RESEARCH ARTICLE

Taxonomic studies of Mammalian tapeworm *Moniezia* (*B.*) *bhalchandrai* n. sp. from *Capra hircus* (L.)

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ABSTRACT

The present paper deals with the description of a new species of genus *Moniezia,* Blanchard, 1891 subgenus Blanchariezia, Skrjabin and Schulz, 1937, viz. *Moniezia (B.) bhalchandrai* n. sp. The present tapeworm differs from all other species of genus *Moniezia (B.)* in having scolex medium, quadrangular in shape, with four suckers; neck medium; mature segment broader than long, with double set of reproductive organs; testes 196-200 in number; cirrus pouchoval in shape, cirrus thin; vas deferens thin, wavy; ovary medium, inverted cup shaped; vagina thin tube, posterior to the cirrus pouch; receptaculum seminis large, spindle shaped; ootype small, round; genital pores bilateral, medium, oval; longitudinal excretory canals wide; interproglottid glands 13-14 in number; vitelline gland large, oval in shape and gravid proglottids large, rectangular with numerous round eggs showing pyriform apparatus.

Key words: *Capra hircus*, new species, *Moniezia (B.) bhalchandrai* n.sp., Kusumba.

INTRODUCTION

The genus *Moniezia* was established by Blanchard, in 1891 as a type species *Moniezia expansa* from *Ovis aries*. Skrjabin and Schulz, 1937 divided this genus, into three sub-genera as follows:

1. Interproglottidal glands grouped in rosettes……..*Moniezia*
2. Interproglottidal glands arranged lineally (sometimes absent) ……..*Blanchariezia*
3. Interproglottidal glands absent ……..*Baeriezia*

The present worm agrees in all characters with subgenus *Blanchariezia* in which the following species are added, till to date, by different workers, in the world.

1. *M. (B.) benedeni* (Moniez, 1879) Skrj. et. Schulz, 1937
2. *M. (B.) pallid* Monnig, 1926
3. *M. (B.) aurangabadensis* Shinde, Jadhav & Kadam, 1985
4. *M. (B.) bharalae* Shinde, Jadhav & Kadam, 1985
5. *M*. (*B*.) *murhari* Kalse & Shinde, 1999
6. *M*. (*B*.) *jadhavae* Hiware, 1999
7. *M*. (*B*.) *kalawati* Nanware, Jadhav & Babare, 1999
8. *M.* (*B*.) *jalnaensis* Borde & Shinde, 1999
9. *M*. (*B*.) *warananagarensis* Patil & Shinde, 2000
10. *M*. (*B*.) *shindei* Deshmukh & Shinde, 2001
11. *M*. (*B*.) *hircusae* Tat & Jadhav, 2004
12. *M*. (*B*.) *aishvaryae* Shelke & Shinde, 2004
13. *M*. (*B*.) *caprai* Pokale, Shinde & Wagh, 2004
14. *M*. (*B*.) *rajalensis* Borde, Patil & Naphade, 2007
15. *M*. (*B*.) *punensis* Suryawanshi, Kalse & Chaudhari, 2008
16. *M*. (*B*.) *caprae* Nanware, 2010
17. *M*. (*B*.) *madhukarae* Kasar, Bhure, Nanware & Sonune, 2010
18. *M*. (*B*.) *maharashtrae* Nanware, 2010
19. *M*. (*B*.) *warudensis* Chaudhary, 2010
20. *M*. (*B*.) *babai* Humbe, Jadhav & Borde, 2011
21. *M*. (*B*.) *govindae* Padwal & Kadam, 2011
22. *M. (B.) ovisae* Humbe, Jadhav & Borde, 2011
23. *M. (B.) mansurae* Shaikh, Chaudhary, Waghmare & Bhure, 2011
24. *M. (B.) orientalis* Shinde, Nanware, Bhure and Deshmukh, 2013
25. *M. (B.) parbhaniensis* Makne, 2013
26. *M. (B.) nagaonensis* Suryawanshi & Kalse, 2015

The present communication, deals with the description, of a new species, as *Moniezia* (*Blanchariezia) bhalchandrai* n. sp. collected from the intestine of a goat, *Capra hircus* at. Kusumba, Tq. & Dist. Dhule, M.S., India.

MATERIAL AND METHODS

The survey of *Capra hircus* were made at Kusumba for Cestode infection. Four Cestodes were collected from the intestine. All the worms are flattened preserved in 4% formalin, stained with Harris Haematoxyline, passed through various alcoholic grades, cleared in Xylol, mounted in DPX and whole mount slide were prepared for anatomical studies, drawing were made with the help of camera lucida and microphotographs were taken by digital camera.

RESULTS

Description (**Based on four specimens**): **(Figs. 1 A, B, C, D)**

The worms were large in size, muscular and consist of scolex, numerous immature, mature and gravid proglottids. Scolex is medium in size, quadrangular in shape, broad anteriorly and narrow posteriorly, with four medium suckers, without rostellum, distinctly marked off from the strobila and measures 0.233 - 0.250 x 0.240 - 0.310. Suckers are medium in size, round in shape, arranged in two pairs, one pair in each half of it, slightly touching each other and measure 0.080 - 0.090 in diameter. Neck is medium in length, uniform anteriorly and posteriorly, with slightly curved lateral margin and measures 0.150 - 0.170 x 0.123 - 0.130.

Mature proglottids are large in size, rectangular in shape, broader than long, almost four and half times broader than long, each with a double set of reproductive organs, one set on each side of each segment, craspedote, with regular concave lateral margins, and measure 0.200 - 0.216 x 0.840 - 0.883.Testes are medium in size, oval in shape, 196-200 in number, evenly distributed, in a single field, in the central medulla of the segment, bounded laterally by the longitudinal excretory canals, majority of them in between the ovary of each side, few on the poral side of the ovary and measure 0.003 to 0.013 x 0.006 - 0.016. Cirrus pouch on each side is large in size, oval in shape, elongated, situated in anterior one third region of the segments, reaching the longitudinal excretory canals, slightly obliquely placed, directed anteriorly, medially and measures 0.060 - 0.080 x 0.013 - 0.016.Cirrus on each side is a thin tube, slightly curved, contained within the cirrus pouch and measures 0.060 - 0.067 x 0.003. Vas deferens on each side is thin, wavy, runs obliquely and measures 0.067 - 0.100 x 0.006 - 0.010.

Ovary on each side is medium in size, inverted cup shaped in appearance, with irregular margin, with numerous prominent, blunt, round acini, lobes directed posteriorly, placed in the middle of the segments and measures 0.140 - 0.150 x 0.023 - 0.026.Vagina on each side is a thin tube, situated posterior to the cirrus pouch, starts from the genital pore, extends anteriorly and then medially for a long distance, takes a turn posteriorly, enlarged and forms the receptaculum seminis, reaches and opens into the

ootype and measures 0.100 - 0.133 x 0.003 - 0.007. Receptaculum seminis is large, elongated, spindle shaped, in between the ovarian lobes, obliquely placed and measures 0.033 - 0.066 x 0.013 - 0.023.Ootype is small in size, round in shape, situated to the poral lobe of the ovary and measures 0.003 - 0.036 in diameter. Genital pores are bilateral, medium in size, oval in shape, placed in the anterior one third of the segments and measure 0.016 - 0.020 x 0.010 - 0.013 in breadth. Longitudinal excretory canals are wide and measures 0.026 - 0.038 in breadth.

Interproglottid glands are present in the inter-segmental regions, of the anterior and posterior margins of the segments, large in size, 13-14 in number, oval in shape, highly muscular, single regularly and lineally arranged and measure 0.010 - 0.023 x 0.006 - 0.020. Vitelline gland on each side is large in size, oval in shape, obliquely placed, post ovarian, having short, blunt, round acini and measures 0.033 - 0.036 x 0.003 - 0.004. Gravid proglottids are large in size, rectangular in shape, broader than long, showing number of eggs and measure 0.271 - 0.300 x 0.314 - 0.371. Eggs are round in shape showing pyriform apparatus with bulb and measures 0.003 - 0.006 in diameter.

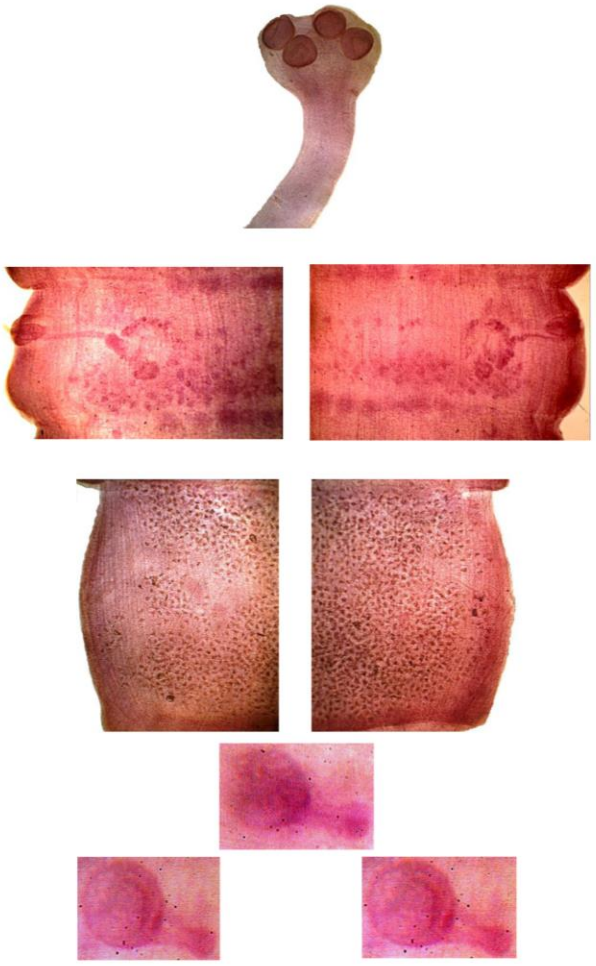

Fig: 1 - *Moniezia (B.) bhalchandrai* n. sp.

A – Scolex; B – Enlarged Mature half segment; C – Enlarged Gravid half segment; D- Eggs

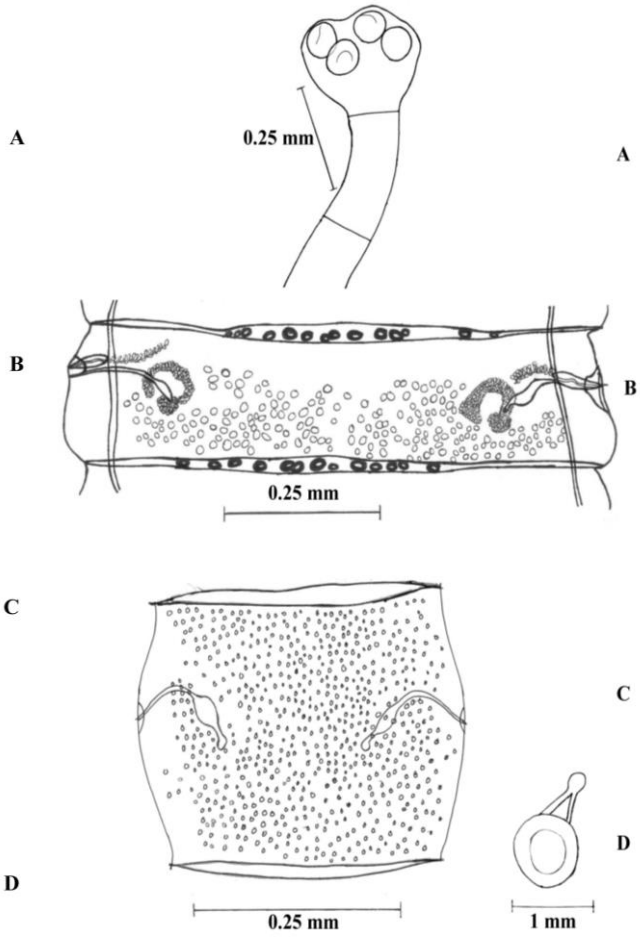

Fig: 1 - *Moniezia (B.) bhalchandrai* n. sp.

A – Scolex; B – Mature segment; C – Gravid segment; D – Egg

DISCUSSION

1) The genus *Moniezia* was established by Blanchard, 1891 and Skrjabin and Schulz, 1937 divided this genus, into three sub-genera as *Moniezia, Blanchariezia and Baeriezia*. The present worm agrees with subgenus *Blanchariezia*, in which the following 25 species are added till to date, by different workers, in the world

2) The worm under discussion differs from *M.* (*B.) benedeni* in the number of testes (196-200 vs. 500), ovary (inverted cup shaped vs, compact), cirrus pouch (elongated vs. short), interproglottidal glands (13-14 vs. 10-12), vitelline gland (oval vs. absent) and host (*Capra hircus* vs. *Ovies aries*.

3) The parasite under discussion, differs from *M. (B.) pallida* which is having mature segments (broader than long vs. squarish), interproglottid glands (13-14 vs. varying in size) and host (*Capra hircus* vs. *Equus caballus*).

4) The present cestode, differs from *M. (B.) aurangabadensis*, in the number of testes (196-200 vs. 1100-1200) and in host (*Capra hircus* vs. *Ovis bharal*).

5) The present worm, differs from *M. (B.) bharalae*, in the ovary (inverted cup shaped vs. bilobed & compact), in the number of interproglottid gland (13-14 vs. 38-44) and in host (*Capra hircus* vs. *Ovis bharal*).

6) The worm under discussion, differs from *M. (B.) murhari* in the number of testes (196-200 vs. 405-415), ovary (inverted cup shaped vs. bilobed), interproglottid glands (13-14 vs. 63) and vitelline gland (oval vs. rounded).

7) The present cestode, differs from *M. (B.) jadhavae*, in the shape of scolex (quadrangular vs. dome), in the number of testes (196-200 vs. 30-50), ovary (inverted cup shaped vs. bilobed) in the number of interproglottid gland (13-14 vs. 10-12), vagina (posterior to cirrus pouchvs. anterior to cirrus pouch) and in host (*Capra hircus* vs. *Ovis bharal*).

8) The parasite under discussion, differs from *M. (B.) kalawati* in the shape of ovary (inverted cup shaped vs. single mass) and interproglottid glands (13-14 vs. 54).

9) The worm under discussion, differs from *M. (B.) jalnaensis,* in the number of testes (196-200 vs. 150-160), in the number of interproglottid gland (13-14 vs. 19) and in host (*Capra hircus* vs. *Ovis bharal*).

10) The present cestode, differs from *M. (B.) warananagarensis*, in the shape of scolex (quadrangular vs. globular), in the number of testes (196-200 vs. 300-320), ovary (inverted cup shaped vs. bilobed) in the number of interproglottid gland (13-14 vs. 56) and in host (*Capra hircus* vs. *Ovis bharal*).

11) The present tapeworm, differs from *M. (B.) shindei*, in the shape of scolex (quadrangular vs. dome shaped), in the number of testes (196-200 vs. 30-40), in the shape of ovary (inverted cup shaped vs. distinctly bilobed) and in host (*Capra hircus* vs. *Ovis bharal*).

12) The worm under discussion, differs from *M. (B.) hircusae*, in the shape of scolex (quadrangular vs. globular), in the number of testes (196-200 vs. 168) and in the shape of ovary (inverted cup shaped vs. oval).

13) The parasite under discussion, differs from *M. (B.) aishvaryae*, in the shape of scolex (quadrangular vs. globular), in the number of testes (196-200 vs. 255-265), in the shape of ovary (inverted cup shaped vs. single mass), interproglottid gland (13-14 vs. 43-46), vitelline gland (oval vs. quadrangular) and in host (*Capra hircus* vs. *Bos indicus*).

14) The present cestode, differs from *M. (B.) caprai*, in the number of testes (196-200 vs. 255-260) and in the number of interproglottid gland (13-14 vs. 30-34).

15) The present parasite, differs from *M. (B.) rajalensis*, in the shape of scolex (quadrangular vs. globular), in the number of testes (196-200 vs. 250-260), in the shape of ovary (inverted cup vs. horse shoe shaped) and in the number of interproglottid gland (13-14 vs. 31-32).

16) The present worm, differs from *M. (B.) punensis*, in the number of testes (196-200 vs. 110-120) and in the number of interproglottid gland (13-14 vs. 18-22).

17) The present parasite, differs from *M. (B.) caprae*, in the shape of scolex (quadrangular vs. oval), in the number of testes (196-200 vs. 170), in the shape of ovary (inverted cup vs. bilobed) and in the number of interproglottid gland (13-14 vs. 40).

18) The worm under discussion, differs from *M. (B.) madhukarae*, in the shape of scolex (quadrangular vs. elongated), in the number of testes (196-200 vs. 210-240) and in the number of interproglottid gland (13-14 vs. 18-20).

19) The present worm, differs from *M. (B.) maharashtrae,* in the shape of scolex (quadrangular vs. oval), in the number of testes (196-200 vs. 116),in the shape of ovary (inverted cup vs. butterfly shaped) and in the number of interproglottid gland (13-14 vs. 38).

20) The present parasite, differs from *M.* (*B.*) *warudensis,* in the number of testes (196-200 vs.

241-256), in the shape of ovary (inverted cup vs compact) and in the number of interproglottid gland (13-14 vs. 30-35).

21) The present worm, differs from *M. (B.) babai,* in the shape of scolex (quadrangular vs. globular), in the shape of ovary (inverted cup shaped vs. rounded) and in the number of interproglottid gland (13-14 vs. 18-20).

22) The worm under discussion, differs from *M. (B.) govindae,* in the shape of scolex (quadrangular vs. globular), in the number of testes (196-200 vs. 100-140), in the shape of ovary (inverted cup vs. nut shaped) and in the number of interproglottid gland (13-14 vs. 42).

23) The present tape worm differs from *M. (B.) ovisae*, in the number of testes (196-200 vs. 155-165), in the shape of ovary (inverted cup vs. bilobed), in the number of interproglottid gland (13-14 vs. 32-35 in each pair) and reported from host (*Capra hircus* vs. *Ovis bharal).*

24) The worm under discussion, differs from *M. (B.) mansurae,* in the shape of scolex (quadrangular vs. globular), in the number of testes (196-200 vs. 160-170), in the shape of ovary (inverted cup vs. compact) and in the number of interproglottid gland (13-14 vs. 18).

25) The present parasite, differs from *M. (B.) orientalis* which is having scolex (quadrangular vs. oval), testes (196-200 vs. 35-40), in the shape of ovary (inverted cup vs. bean), interproglottid glands (13 - 14 vs. 33-37), vagina (posterior to cirrus pouch vs. anterior to cirrus pouch) and reported from host (*Capra hircus* vs. *Ovis bharal).*

26) The worm under discussion, differs from *M. (B.) parbhaniensis*, in the shape of scolex (quadrangular vs. squarish), in the number of testes (196-200 vs. 240-246), in the shape of ovary (inverted cup vs. bilobed) and in the number of interproglottid gland (13-14 vs. 27-30).

27) The parasite under discussion, differs from *M. (B.) nagaonensis,* in the number of testes (196-200 vs. 185), in the shape of ovary (inverted cup vs. horse shoe) and in the number of interproglottid gland (13-14 vs. 33-37).

These characters are valid enough, to erect a new species, for these worms and hence the name *M. (B.) bhalchandrai* n. sp. is proposed, in the honor of author's father.

Conflicts of interest: The authors stated that no conflicts of interest.

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