, spicular of *Trichocephalus ovis* parasitic to the goats was developed within 95 days and the specific gravity of mature insect egg was 1.23.

Key words goat, parasite, insect egg

Introduction

The great leader Comrade **Kim Il Sung** said.

"**The veterinary and epizootic prevention work should be strengthened.**

Only by so doing can we prevent epizootics and various other diseases or death of domestic animals and steadily increase animal products."("**KIM IL SUNG** WORKS" Vol. 8 P. 393)

Whipworm is spread all over the world including our country where goats are bred. It is not a cause of acute epidemic but gives negative effect to husbandry such as diarrhea and growth delay. In addition, it is the main factor of pasture pollution by soil infection. In our country, some characters about whipworm parasitic to goats are discovered, but its floating property was not found. Therefore, checking and diagnosis of animal are in difficulty. The forms of spicular of *T. ovis* are important in type decision of *Trichuris*. In literature the forms of spicular are glass-shaped [1, 2, 4－6, 9], triangled [3], or round shape [10]. So it is difficult for vets to decide species of parasite.

Also according to existing theory the diagnosis of *Trichuris trichira* was done by float method with saturated salt water [1, 2, 4－8], but in fact in the specific gravity of 1.2 there was no float, so wrong diagnosis was made occasionally. Therefore, we surveyed specific gravity of insect eggs in difference development stages and found out the development process of *T. ovis*.

1. Materials and Methods

1.1. Place and period

Experiments were proceeded in a laboratory animal shed of Pyongyang Agricultural College of **Kim Il Sung** University and goat farms from April 2008 to September 2014.

1.2. Materials

In the experiments1 500 goats were used as Laboratory animals.

Gravimeter, scale, microscope "(ML-4M)", thermometer, beaker, and so on.

Sugar powder and salt as reagents.

1.3. Methods

We held postmortem of 20 goats infected by whipworm to investigate parasitism parts and rate.

Investigation of spicular development characteristics of *T. ovis* parasitic to goats was done as follows.

First, we transmitted infiltrative eggs to uninfected goats to be selected.

Then, we selected goats in different days.

Next, we collected an insect and investigated form changes of spicular.

The survey of spicular degeneration characteristics of *T. ovis* was done by preserving an insect in 10% of formalin and examining form changes in different days.

The survey of floating property of insect eggs and digestion remnants of *T. ovis* was done as follows.

First, we made sugar solutions with different specific gravity.

Then, we floated insect eggs and remnants in different development stages.

2. Results

2.1. Parasitism parts and rate of *Trichocephalus ovis*

The parasitism parts and rate of *Trichocephalus ovis* in goat that are infected naturally is seen in table 1.

Table 1. Parasitism parts and rate of *Trichocephalus ovis*

Parasitism parts	Num. of goats/head	Num. of insect of parasitism parts	Parasitism rate/%
Jejunum	20	—	—
Ileum	20	85±9	30.1
Cecum	20	113±14	40.1
Colon	20	65±7	23.0
Rectum	20	19±6	6.7

As seen in table 1, the location where adult insects are most alive was 40.1% in cecum, the highest, 30.1% in ileum, 23% in colon and 6.7% in rectum.

2.2. Development and degeneration of spicular of *T. ovis*

The form changes of spicular in different stages of internal and external development are as follows (table 2).

As seen in table 2, the spicular parasitic to the goats developed within 95 days and the form of spicular was round and in external condition it was degenerated into glass-shape after 14 months.

Table 2. Development and degeneration of spicular of *T. ovis*.

Groups	Development stage	Spicule sheath			Spicule			Spicular		
		Length /mm	Width /mm	Form	Length /mm	Width /mm	Form	Length /mm	Width /mm	Form
Development stage in intra body	After artificial infection, 55days	1.182 (1.180~1.184)	0.043 (0.042~0.044)	Tubular shape, Many brunch	5.45 (5.3~5.6)	0.026 (0.024~0.029)	Acute	0.155 (0.14~0.16)	0.155 (0.14~0.16)	—
	After artificial infection, 75days	6.6 (6.5~6.7)	0.065 (0.06~0.07)	〃	7.25 (7.0~7.5)	0.029 (0.026~0.032)	〃	0.16 (0.15~0.17)	0.22 (0.21~0.23)	Boll shape
	After artificial infection, 85days	6.6 (6.5~6.7)	0.075 (0.07~0.08)	〃	7.25 (7.0~7.5)	0.029 (0.026~0.032)	〃	0.16 (0.15~0.17)	0.22 (0.21~0.23)	Glass shape
	After artificial infection, 95days	6.6 (6.5~6.7)	0.075 (0.07~0.08)	〃	7.25 (7.0~7.5)	0.029 (0.026~0.032)	〃	0.155 (0.14~0.16)	0.21 (0.20~0.22)	Round shape
Development stage in extra body	After collecting of insect, 12months	6.6 (6.5~6.7)	0.066	〃	7.25 (7.0~7.5)	0.024 (0.026~0.032)	〃	0.155	0.21	Round shape
	After collecting of insect, 14months	6.6	0.065	〃	7.25	0.024	〃	0.155 (0.14~0.16)	0.155 (0.14~0.16)	Glass shape

2.3. Floating property of insect eggs and digestion remnants of *Trichocephalus ovis* parasitic to goats

2.3.1. The relation between concentration, density and temperature of sugar solutions

The relation between concentration and density of sugar solutions are as follows (table 3).

Table 3. The relation between gravity and density of sugar solutions.

Concentration/%	Water/mL	Sugar powder/g	Density/d
16.666 7	150	30	1.08
20.000 0	150	37.5	1.09
23.076 9	150	45	1.10
25.925 9	150	52.5	1.11

Based on table 3, the relation between concentration of sugar solution and density is same as the recurrence formula (1).

$$y=0.003\ 2x+1.026\ 1\quad (R^2=0.997) \quad (1)$$

where, y is density of sugar solutions, x is concentration of sugar solutions (%).

As seen in table 3 and a recurrence formula 1, there was a positive relation between density and the concentration.

The recurrence formula of the relation between density and temperature of sugar solution is as follows.

$$y=-0.000\ 5x+1.23 \qquad (R^2=1) \qquad (2)$$

where y is density of sugar solutions, x is temperature.(℃)

As seen the recurrence formula 2, there was a negative relation between density and temperature of sugar solution.

2.3.2. The density of eggs of *T. ovis*

The floating density according to development stages of egg of *T. ovis* are as follows (table 4).

Table 4. The density according to growth stages of eggs of *T. ovis*

Density	Concentration/%	Floating state		
		Immaturity eggs	Maturation eggs	Invasiveness eggs
1.20	54.344	+	−	−
1.21	57.469	+	±	±
1.22	60.594	+	+	±
1.23	63.719	+	+	+
1.24	66.844	+	+	+
1.25	69.969	+	+	+

+ floating, − Eggs are not floating

As seen in table 4, mature eggs of *T. ovis* were floated in the solution of 1.23 density.

2.3.3. Floating state of digestion remnants in different solution

The floating states of remnant that raise an obstacle to the diagnosis in different density of the sugar solution are as follows (table 5).

As seen in table 5, the remnants in excrements were not floated in 1.23 density.

Table 5. Floating state of remnant in different solution

Gravity	Sugar gravity/%	Float state
1.22	60.594	—
1.23	63.719	—
1.24	66.844	+

+ floating, - no floating

Conclusion

T. ovis parasitic to goats is in jejunum, ileum, cecum, colon and rectum. In cecum, the parasitism rate was 40.1%, the highest of them.

The development of spicular of *T. ovis* parasitic to goats occurs within 95 days and outside the goat bodies spicular of round shape are changed into glass shape after 14 month.

The specific gravity of infiltrative eggs of *T. ovis* parasitic to goats is 1.23.

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