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A mixed infection of *Ascaridia galli* and *Raillietina echinobothrida* in Aseel birds

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Abstract
Three Carcasses of one month old female Aseel birds were presented for postmortem examination with the clinical history of reduced appetite, loss of weight and sudden death. The postmortem examination revealed gross pathological lesions of infected organs *viz*., intestine, liver, bursa, and lungs. Small intestine showed creamy-white cylindrical worms in the cluster which almost occluded the lumen. Few fine ribbon-like segmented organisms embedded in the intestinal mucosa were also observed with hemorrhage on the wall of mucosa. Liver showed hepatomegaly with pale areas of necrotic foci, while the bursa appeared edematous and hemorrhagic. Lungs were congested and pneumonic. Morphological examination of these parasites revealed that the cylindrical parasites belonged to the genus *Ascaridia*, while the segmented organisms belonged to the genus *Raillietina*. Further microscopic examination of the intestinal contents confirmed the presence of characteristic ova of *Ascaridia* spp. It was concluded that the co-infection with these parasites might have caused serious fatality in poultry birds.

Keywords: Aseel bird, gross-pathology, postmortem examination, *Ascaridia galli*, *Raillietina echinobothrida*

Introduction
Since the beginning of human civilization, poultry birds have played a crucial role in providing both meat and eggs. Initially, these birds were raised through traditional backyard farming practices. However, in modern times, advanced and intensive rearing methods have not only met the increasing demand for poultry products but have also significantly contributed to the economy and livelihoods of small-scale farmers. The poultry sector stands out as one of the fastest-growing segment among all livestock sectors. Therefore, it is imperative to prioritize modern poultry rearing practices to effectively double farmers' income. By embracing modern techniques and technologies in poultry farming, farmers can enhance productivity, improve efficiency, and ultimately boost their incomes. This approach not only meets the growing demand for poultry products but also ensures sustainable growth in the agricultural sector. Thus, promoting modern poultry rearing practices is crucial for the overall development of the poultry industry and the welfare of farmers.

Inadequate and ineffective management practices often serve as the primary obstacle in the development of the poultry sector. Specifically, substandard hygiene measures contribute to a higher prevalence of parasitic diseases within farms. Parasitic diseases manifest in both clinical and subclinical infections, resulting in detrimental effects on farm profitability. These infections significantly elevate mortality and morbidity rates while also impairing productivity, leading to reduced egg production in layers or increased feed conversion ratios in meat birds. (Belete *et al*., 2016; Puttalakshmamma *et al*., 2008) [2, 11].

In subclinical infections of parasitic diseases, poultry often appear healthy initially, and farmers may not notice the ongoing infection. However, this can eventually lead to poor growth performance, emaciation, weakness, and a decrease in feed conversion ratio, among other symptoms (Katoch *et al*., 2012; Belete *et al*., 2016) [7, 2]. The high parasitic burden in the intestine and their attachment to the intestinal mucosa can result in pathological lesions in the gastrointestinal tract, reducing the available surface area for digestion and absorption of feed (Brar *et al*., 2016; Permin and Hansen, 1998) [4, 10].

In addition, parasites compete with the host for nutrients, causing huge economic losses due to poor growth and productivity. Infections with *Ascaridia galli*, for instance, can impair the absorption and utilization of nutrients in infected birds, leading to reduced growth rates (Das *et al*., 2010) [5].
In cases where the immune system is compromised, chronic subclinical infections can progress to clinical infections, potentially leading to the death of the host. In a recent case report, co-infection with the helminths belonging to genera *Ascaridia* and *Raillietina* was identified through morphological analysis of these parasites. Additionally, routine microscopic examination of intestinal contents showed the presence of *Ascaridia* eggs.

Case history and observation
Three female Aseel birds with an approximate weight of 1kg were presented for post-mortem examination to the Department of Veterinary Pathology, Veterinary College, Bidar. The history of birds revealed by the farmer was poor appetite and loss of weight over a period of 7 days. Upon external examination, the condition of the bird was dehydrated with pale conjunctival mucous membrane.

Materials and Methods
Roundworms and tapeworms collected from the small intestine of naturally infected chickens were alive during postmortem. The specimens were flattened and fixed in 10 percent buffered formalin for gross and microscopic studies. Identification of roundworms and tapeworms was conducted based on morphology. Morphological characteristics used for distinguishing roundworms typically included a cylindrical and elongated shape with tapering ends, a colorless or creamy-white body with translucent cuticles. For tapeworm speciation, distinctions were made in the size and shape of the scolex, morphology of the rostellum (armed with either a single row or double rows of hooks), presence of armed or unarmed suckers, the position of genital pores (unilateral or irregularly alternating), and the number of eggs within an egg capsule in gravid proglottids. Additionally, routine microscopic examination was carried out to detect the presence of parasitic eggs/ova from the recovered intestinal contents (Schmidt 1986; Yamaguti 1959; Khalil *et al*. 2006) [12, 15, 8].

Results and Discussion
Three deceased Aseel bird carcasses with a history of decreased appetite and weight loss were submitted for necropsy to the Department of Veterinary Pathology, Veterinary College Bidar, Karnataka. Upon external examination, the carcasses exhibited signs of emaciation, a prominent keel bone (Fig. 1) and pale visible mucous membranes. Internal examination revealed pale subcutaneous fascia, atrophied breast muscles with a prominent keel bone. Further exploration of the abdominal cavity revealed an enlarged liver with areas of pale necrotic foci, congested lungs (Fig. 2), tracheal congestion (Fig. 3) and an edematous, hemorrhagic bursa was also observed.
Pathological lesions were notably identified in the gastrointestinal system. The mucosal surface of the intestine showed congestion (Fig. 4). Upon exposure of the lumen, it was observed that creamy white cylindrical worms clustered together (Fig. 5), nearly obstructing the lumen of the small intestine. Additionally, a few ribbon-like segmented worms were also noted (Brar *et al*., 2016) [4]. Both the parasites as well as intestinal contents were collected in 10 percent buffered formalin for further diagnosis. Microscopic examination of feces confirmed presence of *Ascaridia galli* (ova) (Fig. 6).

Fig 1: Emaciated carcass with prominent keel bone

Fig 2: Lungs showed congestion and Pneumonia

Fig 3: Trachea was slightly congested with hemorrhages at lateral surface

Fig 4: Mucosal surface of the intestine showed congestion

Fig 5: Bundle of roundworms and Tapeworm

Fig 6: *Ascaridia galli* eggs observed in Feces in low power of microscope

The round worm showed the measurement of around 9 cm on an average (Fig. 7) with characteristic three prominent lips in anterior portion (Fig. 8), esophagus had no posterior bulb (Fig. 9). The posterior end of female showed uterus and presence of typical smooth shell ascarid egg (Fig. 10 & 11) whereas that of male showed papillae (Fig. 12) and spicules were evident (Fig. 13). These features indicated round worm as *Ascaridia galli* (Soulsby, 1982) [14].

The tapeworm was not intact, segments were separated. one segment included head and immature proglottids. Upon microscopic examination it was revealed that scolex had four circular armed suckers (Fig. 14), a very evident rostellum which was also armed with hooks (Fig. 15) and immature proglottids (Fig. 16). These features indicated the tapeworm to be *Raillietina echinobothrida* [14].

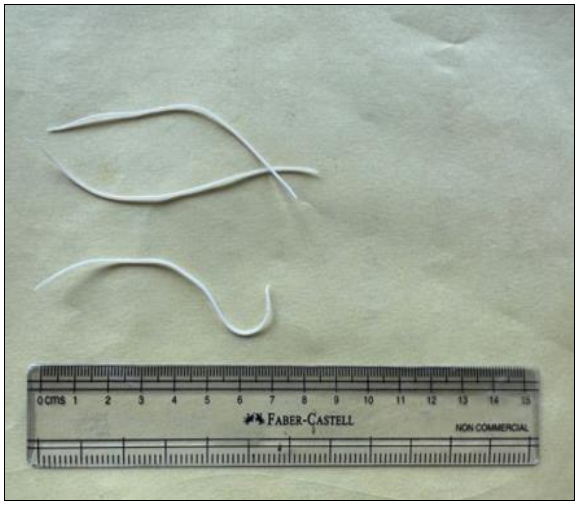

Fig 7: Adult round worms

Fig 8: Anterior end showing three lips

Fig 9: Oesophagus with no posterior bulb

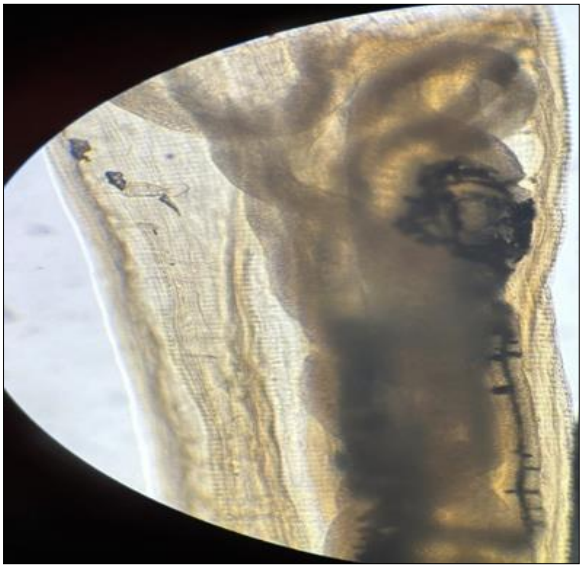

Fig 10: Uterus in adult female

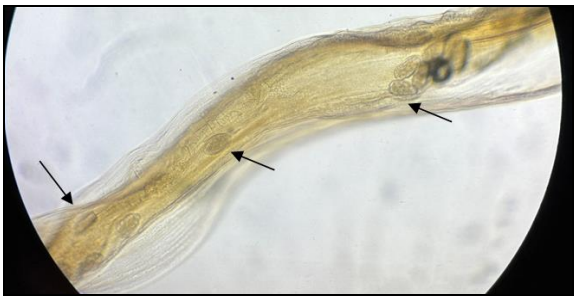

Fig 11: Ascarid egg inutero

Fig 12: Posterior male end with papillae

Fig 13: Spicules male posterior end

Fig 14: Four circular armed suckers

Fig 15: Armed rostellum, head of tapeworm of tapeworm

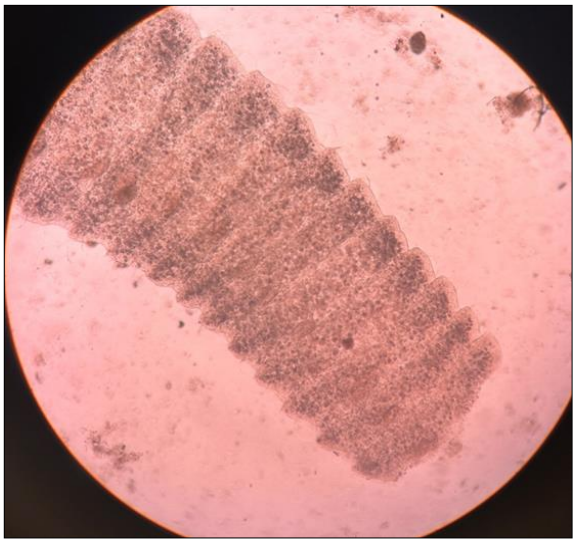

Fig 16: Immature proglottids in the fecal sample

Adults of *Ascaridia galli* were found in bundle within the small intestine, which can induce clinical symptoms such as diarrhea, anaemia, marked emaciation, and retarded growth

(Bhatia *et al*., 2018) [3]. *Ascaridia galli* infection can result in decreased meat and egg production, with a high worm burden potentially leading to intestinal haemorrhages, increased mortality, anemia, and exacerbation of other pre-existing conditions (Norton and Ruff, 2003) [9]. Direct losses in hens occur when the intestinal tract is obstructed and damaged due to high worm loads (Sharma *et al*., 2019) [13]. Similar findings have been reported for adult *Raillietina* spp., with their presence noted in the jejunum and ileum of the definitive host. *Raillietina* spp. infection may lead to reduced growth, emaciation, weakness, and digestive tract obstruction (Permin and Hansen, 1998) [10]. Additionally, larval stages (cysticercoids) of *Raillietina* spp. have been identified in various invertebrate intermediate hosts, including ants, beetles, small mini-wasps, or termites (Holstad *et al*., 1984; Alenyorege *et al*., 2011) [6, 1]. Implementing strict biosecurity measures can effectively prevent the spread of parasitic infections within farms.

Conclusion

Based on post-mortem and parasitological findings, the case was successfully diagnosed as Parasitic enteritis in Aseel birds and the birds may have died due to mixed infection of *Ascaridia galli* and *Raillietina echinobothrida*.

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