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Investigation of the prevalence of digestive system parasites in chickens in the Kırıkkale region

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ABSTRACT

Objective: In this study, it was aimed to investigate the prevalence of digestive system parasites in backyard chickens in the Kırıkkale region.

Material-Method: One hundred (100) faecal samples were taken by visiting the poultry houses where domestic chicken breeding was carried out. Care was taken to ensure that the faecal samples were fresh and not in contact with soil. Each faecal sample was separately placed in plastic containers with lids and delivered to Kırıkkale University, Faculty of Veterinary Medicine, Department of Parasitology, Routine and Epidemiology laboratory under appropriate conditions. The samples were analysed on the same day by native-Lugol and Fülleborn flotation technique and the faecal samples which were positive for Eimeria oocyst were sporulated in potassium dichromate for species identification.

Result: Sixty-three of the faecal samples (63%) were found to be infected with one or more parasite eggs/oocysts. Eggs/oocysts of one, two and three different parasite species were detected in 42.9%, 39.7% and 11.1% of the faecal samples, respectively. *Eimeria* spp. 13%, *Ascaridia* spp. 6%, *Capillaria* spp. 12%, *Eimeria* spp.+*Trichostrongylus tenuis* 3%, *Eimeria* spp. + *Ascaridia* spp. 3%, *Ascaridia* spp. + *Capillaria* spp. 11%, *Ascaridia* spp. + *Capillaria* spp. + *Eimeria* spp. 3%, *Capillaria* spp + *Eimeria* spp. 4%, *Capillaria* spp + *T. tenuis* 1%, *Eimeria* spp. + *Ascaridia* spp. + *Heterakis* spp. 1%, *Ascaridia* spp. + *Capillaria* spp. + *T. tenuis* 1%, *Capillaria* spp. + *Ascaridia* spp. + *Heterakis* spp. 2%, *Ascaridia* spp. + *Heterakis* spp. 2% and *T. tenuis* 1% were detected in this study. *Eimeria* spp. oocysts were morphologically identified as *E. tenella, E. necatrix, E. brunetti, E. mitis* and *E. maxima*.

Conclusion: As a result, it is thought that the parasite rate is high due to the fact that the sampled chickens are free-ranging in the natural environment, parasites are more common during the infective periods of parasites or parasite control and treatment are not performed regularly. In order to reduce the presence of parasite infections that cause yield losses, it is recommended that the animals should have access to clean feed and water sources and regular parasitic control and treatment should be carried out.

Keywords: *Chicken, Helminth, Parasite, Protozoon, Kırıkkale*

INTRODUCTION

Chickens can be produced inexpensively due to their ability to utilise feed and high productivity such as meat and eggs, and are therefore widely used as a source of animal protein for humans both in the world and in Turkey (Tosun, 2022). In recent years, free-range chicken farming has become

increasingly widespread for reasons such as the protection of animal welfare. Free-range chicken farming contributes to the reduction of feed costs by allowing chickens to exhibit their natural behaviour, benefit from fresh air, sunlight and greenery, and feed on natural foods such as worms, insects and grass. This way of feeding causes chickens to be more exposed to the infective periods of parasites. Chickens can be infected directly by ingesting oocysts, eggs and larvae of developing parasites, or by ingesting arachnid or paratenic hosts of some parasites.

Until today, studies have been carried out to determine digestive system parasites according to faecal examination in backyard chickens. There is limited number of studies conducted about this subject in Turkey, *Echinostoma revolutum*, *Echinostoma* spp., *Raillietina* spp., *Capillaria* spp., *C. caudinflata*, *Ascaridia galli*, *Heterakis gallinarum*, *Syngamus trachea*, *Trichostrongylus tenuis*, *Davainea proglottina*, *Dispharynx nasuta*, *Choanotaenia infundibulum* among helminths (Biçek et al., 2000; Köse et al., 2009; Aydın et al., 2010; Ünlü, 2012; Denizhan and Karakuş, 2019), and *Eimeria* spp. oocysts among protozoa were detected (Orunç and Biçek, 2009).

In this study, it was aimed to investigate the prevalence of digestive system parasites in backyard chickens in the Kırıkkale region.

MATERIALS and METHODS

Permission for sample collection and the conduct of the study was obtained from Kırıkkale University Experimental Animals Local Ethics Committee (Letter dated 12.12.2022 and numbered E-137009). A total of 100 faecal samples were collected from chicken coops in Kırıkkale Centre, Keskin, Balışeyh, Bahşılı and Yahşihan districts. Before the faecal samples were collected, chickens were randomly selected from the animals in different poultry houses and each of them was individually placed in separate closed cages and faecal samples were collected from the relevant places the same day. Each of the collected fresh faecal samples was placed in plastic containers with lids and transported to the laboratory under suitable conditions. The faeces were analysed on the same day by native-lugol and Fülleborn saturated saline flotation technique. The faeces found to be positive for *Eimeria* spp. were placed in Petri dishes containing potassium dichromate for sporulation of oocysts and checked daily for 7 days to determine the sporulated oocysts and species identification was made from the relevant literature (Kumar et al., 2015).

Statistical Analysis

Samples were analysed with frequency tables. The rates of detected parasites were evaluated as percentages.

RESULTS

It was found that 63% of the examined chicken faeces were infected with eggs/oocysts of at least one parasite. Among the protozoans, *Eimeria* spp. oocysts and among the helminths, *Capillaria* spp., *Ascaridia* spp., *Heterakis* spp. and *Trichostrongylus tenuis* eggs were found (Figure 1).

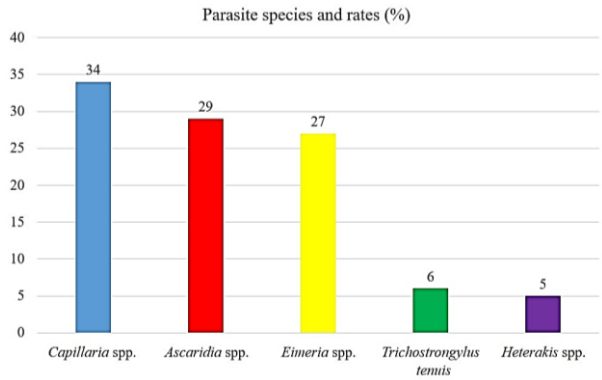

Figure 1. The ratio of parasites detected at genus and/or species level

In 42.9%, 39.7%, 11.1% and 11.1% of the faecal samples found to be positive for parasites, one, two and three different parasite species were found at the same time. The parasite eggs/oocysts and their ratios detected in the study are given in Table 1.

When the total rates of single and mixed infected faeces were analysed, the most common species was *Capillaria* spp. (34%). This was followed by *Ascaridia* spp. (29%), *Eimeria* spp. (27%), *T. tenuis* (6%) and *Heterakis* spp. (5%) (Figure 1).

Only protozoan oocysts were found in 20.6%, only helminth eggs were found in 57.2%, and eggs and oocysts of helminth+protozoan parasites were found in 22.2% of the faecal samples which were positive for parasites. All of the detected helminths belonged to nematode parasites and no trematode or cestode eggs were found.

Eimeria spp. oocysts were detected morphologically as *E. tenella, E. necatrix, E. brunetti, E. mitis* and *E. maxima* oocysts as a result of sporulation of faecal samples which were positive for *Eimeria* spp. oocysts (Figure 2).

Table 1. Parasite species and rates detected in chickens according to fecal examination

Parasite species	Number of positive samples (n)	The proportion of positive samples (%)	The proportion of total samples (%)
Eimeria spp.	13	20.6	13
Ascaridia spp.	6	9.5	6
Capillaria spp.	12	19	12
Trichostrongylus tenuis	1	1.6	1
Eimeria spp.+*T. tenuis*	3	4.8	3
Eimeria spp.+ *Ascaridia* spp.	3	4.8	3
Ascaridia spp.,+ *Capillaria* spp.	11	17.4	11
Capillaria spp.+*Eimeria* spp.	4	6.3	4
Capillaria spp. + *T. tenuis*	1	1.6	1
Ascaridia spp.+*Heterakis* spp.	2	3.2	2
Eimeria spp.+ *Ascaridia* spp. + *Heterakis* spp.	1	1.6	1
Ascaridia spp.+ *Capillaria* spp.+*Eimeria* spp.	3	4.8	3
Ascaridia spp.,+ *Capillaria* spp.,+ *T. tenuis*	1	1.6	1
Capillaria spp.+ *Ascaridia* spp. + *Heterakis* spp.	2	3.2	2

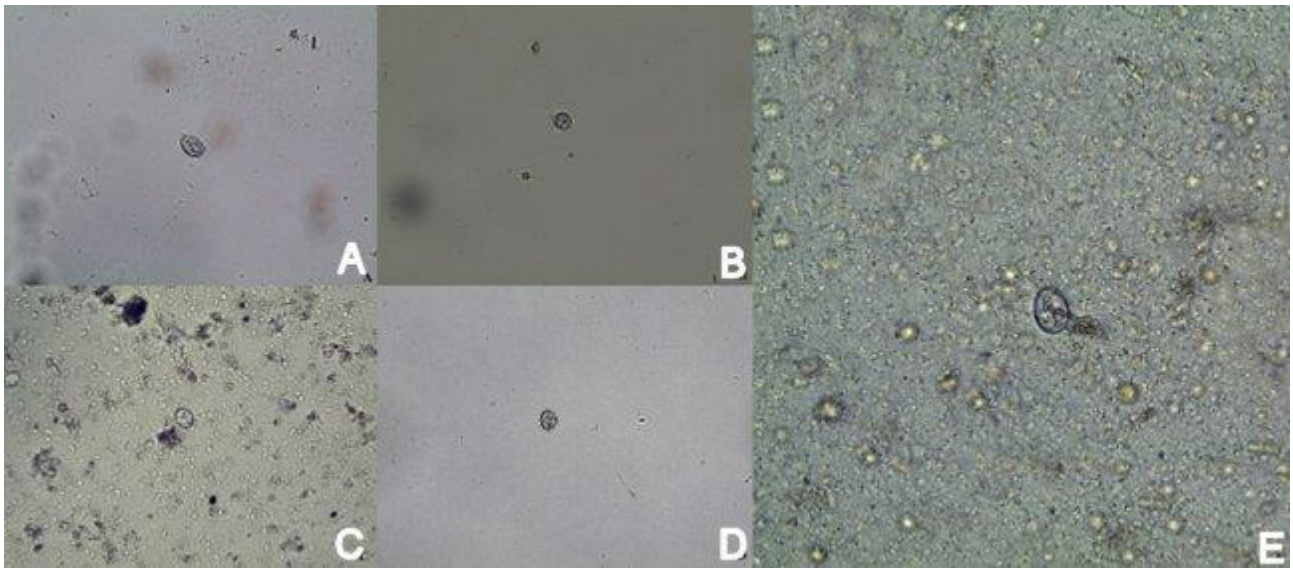

Figure 2. Sporulated *Eimeria* oocyst. **A:** *Eimeria maxima* (x10), **B:** *E. mitis* (x20), **C:** *E. necatrix* (x20), **D:** *E. tenella* (x10), **E:** *E. brunetti* (x40)

DISCUSSION

Parasitic diseases, which cause significant economic losses in the poultry sector, are usually subclinical and therefore the diagnosis of these diseases is generally neglected. In Turkey, studies have been carried out to determine helminths according to faecal examination in backyard chickens, but there are very few studies on the presence of both helminths and protozoa in general. In a study conducted in Van, the rate of endoparasites in chickens according to faecal examination was determined as 85% (Orunç and Biçek, 2009), while this rate was determined as 63% in our study. In studies conducted in the world, this rate was determined as 92.2% in the Philippines (Ybanez et al., 2018), 62.6% in Brazil (Silva et al., 2022), 60.5% in Myanmar (Win et al., 2020), 71.3% in Nigeria (Nnadi and George, 2010). The results of our study are in accordance with the results of studies in Brazil and Myanmar.

Ascaridia galli has been detected in chickens in many studies in Turkey and around the world. In studies conducted in Turkey, *A. galli* was detected in 0.21-16% of chickens according to faecal examination (Biçek et al., 2000; Köse et al., 2009; Orunç and Biçek, 2009; Aydın et al., 2010; Ünlü, 2012; Denizhan and Karakuş, 2019), whereas in studies conducted in the world, *A. galli* was detected at a rate of 12.5% in Pakistan (Sial et al., 2015), 7-17.2% in Nigeria

(Nnadi and George, 2010; Afolabi et al., 2016), 0.63-37.1% in Ethiopia (Berhe et al., 2019; Wondimu et al., 2019), 41.2% in the Philippines (Ybanez et al., 2018), 33% in Iran (Nabinejad and Noaman, 2019), and 19.16% in India (Bhat et al., 2014). In this study, *Ascaridia* spp. was detected at a rate of 6% alone and 29% in total. Considering the total rate, *Ascaridia* spp. eggs were found at a higher rate than in other studies in our country. The difference might be due to the different number of samples examined, the methods used, the feeding conditions of the animals or the climatic characteristics of the regions and therefore the ecology.

Heterakis gallinarum is a common parasite in chickens in Turkey. In the studies carried out in Turkey, the egg production of this parasite was 10.32-23.91% (Biçek et al., 2000; Köse et al., 2009; Orunç and Biçek, 2009; Aydın et al., 2010; Ünlü, 2012; Denizhan and Karakuş, 2019). In studies conducted around the world, *Heterakis* spp. eggs were found in chickens at a rate of 9.5% in India (Bhat et al., 2014), 10.4-65.6% in Ethiopia (Berhe et al., 2019; Wondimu et al., 2019), 1.8-12.6% in Nigeria (Jegede et al., 2015; Afolabi et al., 2016; Gimba et al., 2019), 59.3% in the Philippines (Ybanez et al., 2018), 18% in Iran (Nabinejad and Noaman, 2019). In the present study, *Heterakis* spp. eggs were found at a rate of 5%. Eggs of this species were not detected alone in any sample but were detected mixed with other parasites. In our study, *Heterakis* spp. detected according to faecal examination was lower than the studies conducted both in Turkey and in the world. The reason for this may be due to various conditions such as the number of samples examined, the methods used in diagnosis, and the different structures of the poultry houses where the animals were housed.

According to faecal examination in chickens, *Capillaria* species were found in 59.3% of eggs in Ethiopia (Berhe et al., 2019), 0.9-5.7% in Nigeria (Nnadi and George, 2010; Jedege et al., 2015), 49.6% in Myanmar (Win et al., 2019), 10.7% in the Philippines (Ybanez et al., 2018), 7.25% in Iran (Nabinejad and Noaman, 2019), and 3.5% in India (Bhat et al., 2014). In Turkey, the rates were 12.5-30.0% in Van (Biçek et al., 2000; Orunç and Biçek, 2009; Denizhan and Karakuş, 2019), 18% in Afyonkarahisar (Köse et al., 2009), 11.3% in Aydın (Ünlü, 2012) and 21.38% in Hakkari (Aydın et al., 2010). In our study, the rate of the causative agent was 12% alone and 34% in total. The present findings are in agreement with other studies in Turkey. When compared with the studies carried out in the world, it is higher than those detected in Nigeria and the Philippines and lower than the studies carried out in Ethiopia and Myanmar. It is thought that the reason why the rate is different from these studies is due to the fact that the care and feeding conditions and production methods of the animals are different from each other. While all of the animals sampled in our study were backyard chickens, considering the studies conducted in the world, the animals from which faecal samples were taken were obtained from free-range chickens and/or commercial enterprises.

In this study, *T. tenuis* eggs were found at a rate of 6%. In other studies, conducted in Turkey, this rate was found to be 5% in Afyonkarahisar (Köse et al., 2009); 2-7.4% in Van (Biçek et al., 2000; Orunç and Biçek, 2009; Denizhan and Karakuş, 2019), 11.9% in Hakkari (Aydın et al., 2010). In studies conducted around the world, it was determined as 3.5% in Iran (Nabinejad and Noaman, 2019), 1.6% in Nigeria (Afolabi et al., 2016), 1.72-2.5% in India (Bhat et al., 2014; Kumar et al., 2015). When the studies conducted both in various countries in the world and in Turkey are examined, it is noteworthy that *T. tenuis* is less common in chickens compared to other nematodes, similar to the results of our study.

In this study, eggs of nematodes were found among helminths, while eggs of cestodes and trematodes were not found. While cestodes and trematodes usually complete their development by using a host, nematodes usually develop without using a host. The reason why cestode and trematode eggs were not found in our study was thought to be due to the inability of chickens to reach the arachnids of these parasites due to their feeding and production characteristics.

Oocysts of *Eimeria* species causing coccidiosis, which is considered to be the most important protozoal infection in poultry, were found in 27% of chickens in this study. This rate was 31.8% in Tunisia (Kaboudi et al., 2016); 7.7-39.5% in Nigeria (Jedege et al., 2015; Afolabi et al., 2016); 5.33-81.03% in India (Bhat et al., 2014; Kumar et al., 2015); 47% in Pakistan (Sial et al., 2015), 87.75% in China (Huang et al., 2017), 20.5% in Myanmar (Win et al., 2020), 21.4-27.1% in Ethiopia (Temesigen et al., 2018; Wondimu et al., 2019), 43.2% in the Philippines (Ybanez et al., 2018) and 61.5-65.0% in backyard chickens in studies in Turkey (Orunç and Biçek, 2009; Aslan, 2017). While the *Eimeria* rate detected in our study is quite low compared to similar studies in Turkey, Pakistan, India and China, it is similar to the studies in other countries. It is

thought that the way chickens are raised, and feed and water hygiene are effective in the emergence of these results.

CONCLUSION

In conclusion, according to faecal examination, the rate of parasitic infection in backyard chickens in the Kırıkkale region was determined as 63%. It is thought that this rate is high because chickens are more exposed to the infective periods of parasites due to the free movement of chickens outside, lack of regular parasite control and treatment, and non-compliance with prevention and control measures. In order to reduce the amount of parasite infection in chickens, it is recommended that quarantine measures should be followed when new animals are taken into the poultry houses, attention should be paid to feed and water hygiene and regular parasite control and treatment should be applied.

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