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OBSERVATION ON THE BIOLOGY OF *ORNITHOSTRONGYLUS QUADRIRADIATUS* (STEPHENSON, 1904) IN PIGEONS
I. Free-living larval stages

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Ornithostrongylus quadriradiatus, one of the most pathogenic strongyle parasite occurring in the small intestine of pigeon, has been reported by many workers (Kamarov and Beaudette, 1931; Whitney, 1961; Begum and Shaikh, 1987; Rao and Makhekar, 1992). This parasite was first reported by Srivastava (1939) in Indian domestic pigeons which died due to Ornithostrongylosis in Muktheswar. The only available literature on the bionomics and morphology of free living larval stages of this parasite appears to be by Cran and Cuvillier (1931) and Cuvillier (1937) but the information given by them is very limited. The present paper describes our observation on the development of egg to infective third stage larva of *O. quadriradiatus.*

Materials and methods

Mature female worms collected from small intestine of naturally infected birds were washed in saline and their uteri dissected at the vulvar region for collection of eggs to set up cultures. Water culture and faecal culture (with charcoal) were made and maintained at room temperature of 28-30° C. Cultures were examined at frequent intervals for the study of development of eggs and larval forms. To study the effect of temperature on the development of infective larva, faecal cultures were maintained in incubator at various temperatures of 4° C, 12° C, 20° C, 29° C, 38° C and 50° C. In addition the viability of infective larvae was also determined in dry and wet season. The morphology of larval forms both live and fixed was studied and camera lucida drawings made for measurement.

Results and discussion

The studies were made from March to June, 1996 at room temperature, (24° C < 36.2° C).

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Development of eggs and hatching

Freshly voided eggs were oval, thin, smooth shelled, measuring 70-82 x 38-45 μm in size and were in 16-32 cell stage. The segmentation, morula, tadpole and vermiform stages could be clearly seen in the culture. Active vermi form stage developed in 12 to 13 hrs and majority of first stage larvae hatched out by about 15 to 16 hrs at 29-30° C. Cran and Cuvillier (loc.cit) and Cuvillier (loc. cit) observed that the eggs hatched in 19 hrs after incubation.

Free living stages

The data on morphometry of free living stages of *O. quadriradiatus* are furnished in the Table 1.

First stage larvae (Fig. 1)

The larvae were slender with more or less rounded anterior end and tapering posterior end which formed a delicate pointed tail. The anterior end was provided with an oral aperture with short buccal tube which leads to rhabditiform oesophagus. The active movements and feeding lasted for about 16 to 19 hrs, the lethargy for 8 to 9 hrs and the first moult occurred within 25 to 27 hrs after setting of culture.

Second stage larva (Fig. 2)

There was marked increase in the length of larvae with pointed tail end. The oesophagus was less rhabditiform. The active movements and feeding lasted for about 26 to 29 hrs and the lethargy for 16 to 21 hrs. The second moulting occurred on day 3 after hatching and meanwhile the cuticle got separated but remained unshed.

Third stage larvae (Fig. 3, 4 and 5)

Marked structural changes to become third stage larva took place and the oesophagus now assumed filariform shape with slight enlargement of the posterior end. The intestinal cells became well defined, 16 in number. The tail ended in a point, had a pair of lateral, asymmetrical subterminal spines and the tail sheath measured 26 to 31 μm from tail tip. Third stage larvae were more active compared to second stage. The larvae when developed in faecal culture migrated actively towards water of condensation in the sides of vial.

In the present study it was observed that first and second moults occurred in 25-27 and 72 hrs respectively and the third stage infective larvae were seen from 72 hrs onwards in culture. The present findings of moulting period are consistent with those reported by Cran and Cuvillier (loc. cit) and Cuvillier (loc. cit). But the morphological details of free living larval stages could not be compared for want of such details in their reports.

Egg cultures in water, incubated at different temperatures, revealed that the temperature had a significant effect on development. Optimum development was recorded at 29° C, whereas no development was observed at 4° C, 38° C and 50° C. The infective larvae were observed from day 8 to 9 at 12° C, 6 to 7 at 20° C and 3 at 29° C after setting the culture

Table 1 Morphology of free-living larval stages of *O. quadriradiatus* (in microns)

Larval stage	Total length	Breadth at the level of oesophagus	Length of oesophagus	Distance from anterior end				Tail (from anus to posterior end)
				Nerve ring	Excretory pore	Genital primordium	Anus	
First	320-381 (355)	12-15 (13)	74-88 (81)	34-61 (47)	42-67 (58)	61-202 (184-8)	294-326 (184-8)	38-52 (44)
Second	520-585 (555)	16-18 (11)	102-108 (105)	60-64 (62)	70-74 (72)	265-274 (270.0)	471-516 (490)	54-74 (66)
Third	594-655 (629)	22-26 (24)	140-156 (147)	75-84 (80)	88-96 (92)	320-366 (343)	519-564 (542)	71-94 (87)

* Represent measurements of 100 larvae of each case

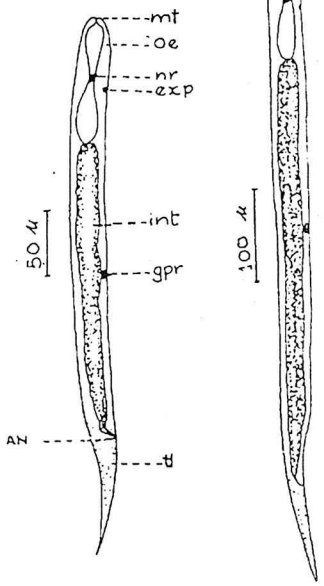

Fig. 1

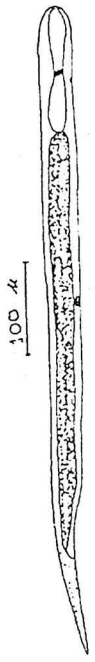

Fig. 2

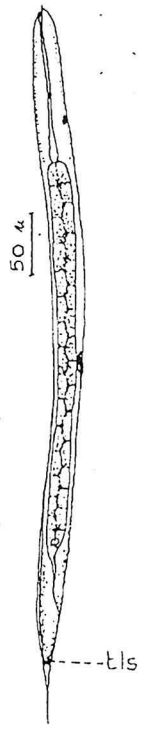

Fig. 3

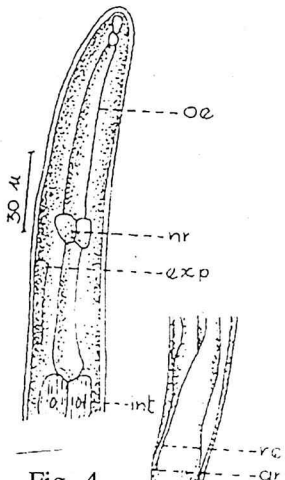

Fig. 4

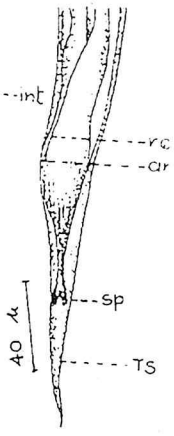

Fig. 5

Fig. 1 First stage larva
Fig. 2 Second stage larva
Fig. 3 Third stage larva
Fig. 4 Head end of third stage larva
Fig. 5 Tail end of third stage larva

Abbreviations used

An	:	Anus
exp	:	excretory pore
gpn	:	genital primordium
int	:	intestine
mt	:	mouth terminal
nr	:	nerve ring
oe	:	oesophagus
sp	:	spicule
tls	:	tail sheath
tl	:	tail

The viability of infective larvae was 60 to 67 (ave. 63) days in wet season (June) as against 47 to 52 (ave. 49) days in dry season (May) beyond which the intestinal cells of larvae got gradually exhausted, became pale, shrunken and the sheath was lost the larvae ultimately died and floated in water. Shorter viability period of 35 to 42 (ave. 39) days was reported by Cran and Cuvillier (loc.cit), but they did not mention any influence of temperature or season on the viability.

Summary

The morphology, development and viability of free living larval stages of *O. quadriradiatus* were described in detail. The period required for the development of egg to infective larvae was found to be 72 hrs at room temperature.

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