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## Gastrointestinal Parasites in Free-Range Chicken Raised under Extensive System from the Northeast of Brazil

### ABSTRACT

Brazilian poultry production is growing, mainly due to the cost and benefit that chicken meat provides. The importance of free-range chickens and the susceptibility, to which they are exposed, makes it necessary to know about gastrointestinal parasites and the consequences that large infections can cause for them as such as weight loss. The present study aimed to determine the occurrence of gastrointestinal parasites in free-range hens raised in an extensive regime in the municipality of Santa Rita, state of Maranhão, Brazil. The studied population was composed of adult chickens (*Gallus gallus domesticus*) acquired from slaughterhouses in the region. The gastrointestinal organs of each chicken were separated and subsequently conditioned in flasks containing Railliet and Henry's solution and sent to the laboratory, to be analyzed and processed. Of the 100 chickens examined, 227 specimens of helminthes were identified, with a frequency of 32.6% for nematodes and 67.4% for cestodes. Among the nematode the following parasites were identified: *Ascaridia galli* (27.03%); *Heterakis gallinarum* (48.65%) and *Subulura* spp. (24, 32%). *Raillietina echinobothrida* (100%) was the only cestoda identified. The average infection rate by species of parasite was 1.18 for *A. galli*, 2.22 for *H. gallinarum*, 1.06 for *Subulura* spp. and 9.00 for *R. echinobothrida*. It is concluded that free-range chickens are parasitized by nematodes and cestoda.

### INTRODUCTION

Brazilian poultry production is growing, mainly due to the cost and benefit that chicken meat provides. Alongside that the alternative raising of free-range chicken is getting importance in the market (Associação Brasileira da Avicultura Alternativa, 2018).

The governmental program "More Production" of the State of Maranhão, Brazil has the objective to promote de economic empowerment of the production chains in different scales, adding value to the products from Maranhão State, leading to richness, employments and income. In this context we found the production chain of free-range chicken in the municipality of Santa Rita, where this study was done.

The rising of free-range chicken is an important activity in rural proprieties and smallholder farms of the Northeastern of Brazil. However, lack of technical assistance makes an efficient management of the animals difficult and the parasitism could lead to loss of appetite, low food conversion and decrease in meat and egg production (Iqbal *et al.*, 2018; Van *et al.*, 2019).

The actual importance of free-range chicken production makes the knowledge about gastrointestinal parasites and the consequence that severe infections can bring to the productivity of these animals necessary (Yevstafyeva *et al.*, 2018).



This study aimed to evaluate the prevalence of gastrointestinal parasites in free-range chicken (*Gallus gallus domesticus*) kept under extensive conditions in the municipality of Santa Rita, State of Maranhão, Brazil as a mean to generate scientific knowledge that could provide contributions to this production chain within the scope of the "More Production" governmental program.

## MATERIAL AND METHODS

This study was conducted in the municipality of Santa Rita, Maranhão State, Brazil, located in the coordinates 03°08'37 "S and 44°19'33" W. The climate is subtropical humid, the mean annual temperature is above 24°C (Geplan, 2002; lbge, 2018).

The study was carried out from September/2016 to January/2017. The sample was defined for convenience and comprised by 100 free-range chickens (*Gallus gallus domesticus*). The animals were raised under extensive conditions. During the daytime, they were allowed to scavenge for edible insects, seeds, and pasture. During the night, they were perched on the trees, as informed by the owners.

The gastrointestinal tract of each animal was collected after slaughter, put on vials containing Railliet & Henry solution (Amato *et al.*, 1991) for further examination, to search for helminthes.

The collected helminthes were screened and mounted according to Amato *et al.* (1991) and the species were identified according to the description given by Vicente *et al.* (1995).

This research was approved by the Ethics Commitee of the State University of Maranhão (Process n°. 31/2017).

## RESULTS AND DISCUSSION

In free-range/backyard poultry production system, the species of helminthes involved are more or less the same, but different numbers were reported by different investigators (Uhuo *et al.*, 2013; Maina *et al.*, 2017; Win *et al.*, 2020). A total of 227 specimens of helminthes were collected from the gastrointestinal tract, 74(32.6%)nematodesand 153(67.4%)cestodes. None of the birds harbored trematodes. Nematodes *Ascaridia galli* (20/27.03%) *Heterakis gallinarum* (36/48.65%) and *Subulura* spp (18/24.32%) and the cestode *Raillietina echinobothrida* (153/100%) were recovered (Table 1). Except for *Subulura*, the other parasites identified in the present study are commonly

reported in the literature (Luka & Ndams, 2007; Ekpo *et al.*, 2010; Rayyan *et al.*, 2010; Uhuo *et al.*, 2013; Tomza-Marciniak, 2014; Wuthijaree *et al.*, 2019). Win *et al.* (2020) identified *Subulura brumpti* (2.0%) in fecal samples of free-range chickens.

**Table 1** – Helminth species infecting chicken free-range hens raised in an extensive regime in the municipality of Santa Rita, state of Maranhão, Brazil.

Helminth species	No. of infected chicken/ nematodes or cestodes	Percentage %
<i>Ascaridia galli</i>	20/74	27.03
<i>Heterakis gallinarum</i>	36/74	48.65
<i>Subulura</i> spp.	18/74	24.32
<i>Raillietina echinobothrida</i>	153/153	100
Total	227	100

In Brazil we can mention the work of Costa *et al.* (1986) that published a literature review and described 50 species of helminthic parasites of chickens' occurrence in Brazilian states and territories. Afterwards, works were published in the States of Rio de Janeiro (D'Avila *et al.*, 2004; Gomes *et al.*, 2009), Paraná, (Vieira, 2010), São Paulo (Silva *et al.*, 2016) and so on, and also pointed out *Ascaridia galli*, *Heterakis gallinarum* and *Raillietina* as frequent parasites in chicken. However, chickens can present a diversity of nematode, cestoda and trematoda helminthes as reported by Silva *et al.* (2018) when studying helminthic infections in chickens (*Gallus domesticus*) raised indifferent production systems in Brazil

Related to the sex of the parasites we had: 40% female and 60% male of *A. galli*, 36.11% female and 63.89% males of *H. gallinarum* and 72.22% female and 27.78% male of *Subulura* spp. The mean infection rate was as follows: 1.18; 2.22; 1.06; 9.00 for *A. galli*, *H. gallinarum*, *Subulura* spp., *R. echinobothrida*, respectively.

From the total of examined chicken, 8% were parasitized by *A. galli*, differing from other reports that pointed out a prevalence varying from 69,5% to 100% (Permin *et al.*, 2002; Thapa *et al.*, 2015). But Iqbal *et al.* (2018), as we did, found out a prevalence of 9%. Differences could probably be due to the type of rearing system as intensive system tends to favor the presence of parasite of short cycle and direct transmission where the litter is an ideal place for the development of the eggs of *A. galli* (Ruff, 1999; Iqbal *et al.*, 2018). It is important to mention that high prevalence of *A. galli* in hen farming is partly because of a deficient management and there is no immunity from hens to chicks, as stated by Rahimian *et al.* (2017). Besides, *Ascaridia galli* causes stunted growth, low productivity, irritation and inflammation



of the mucosa thus interfering with the absorption of food (UHUO, *et al.* 2013), so in severe infections can become a problem.

In this study, from the total of chickens it was observed that 2% were parasitized by *H. gallinarum*. Higher results were found by Thapa *et al.* (2015) who obtained a global mean prevalence of 29.0% in European countries with great variation among countries. In Brazil, this parasite was the most common species diagnosed in *Gallus gallus* in different regions of São Paulo State (Silva *et al.*, 2016).

*H. gallinarum* has indirect biological cycle and its intermediate hosts are earthworm and insects, in which the eggs of the parasite remain viable. Chickens get infection by eating the intermediate hosts. This species of parasite could lead to typhlitis, diarrhea and weight loss (Yevstafyeva *et al.*, 2018; Ola-Fadunsin *et al.*, 2019). Uhuo *et al.* (2013) calls attention to this species because it can also act as a carrier of *Histomonas meleagridis* in turkeys and chickens.

*Subulura* had 9% of prevalence of the total of chicken sampled, whereas Iqbal *et al.* (2018) detected 14% of *Subulura brumpti* and Ola-Fadunsin *et al.* (2019) 0,4% of *S. brumpti* in fecal samples. Variations could be due to rearing systems since the intensive one has better treatment in terms of biosecurity, hygiene, and food when compared to the extensive one (Ola-Fadunsin *et al.*, 2019).

The infection by cestoda was of 10% of the total of the sampled animals and was represented exclusively by *Raillietina echinobothrida*. This parasite genus and its species are reported in many parts of the world, including in Brazil, presenting different prevalence (Costa *et al.*, 1975; Costa *et al.*, 1986; Gomes 2009; Iqbal *et al.* 2018, Win *et al.*, 2020).

Species of *Raillietina* need intermediate hosts (gastropod mollusk and ants) to complete the biological cycle. Therefore, differences in prevalence can be associated to the quantity of available intermediate hosts, hygiene and local climate (Costa *et al.*, 1986; Iqbal *et al.*, 2018).

Intestinal nodules and severe hemorrhagic enteritis due to deep penetration of the parasite in the intestinal mucosa and submucosa of the host was observed here as reported by Silva *et al.* (2005) in cases of *Raillietina magninumida* infection and Vieira *et al.* (2010) detected intestinal tissue injury in chicken infected by *R. echinobothrida*. In fact, *R. echinobothrida* induces the formation of nodules in the intestinal wall, which can lead to confusion with lesions of avian tuberculosis (Saif *et al.*, 2003).

The genus *Raillietina* is considered of great pathogenicity among the cestoda of chickens and it has been associated to 50% of mortality in the same hen farms.

It is important to emphasize that chickens reared in extensive systems satisfy their nutrient requirement by roaming from place to place and they usually seek for food in the superficial layers of the soil that is often contaminated with parasite eggs and larva, as well as various insects or earthworm that serve as paratenic or intermediate hosts for internal parasites that infest poultry (Puttalakshamma *et al.*, 2008). Therefore, free-ranging birds have an increased opportunity to encounter the infective eggs, larvae, and intermediate hosts of parasites that can cause serious debilitating infections (Wilson *et al.*, 1987; Aini, 1990). In this sense, Afolabi *et al.* (2016) observed in their studies that the highest prevalence of gastrointestinal infection was recorded among the chickens that were kept in an extensive management system, while the lowest prevalence was recorded among the chickens kept in an intensive management system.

## CONCLUSION

It is concluded that free-range chicken from Santa Rita are infected by helminthes. *Ascaridia galli*, *Heterakis gallinarum*, *Subulura* spp. and *Raillietina echinobothrida* are for the first time reported in this host in the State of Maranhão. Although the prevalence was not high it is recommended hygiene measures in order to avoid severe parasite loads that could cause injury to the animals and compromise production.

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