SHORT COMMUNICATION

Incidence of Cysticercoids in the Lesser Mealworm Beetles in Commercial Poultry Farms

Magudapathy Senthilkumar Buven Prasad, Sadhasivam Chakkaravarthi, Sivalingam Brindhadevi, Madhu Boomika, Dasari Udisha, Rangasamy Velusamy*, Bonthala Nikhila

Abstract

Tapeworms are the major consistent problem in intensive commercial poultry farms and transmitted to other birds by various invertebrate hosts dwelling in the poultry litter. Beetles are the major pests, causing not only economic losses but also spreading various pathogenic diseases leading to reduced growth and productivity in birds. The beetles were collected from commercial poultry farm suspected with tapeworm infection. A total of 120 beetles were collected and examined for their vector potentiality. Out of these, 51 (42.5%) were found to harbour the cysticercoids of *Raillietina cesticillus.* The beetles harbouring cysticercoids were identified as *Alphitobius diaperinus* (lesser mealworm beetle), which is the natural intermediate host for poultry tapeworm, *Raillietina cesticillus* in Namakkal area. Effective control of tapeworm infection can only be possible through the control of intermediate hosts rather than indiscriminate use of anthelmintics against the tapeworms in chicken.

Keywords: *Alphitobius diaperinus,* Cysticercoids, Poultry, *Raillietina cesticillus,* Tapeworm

Ind J Vet Sci and Biotech (2026): 10.48165/ijvsbt.22.5.29

Introduction

India is the third largest egg producer in the world. The total egg production in the country was 149.11 billion during the year 2024-25. The poultry industry contributed over 1.44 crore to National GDP (Muraleedharan, 2024). Tapeworms are very common in tropical countries like India where poor management of poultry houses are practiced, which usually inhabit the intestine and cause reduced egg production and decreased growth (Das *et al.,* 2022). The lifecycle is indirect which involves slugs, beetles ants and houseflies as intermediate host depending on the species of tapeworm. The mealworm beetles inhabit poultry droppings and act as vector and reservoir hosts for various poultry diseases, *viz.,* Aspergillosis, Marek's disease, Infectious bursal disease (IBD) and Newcastle disease and also act as an intermediate host for nematodes, cestodes and protozoa (Velusamy *et al*., 2023). In addition, both larvae and adult beetles can transmit some of the food-borne pathogens such as *Salmonella* (Roche *et al*., 2009) and *Campylobacter* infection to broilers (Bates *et al.,* 2004) and its vectorial competence was described by Leffer *et al*. (2010). It also acts as vector for *Eimeria* spp. that cause coccidiosis in birds and fowl tapeworms such as *Raillietina cesticillus*, *Choanotaenia infundibulum* and the nematodes, *Subulura brumpti* and *Hadjelia truncate* (Alborzi and Rahbar, 2012). The constant presence of these intermediate host accounts for the presence of tapeworm infections in commercial chicken. Therefore, effective control of these tapeworms can only be possible through the control of intermediate hosts rather than indiscriminate use of anthelmintics against the tapeworms in chicken. This study was aimed to know the incidence of cysticercoids in the lesser mealworm beetles in commercial poultry farms in Namakkal region of Tamil Nadu.

Department of Veterinary Parasitology, Veterinary College and Research Institute, Namakkal-637 002, Tamil Nadu Veterinary and Animal Sciences University, Tamil Nadu, India

Corresponding Author: Dr. R. Velusamy, Associate Professor, Department of Veterinary Parasitology, Veterinary College and Research Institute, Namakkal-637002, TANUVAS, Tamil Nadu, India. E-mail: velupara@gmail.com

How to cite this article: Buven Prasad, M. S., Chakkaravarthi, S., Brindhadevi, S., Boomika, M., Udisha, D., & Velusamy, R. (2026). Incidence of Cysticercoids in the Lesser Mealworm Beetles in Commercial Poultry Farms. Ind J Vet Sci & Biotech, 22(5), 159-162.

Source of support: Nil

Conflict of interest: None

Submitted 06/05/2026 **Accepted** 12/07/2026 **Published** 10/09/2026

Materials and Methods

The beetles were manually collected twice at the interval of one month from litter of commercial poultry farm in Namakkal (Tamil Nadu, India) and put into a test tube containing chloroform for easy handling. The collected beetles were brought to the laboratory and they were cut open on both sides of abdomen by removing the elytra and wings (appendages) with the pair of scissors to check for the presence of cysticercoids around the intestine. To assess the prevalence and severity of infection in the beetles, the number of beetles that harboured cysticercoids as well as number of cysticercoids in each beetle was counted. Cysticercoids were typically found attached on the outside of the gut and internal tissues in haemocoel cavity and gently loosen by drenching the dissected beetles in an embryo cup containing physiological saline (0.9%). Mature cysticercoids were visible to naked eyes as white pecks in

© The Author(s). 2026 Open Access This work is licensed under a Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License.

saline. Cysticercoids collected from each beetle were counted and recorded.

Results and Discussion

Chicken litter is highly infested with various types of arthropods, particularly the dung beetles are abundant in a poorly constructed and managed poultry houses with large amounts of droppings around them (Fig. 1, 2). The beetles observed in the present study were identified as *Alphitobius diaperinus* (A mealworm beetle) (Fig. 3). The infective stage of the parasite (metacestode stage) was searched in the abdominal cavity of beetles. Out of 120 beetles collected in the farm (60 each at 1 month interval), 51 (42.5%) beetles were found to contain the cysticercoids. The prevalence was higher in first trial than second (55 vs 30%). The prevalence and the intensity of the cysticercoids infection in the beetles are summarized in the Table 1. The maximum number of cysticercoids in a beetle was found out to be 11. Numerous cysticercoids could also be found in the single field (Fig. 4).

The cysticercoids were identified as *R. cesticillus* based on the morphology and morphometry (278 X 249 µm). The mature cysticercoids were oval in shape and had an invaginated scolex at the broader end and the invagination was marked by a deep groove extending to the central cavity. Calcareous corpuscles were uniformly distributed within the body. The surface was translucent and yellowish brown. Two rows of hooks with unarmed suckers were present on the rostellum (Fig. 5). Some of the evaginated cysticercoid with broad rostellum was observed (Fig. 6). Occasionally malformed cysticercoids were also discovered.

Table 1: Infection of *Alphitobius diaperinus* with cysticercoids of *Raillietina cesticillus*

Number of Beetle dissected	No/% of cysticercoids in beetles	Intensity (No.) of Cysticercoids in range		
		0-5	5-10	10-15
Trial A, 60	33 (55%)	6	1	1
Trial B, 60	18 (30%)	8	0	0
Total 120	51 (42.5%)	14	1	1



Fig. 1: Heaps of poultry litter (faecal droppings)



Fig. 2: Presence of *Alphitobius diaperinus* in the heaps of poultry litter



Fig. 3: Dorsal and ventral surfaces of *Alphitobius diaperinus*

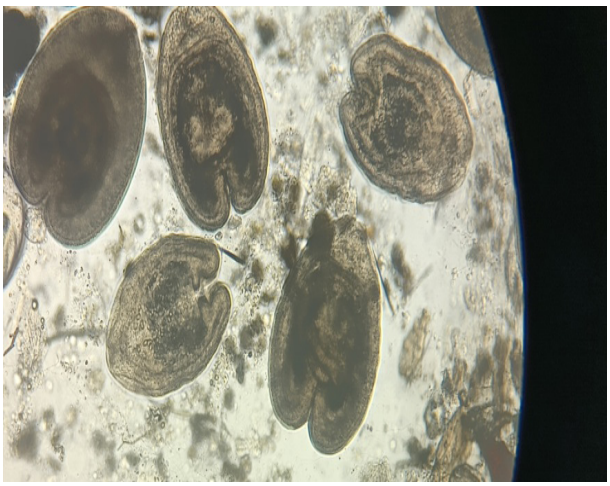


Fig. 4: Numerous cysticercoides in a single field (x100)



Fig. 5: Invaginated cysticercoid of *Raillietina cesticillus* (x400)

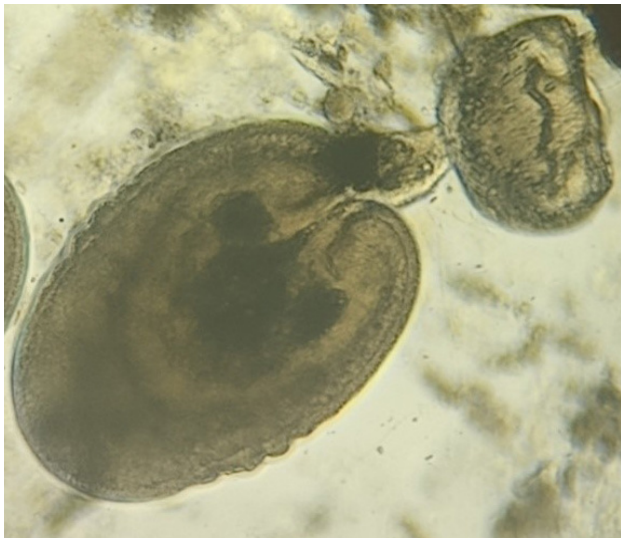


Fig. 6: Evaginated cysticercoids of *R. cesticillus* (x400)

The beetles observed in the present study were identified as *Alphitobius diaperinus* (A mealworm beetle) in Namakkal area. In an earlier study, Velusamy *et al*. (2014) recorded as the first report of *Opatroides frater* (A ground beetle), as natural intermediate host for the poultry tapeworm, *Raillietina cesticillus* in the same area. Moreover, the beetles collected from poultry droppings were infected with cysticercoids of only one species of tapeworm, *R. cesticillus* which is in conformation with Velusamy *et al*. (2023), who also recorded only cysticercoids of *R. cesticillus* in a mealworm beetles, whereas mixed infection of both *R. cesticillus* and *Choanotaenia infundibulum* were observed in a tenebrionid beetles in Namakkal area by Ponnudurai and Chellappa (2001). Recently, Oshima *et al.* (2024) reported that *Dermestes maculatus* (hide beetle) act as an intermediate host for poultry tapeworms, *Raillietina cesticillus* which causes reduced egg production in a poultry farm, the cysticercoids of *R. cesticillus* were detected in *Carcinops troglodytes* (Coleoptera: Histeridae) and *Hypocacculus praecox* (Coleoptera: Histeridae) beetles in Sudan (Mohammed *et al*., 2006). Elowni and Elbihary (1979) also found that cysticercoids of *C. infundibulum* in both adult and larval stages of *A. diaperinus*. The variations among beetles harbouring the cysticercoids of the poultry tapeworm may be due to the different habitats of beetles in poultry litter across various regions.

The variation in incidence between farms reflects differences in litter management practices, the age of the litter and the efficacy of the pest control programs. Tufan-Cetin and Cetin (2025) reported that traditional chemical insecticides are facing challenges due to emerging resistance in *A. diaperinus* populations, making biological and sustainable management approaches increasingly vital.

The micrometry of the mature cysticercoids of *R. cesticillus* averaged as 278 X 249 µm, whereas Velusamy *et al.* (2023) recorded it as 364 x 276 µm. Ponnudurai and Chellappa (2001) recorded an average of 292 x 212 µm mature cysticercoids. The variations in size noticed in the study could be due to presence of number of cysticercoids in a single beetle.

In the present survey, the maximum number of cysticercoids obtained from a single beetle was 11. The prevalence and intensity of cysticercoids infection observed in beetle in this study were not in agreement with findings of maximum of 150 in tenebrionid beetle (Ponnudurai and Chellappa, 2001) and 457 in ground beetle (Velusamy *et al*., 2023). Gogoi and Choudhury (1982) observed cysticercoid in *Tribolium confusum* and the intensity of infection was 7.63%. This marked variation in the prevalence and intensity could be due to the prevailing temperature and moisture condition favourable for breeding of beetles in poultry litter and exotic poultry could also act as carrier of hosts. The wide variation in the percentage of incidence rate between these studies could be due to the number of farms surveyed, beetles collected, and single or mixed infections. However, the major reason for the persistence of tapeworm infection in the study area could be due to the beetles abounding poultry litter and ineffective control measures adapted against them.

In conclusions, chickens maintained in uncleaned or dumped heaps of litter/manure favours breeding and development of beetles. They become infected by the ingestion of tapeworm segments/eggs present in the poultry litter/manure. Adult tapeworms are present in small intestines of infected chickens, while larval stages (cysticercoids) present in the body cavity of the beetles. The cysticercoid carrying beetles were identified as *Alphitobius diaperinus,* which plays a crucial epidemiological role as an intermediate host for poultry tapeworms. The high incidence of cysticercoids found in naturally occurring beetle populations highlights a direct link between density of beetles and tapeworm infection in a flock. Sustainable and long-term control of poultry cestodes rely on prophylactic deworming of the birds and integrated pest management of beetles.

Acknowledgements

The authors are grateful to the Dean, Veterinary College and Research Institute, TANUVAS, Namakkal for facilities provided during study period.

References

Alborzi, A.R., & Rahbar, A. (2012). Introducing *Alphitobius diaperinus (Insecta: Tenebrionidae*) as a new intermediate host of *Hadjelia truncate* (Nematoda). *Iranian Journal of Parasitology, 7*(2), 92-98.

Bates, C., Hiett, K.L., & Stern, N.J. (2004). Relationship of *Campylobacter* isolated from poultry and from darkling beetles in New Zeland. *Avian Diseases*, *48,138*-147.

Das, M., Laha, R., & Doley, S. (2022). Gastrointestinal parasites in backyard chickens of mid hill region of Meghalaya. *The Indian Journal of Animal Sciences*, *92*,179-182.

Elowni, E.E., & Elbihari, S. (1979). Natural and experimental infection of the beetle *Alphitobius diaperinus* (Coleoptera: Tenebrionidae) with *Choanotaenia infundibulum* and other tapeworms. *Veterinary Science Communications, 3*, 171-173.

Gogoi, A.R., & Chaudhuri, R.P. (1982). Infectivity of newly formed cysticercoids of Raillietina tetragona, *R. echinobothrida and R. cesticillus* to chicks. *Indian Journal of Parasitology, 6,* 51-52.

Leffer, A., Kuttel, J., Martins, L.M., Pedroso, A.C., & Ferreira, A.J. (2010). Vectorial competence of larvae and adults of *Alphitobius diaperinus* in the transmission of Salmonella enteritidis in poultry. *Vector borne and Zoonotic Diseases, 10(5),* 481-873.

Mohammed, H.D., Ahmed, E.L., Owni, E.E., & Ali, S.F. (2006). New reports for some intermediate hosts of poultry tapeworms in Khartoum State. *The Sudan Journal of Veterinary Research, 21*(6), 45-51.

Muraleedharan, K. (2024). Perspective of Ant and Beetle Intermediate hosts of poultry tapeworms in India and their control to boost poultry production in India. *Journal of Indian Veterinary Association, Kerala, 22,* 53-64.

Oshima, F., Miyaji, A., Konnai, M., Ito, S., Suzuki, H., Aihara, N., Shiga, T., & Taira, K. (2024). *Raillietina cesticillus* infection causes reduced egg production in chickens in a windowless poultry house. *The Journal of Veterinary Medical Science, 86(2*), 224-227.

Ponnudurai, G., & Chellappa, D.J. (2001). Observation on the biology of *Choanotaenia infundibulum* and *Raillietina cesticillus* and their natural intermediate hosts in Tamil Nadu, India. *Journal of Veterinary Parasitology, 15*(1), 51-53.

Roche, A.J., Cox, N.A., Richardson, L., Buhr, R.J., Cason, J.A., Fairchild, B.D., & Hinkle, N.C. (2009).Transmission of Salmonella to broilers by contaminated larval and adult lesser mealworms, *Alphitobius diaperinus* (Coleoptera: Tenebrionidae). *Poultry Science, 88*, 44-48.

Tufan-Cetin, O., & Cetin, H. (2025). A review of biological and sustainable management approaches for *Alphitobius diaperinus*, A major pest in poultry facilities. *Veterinary Sciences, 12,* 158

Velusamy, R., Abdul Basith, S., Harikrishnan, T.J., Ponnudurai, G., Anna, T., & Ramakrishnan, S. (2014). Ground beetle, *Opatroides frater (Coleoptera)* as natural intermediate host for the poultry tapeworm *R. cesticillus*. *Journal of Parasitic Diseases*, *38,*128-131.

Velusamy, R., Latchumikanthan, A., & Vijayasarathi, M.K. (2023). The lesser meal worm beetle as an intermediate host for *Raillietina cesticillus*. *Uttar Pradesh Journal of Zoology, 14*, 72-77.