I J R B A T, Issue (Special-17), June 2021: 306-312 e-ISSN 2347 – 517X
A Double-Blind Peer Reviewed & Refereed Journal Original Article
INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY

OBSERVATION OF COCCIDIA (APICOMPLEXA: EIMERIIDAE) FROM GOAT (CAPRA HIRCUS) FAMILY-BOVIDAE FROM OSMANABAD DISTRICT, (M.S.) INDIA

Tejswini Sontakke[1], K.T. Patil[2], Dinesh Nalage[3] and N.S. Desale[1]
1. Department of Zoology, Smt. Pushpatai Hiray Arts, Science and Commerce Mahila College, Malegaon Camp, Dist. Nashik 423203 (M.S.) India
2. Department of Zoology M.S.G. College, Malegaon camp, Dist-Nashik (M.S.)
3. Paul Hebert Centre for DNA Barcoding and Biodiversity Studies, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.) India
tejaswinisontakke27@gmail.com

ABSTRACT:
Between June 2013 to May 2015, in this period a total number of 3004 faeces samples from goats were analysed for coccidia and collected from Osmanabad district. In this study 16 species, we have identified. *Eimeria arloingi* out of 3004 samples 2473 samples are positive and prevalence is 30%. One of the *Eimeria* species here we described i. e. *E. arloingi*. E. oocyst is elongated, bilateral wall, and measured (L/W) 23.0X 20.5µm, with an L/W ratio of 1.12µm. Both micropyle and micropylar cap both are present and oocystic residuum and polar granules are absent. Sporocyst is elongate, ovoidal, and measured L/W: 14.7 x 9.95 µm with L/W ratio: 1.47µm. Steida body present and prominent, SSB, PSB: all absent. In the sporocyst compact form of granules dispersed between Sporozoite. Sporozoite is elongate with, spheroidal one ARB and two subspheroidal PRB. Sporocyst possesses a residuum in the form of few scattered granules. This study adds to our growing knowledge of the coccidian fauna of goat in Osmanabad District (M.S.), India.

Keywords: Coccidia, *Eimeria*, Sporocyst, Sporozoite.

INTRODUCTION:

Coccidiosis is an economically important disease, which is caused by unicellular protozoa, *Eimeria*; with worldwide distribution (Chartier and Paraud 2012, Kheirandish *et al.*, 2012, Sontakke 2015c). *Eimeria* is a common gastrointestinal parasite that can be found in a wide range of hosts (Valentine et al., 2007). This disease caused by single cell parasite of the genus *Eimeria.* Infection of sheep with coccidia occurs through ingestion of sporulated oocysts along with water, soil and contaminated with fecal matter. In the small intestine sporulated oocysts release sporozoites which infect intestinal epithelium. The prevalence of coccidiosis species has been recorded in sheep in many countries of the world. Sixteen species of *Eimeria* has been found in the intestines of infected Goat (Sontakke 2016). This study we observed that the rate of infection with gastrointestinal parasites in domestic goat was high rate in comparing with previous studies.

MATERIALS AND METHODS:

Between June 2013 to May 2015, in this period total number of 3004 faeces samples from goats were analysed for coccidia and collected from Osmanabad district. In this study 16 species, we have identified. *Eimeria arloingi* out of 3004 samples 2473 samples are studied. The material for the study of coccidia of goats was obtained

from various slaughter houses as well as from different fields in and around Osmanabad district (Maharashtra).

The samples were examined and processed within four to five days after collection. Faecal samples were microscopically examined individually for the search of coccidian oocysts. After repeated washing the oocysts were concentrated by centrifugation at 3000 rpm for 10 minutes. The oocysts were then spread out in shallow petri dishes and covered with 2.5% solution of potassium dichromate for sporulation (Jadhav 2012, Sontakke 2015a).

Measurements of the sporulated and unsporulated oocyst were done with an ocular micrometer and photograph were taken with 18.1 mega pixel Sony siber shot DSC WX200 camera using 100x oil immersion objective and 10x eye piece. The dimensions of the oocysts were based on a study of 20 to 30 oocysts picked at random. (Nikam 1983, 2009, Sontakke 2015b).

Descriptions of oocysts and sporocysts are follows guideline of Coudert's key (Coudert, 1992, Nikam 1983) as follows: oocyst length (L) and width (W), their ranges and ratio (L/W), micropyle (M), micropylar cap (MC), oocyst residuum (OR), polar granules (PG), sporocyst length (L) and width (W), their ranges and ratio (L/W), sporocysts (SP), stieda body (SB), sub–stieda body (SSB), para–stieda body (PSB), sporocyst residuum (SR), sporozoites (SZ), anterior (ARB) and posterior (PRB) refractile bodies and nucleus (N).

OBSERVATION AND RESULT:

During the present study 16 species of Eimeria are found in goats. 16 species are redescribed. The commonest was E***. parva***, it was found in 897 of 2473 positive samples, showing a prevalence of 36.3% of the positive samples or 29.86% of the total sample examined. ***E. ninakohlyakimovae*** was the second common species found in 874 out of 2473 positive samples representing 29.09% of the positive samples and 35.3% of the total samples examined. ***E. arloingi*** was the fifth found in 741 out of 2743 positive samples, representing 30.0% of the positive samples 24.67% of the total samples.

Descriptions of oocytes:

Eimeria arloingi (*Marotel 1905, Martin 1909*)

Taxonomic summary of host: *Capra hircus* (Family-bovidae) Linnaeus 1758.

Sample Collected: June 2013 to May 2015.

Type of locality: Osmanabad, Maharashtra, India. Osmanabad (18.2070° N, 76.1784° E).

Prevalence: In 30% of this 2473 samples of goat.

Sporulation: 96-120 hrs.

Description:

Unsporulated oocyst: (Fig. a) The unsporulated oocyst has spherical granular sporoblast filling middle portion of the oocyst, measures 12 - 20 µm in diameter.

Sporulated oocyst: (Fig.b)

Oocyst shape elongated and slightly ovoidal; bilayered wall, ~1.8 µm thick, smooth outer layer ~1.0µm, inner layer thin ~0.8µm; L/W: 23.0X 20.5µm (19.0-27.0 – 17.0–24.0); L/W ratio: 1.12µm (1.2–1.1). M, MC both are present and OR, PG both are absent; micropyle ~5.0µm wide and MC is 1.0X5.0µm high, 4.0X9.0µm wide placed asymmetrically over the micropyle.The sporulated oocyst has four elongate, ovoid sporocysts.

Sporocyst and Sporozoites: SP elongate ovoidal, wall ~0.3 thick, with a smooth single-layered wall

composed of 2 valves joined by a longitudinal suture; L/W: 14.7 x 9.95 µm (11.0–18.0 X 6.0-12.0); L/W ratio: 1.47µm (1.57–1.36); SB present and prominant, SSB, PSB: all absent; SR: spheroidal-subspheroidal, ~3 µm (2.0-3.0), composed of compact form of granules dispersed between SZ; SZ: elongate with, spheroidal one ARB (1.6–2.0µm) and two subspheroidal PRB (2.4–4.0 X 2.2– 3.2µm); single N slightly posterior to midpoint of body. (Table. No.1)

Sporocyst: The sporocysts are elongate and ovoid with narrow, pointed anterior end and rounded, broad posterior end. They measure about 11-18 µm in length and 6- 12 µm in width. A stieda body is present. One or more polar granules are present. The sporocyst possesses a residuum in the form of few scattered granules with various sizes distributed in between two sporozoites.

Sporozoite: Sporozoites lie head to tail and carry a large and small refractile globules at broad and narrower end respectively.

Prepatent and patent periods: Unknown.

Site of infection: Unknown, oocytes recovered from feces.

Endogenous stages: Unknown.

Cross-transmission: None to date.

DISCUSSION:

Present species is compared with Levine and Ivens (1970), Shah and Joshi (1963), Singh(1964), Kshirsagar (1976), Majaro (1981), Nikam(1983), Silva (1998), Jadhav (2002), Bandhopadhay (2004) and More (2011). When species compared with all the previous species it is observed that most of the characters are same only minor morphometric differences are seen. Present species is smaller than Nikam (1983), Jadhav (2002) and More (2011) and larger than Levine and Ivens (1970), Shah and Joshi (1963), Singh (1964), Kshirsagar (1976), Majaro (1981), Silva (1998) and Bandhopadhay (2004). Stieda body was absent in the species reported by Kshirsagar (1976) but Nikam (1983), Jadhav (2002), More (2011) and present species observed the stieda body. Present species sporulation time is 84 -96 hours which matches with the Levine and Chevalier's species **(TableNo.-2).** In remaining workers sporulation time is lesser than the present species except More (2011, sporulation time – 108 hrs.). From above discussion it is concluded that the present species is *E. arloingi.*

ACKNOWLEDGEMENT:

The Authors are grateful to the Dept. of Zoology Dr. B.A.M. University, Aurangabad (M.S.) for providing the library and laboratory facilities.

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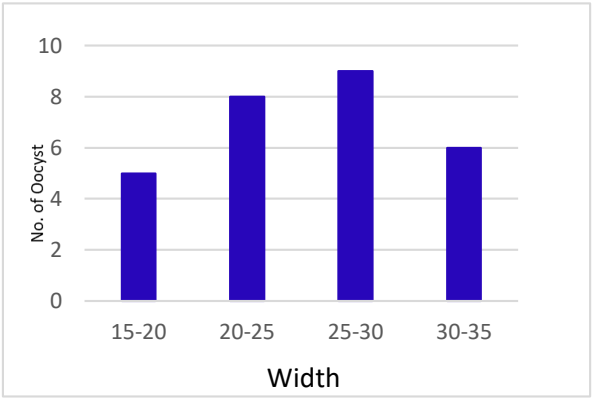
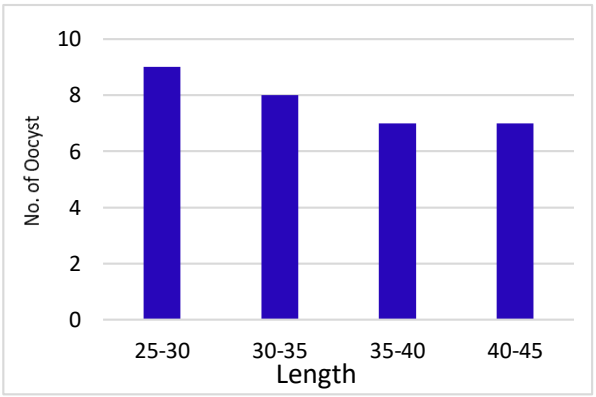
Table: 1- The dimensions of the sporulated oocysts of *Eimeria arloingi* from the goats are as follows: (All measurements are in microns)

Particulars	Oocyst from goat
Length of the oocyst	29.0-45.0 (34.35)
Width of the oocyst	18.0-34.0 (34.35)
Length width ratio of the oocyst	1.61-1.32 (1.29)
Length of the sporocyst	11.0-15.0 (14.7)
Width of the sporocyst	7.0-11.0 (9.95)
Length width ratio of sporocyst	1.57-1.36 (1.47)

Graph.No. 1 and 2. Showing the frequency distribution of the Length and widths of oocysts of *Eimeria arloingi* from goat



Graph: 1



Graph: 2

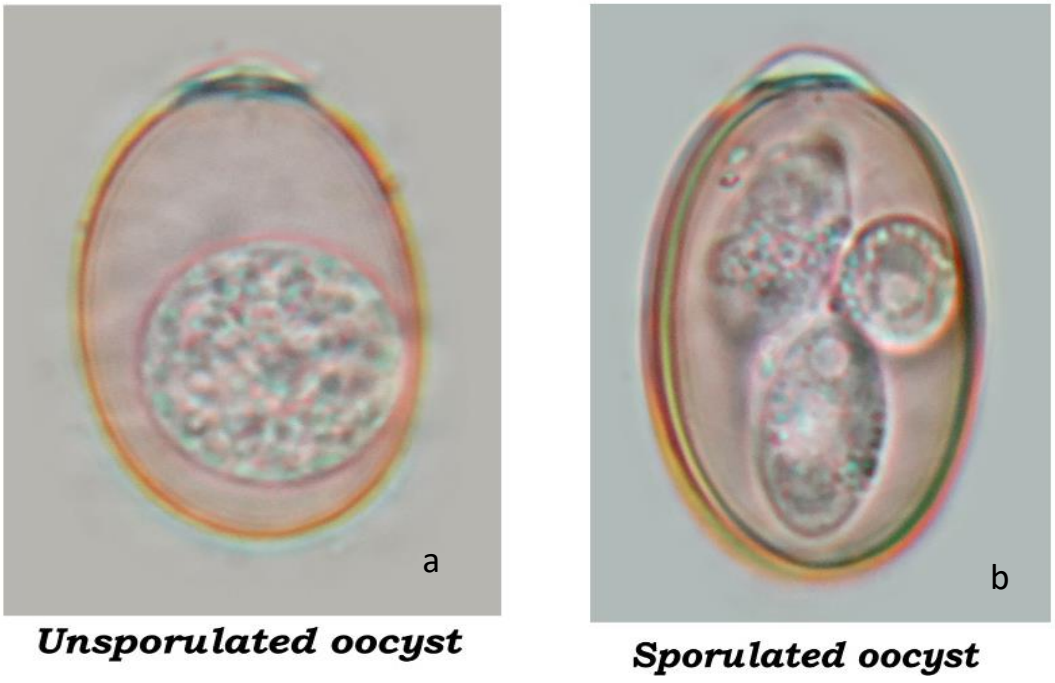


Fig. Oocysts of *Eimeria* species of goats as identified microscopically (1000X)

a. unsporulated oocyst of *E. Arloingi* **b.** Sporulated Oocyst of *E. arloingi.*

Table: 2 Comparison of Morphological characters and dimentions of oocyst of *Eimeria arloingi* from goat on various authors. (All dimentions in microns.)

Table 2: Comparison of morphological characters and dimensions of oocyst of *Eimeria arloingi* from Goats based on variou authors. (All measurements in microns)

Sr. No.	Author	Oocyst (µm)			L./W Ratio	Sporobl ast	Micropyle (Wide)	Micropylar cap		Sporocyst (µm)			L./W Ratio	Wall thickness	Polar granules	Oocystic residiuum	Sporocystic residuum	Shape of sporozoite	Steida body	Refractile globule	Sporulation time
		Shape	Length	Width				Height	Width	Shape	Length	Width									
1	Levine and Ivens (1970)	Ellipsoid, slightly ovoid	22.0–35.0 (28.0)	16.0–26.0 (19.21)	1.3-1.4 (1.5)	–	–	0.4-3.0 (2.0)	4.0-9.0 (6.7)	Elongated ovoid	11.0-17.0 (13.15)	6.0-10.0 (7.8)	1.9-1.7 (1.69)	–	1	–	Present	–	–	1 small 1 large	48-96 hrs
2	Shah and Joshi (1963)	Ellipsoid, ovoid	22.0–35.0 (28.0)	18.0–26.0 (21.0)	1.1-1.6 (1.3)	–	–	1.0-3.0 (2.0)	5.0-9.0 (6.0)	Elongated ovoid	11.0-17.0 (13.0)	6.0-10.0 (8.0)	1.9-1.7 (1.62)	–	1	–	Present	–	Absent	1 small 1 large	–
3	Singh (1964)		24.65–37.4 (20.3)	–	–	–	–	1.7-3.4	3.4-7.6	–	10	5	2	–	–	–	Present	–	–	–	24-72 hrs
4	Chavalier (1966)	Ovoid, straight side	26.0-31.0 (28.0)	16.0-22.0 (19.0)	1.5-1.8 (1.6)	–	–	–	–	Elongate	14.0-17.0 (15.0)	6.0-8.0 (7.0)	2.0-2.3 (2.1)	–	–	–	Present	–	–	–	48-96 hra
5	Kshirsagar (1976)	Ellipsoidal, ovoid	19.0–43.7 (34.66)	17.1–30.4 (22.62)	1.11-1.79 (1.53)	15.0-20.0	2-3.0	0.5-3.0	3.8-11.4	Oval, Elongate	11.4-17.1 (12.58)	7.6-11.4 (7.88)	1.0-2.4 (1.61)	1.5	Absent or Present	Absent	sevral coures granules	–	Absent	1 small 1 large	48-72 hrs
6	Lima (1980b)		22.0-35.0 (28.0)	16.0-23.0 (20.0)	1.2-2.1 (1.4)	–	–	–	–	–	10.0-17.0 (14.0)	6.0-10.0 (7.0)	1.3-2.8 (2.0)	–	–	–	–	–	–	–	–
7	Majaro(1981)		22.1-33.1 (26.53)	17.1-25.3 (20.35)	1.3-1.4 (1.29)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
8	Nikam (1983)	Eongate, ovoid	26.0–52.5 (39.75)	17.0–37.5 (29.01)	1.25-1.81 (1.38)	15.0-20.0	Present	1.0-4.0	4.0-9.0	Elongated	9.0-17.0 (12.26)	6.0-10.0 (7.66)	1.2-1.8 (1.6)	1.5	Absent or Present	Absent	sevral coures granules	–	Present	Present	28-86 hrs
9	Zoological survey of india by Mandal A.K. (1987)	Ellipsoidal	24.65-37.4 (30.3)	–	–	–	Present	1.7-3.4	3.0-7.6	Elongated	11.0-17.0 (14.0)	6.0-10.0 (8.0)	1.9-1.7	–	–	Absent	Present	–	Absent or vestigial	1 small, 1 large	24-48 hours
10	Soe A.K. (1989)	Ellipsoid, ovoid	26.0-32.0 (29.13)	16.0-23.0 (19.12)	1.2-1.7 (1.5)	–	Present	–		Elongate, Ovoid	13.0-17.0 (14.09)	6.0-8.0 (7.04)	1.7-2.4 (2.0)	–	Present	–	Present	–	Present	1 small 1 large	
11	Silva(1998)		22.0-35.0 (28.2)	15.9-23.2 (19.8)	1.12-2.07 (1.43)	–	–	–	–	–	9.8-17.1 (14.0)	6.1-9.8 (7.3)	1.29-2.8 (1.95)	–	–	–	–	–	–	–	–
12	Jadhav (2002)	Eongate, ovoid	24.0–46.0 (36.0)	17.0–30.0 (23.6)	1.4-1.5 (1.52)	–	5.0-8.0	1.0-4.0	4.0-8.0	Elongated	10.0-17.0 (14.2)	6.0-10.0 (8.0)	1.6-1.7 (1.77)	1.5	some times Present or Absent	Absent	several coures granules	–	small	Refractile bodies present	28-80 hrs
13	Bandyopadhyay (2004)		22.0-35.4 (28.2)	15.9-23.2 (19.8)	1.12-2.07 (1.43)	–	–	–	–	–	9.8-17.1 (14.0)	6.1-9.8 (7.3)	1.29-2.80 (1.95)	–	–	–	–	–	–	–	–
14	Kumar, et. al.(2005)	Ellipsoid, ovoidal	28.48	19.22		–	Present	–	–	Elongate, Ovoidal	–	–	–	–	–	–	–	–	–	–	48-72 hrs
15	Avelino D.B. (2010)	Ellipsoidal, ovoidal	36.63-16.65	26.64-13.32	1.66-1.0 (1.33)	–	Present	–	–	–	16.25-9.99 (13.22)	9.99-6.66 (9.64)	2.0-1.3 (1.37)	–	–	–	–	–	–	–	–
16	More (2011)	Elongate, ovoid	28.0–55.4 (40.32)	19.0–42.1 (32.14)	1.3-1.4 (1.25)	18.0-22.0	4.0-6.0	2.0-6.0	5.0-10.0	Elongate, Ovoid	12.0-20.2 (16.0)	8.0-14.2 (11.37)	1.4-1.5 (1.4)	1.7	Absent	Absent	Few scattered granules	Elongate	Present	1 small 1 large	108 hrs
17	Present author	Ellipsoid, elongate	29.0-45.0 (34.35)	18.0-34.0 (26.45)	1.61-1.32 (1.29)	12.0-20	4.0-6.0	1.0-5.0	4.0-9.0	Elongate, Ovoid	11.0-15.0 (4.71)	7.0-11.0 (9.95)	1.57-1.36 (1.47)	1.7	Absent	Absent	Granule form	Elongate	Present	1 small 1 large	84-96 hrs