Occurrence of nematodes in Intestine of local chicken (Gallus gallus) and Pigeon (*Columba livia domestica*) in Misurata, Libya

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Received on: 23/01/2024	Accepted on: 15/06/2024	Published on: 27/06/2024

ABSTRACT

Aim: The study aimed to investigate the prevalence rate and describe the morphological features of nematode helminths in domestic pigeons and local chickens obtained from local markets in Misurata, Libya.

Method and materials: A total of 51 domestic pigeons and 100 local chickens were examined for nematode helminths. The study found that the overall prevalence of nematode infection was 39.5% in domestic pigeons and 32% in local chickens, with slightly significant differences between the two groups.

Results: Four nematode helminth species were identified in local chickens and pigeons: Heterakis spp, Heterakis gallinarum, Ascaridia galli, and Capilliaria columbae. However, it was observed that Heterakis spp and Heterakis gallinarum only infected female chickens, while Capilliaria infected pigeons.

Conclusion: It was concluded that the prevalence of these parasites may vary due to seasonal or climatic changes that affect the abundance of specific invertebrate hosts.

Keywords: Broiler housing, fogging cooling system, broiler production.

Cite This Article as: Emshiheet KA, Elmajdoub LO, Abushiba FM, Elzwawy SE, Abusahal MM and Alagme RS (2024). Occurrence of nematodes in Intestine of local chicken (Gallus gallus) and Pigeon (*Columba livia domestica*) in Misurata, Libya. J. Vet. Res. Adv., 06(01): 53-58.

Introduction

It is well recognized that parasitic infections, including protozoa, arthropods, and worms, pose a significant risk to the intestinal health, performance, and production of domestic birds, particularly chickens and pigeons in rural environments. These birds have frequent contact with outdoor environments, which increases their exposure to various parasites. A study by Santoro *et al.* (2010) highlighted the presence of these risk factors in rural poultry.

Among the various parasites, nematodes are considered particularly important due to the high number of species and the detrimental effects they have on birds. Uhuo *et al.* (2013) emphasized the significance of nematodes in avian parasitic infections. It is common for birds to experience multiple gastrointestinal parasitic infections, which can severely influence their normal activities and cause severe pain, as observed by Radfar *et al* (2012). *Capillaria* is a type of nematode that infects the small intestines of domestic and wild birds such as chickens, geese, ducks, and guinea fowl. In severe infections, *Capillaria* can lead to weight loss, diarrhea, and economic losses (Hoque *et al.*, 2014).

Another nematode of concern is *Ascaridia galli*, which infects the small intestines of domestic and wild birds worldwide. Severe infections of *Ascaridia galli* can cause symptoms such as diarrhea, decreased egg production, emaciation, and anemia, as documented (Yadav *et al.*, 1991).

These studies highlight the importance of understanding and addressing parasitic infections in domestic birds, as they can have significant implications for their health, productivity, and economic viability. Implementing appropriate control and prevention measures is crucial for maintaining the well-being and productivity of poultry in rural environments. The studies conducted in various regions of the world have identified several common gastrointestinal parasites in pigeons. According to Harlin (1994) and Dovc et al. (2004), Ascaridia columbae, Capillaria spp., Dispharnyx spp., and Tetrameres spp. were frequently found in pigeons.

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In a study conducted by Adang *et al.* (2008) in Zaria, Nigeria, pigeons were found to be infested with *Menopon gallinae*, *Columbicola columbae*, and *Pseudolynchia canariensis*.

In the Green Mountain region (El-Jabal Akhtar) of Libya, Elmajdoub and Mshiheet (2016) examined 38 domestic pigeons and found that 29 (76.3%) were infected with various species of gastrointestinal parasites. They identified *Ascaridia galli* in 7 (16.7%) pigeons and *Capillaria columbae* in 12 (28.8%) pigeons.

According to Eljadar et al. (2012), 90% of the 30 examined pigeons (Columba livia) were infected with Eimeria spp. It was also identified nematodes as 20% of the pigeons infected with Capillaria spp. and 10% with Heterakis spp. additionally, 5% of the fecal samples were infected with multiple parasites, and 1% showed infection with Haemoproteus spp. It was demonstrated the presence of various gastrointestinal parasites in pigeons from different regions, emphasizing the importance of monitoring and controlling parasitic infestations in these birds. Understanding the prevalence and diversity of parasites can provide insights into the management and prevention strategies necessary to maintain the health and well-being of pigeons in different environments.

According to Kerrousha *et al.* (2022), local breed chickens reared extensively in the Oran region of Algeria. Four species were identified belonging to different taxa. Two species of nematodes were found: *Ascaridia galli* (60%) and *Heterakis gallinarum* (50%). It suggests that a considerable proportion of the chickens examined were infected with these nematodes.

It was that 46.9% of the chickens were infected with gastrointestinal nematode parasites. The identified nematode species included *Ascaridia galli* (15.1%), *Heterakis gallinarum* (11.7%), *Capillaria columbae* (4.4%), and *Subulura brumpti* (2.9%) as per Beyene *et al.* (2014).

It's been highlight the presence of various gastrointestinal nematode parasites in local breed chickens in the respective regions of Algeria and Ethiopia. The findings underscore the importance of monitoring and implementing appropriate control measures to manage these infections in poultry populations.

It is important to regularly monitor and treat gastrointestinal parasites in local chickens and domesticated pigeons to maintain their good health. There is limited information on the endoparasites of these birds in different regions of Libya, and only a few studies have been conducted on parasitic infections in them. This study was planned to determine the prevalence rates and identify the nematode species in the intestines of local chickens (*Gallus gallus*) and domestic pigeons (*Columba livia*) in Misurata region, northern Libya.

Materials and Methods

The study was conducted in different areas of Misurata region, located in western north of Libya during both wet and dry seasons. Samples were collected from 100 adult local chickens, comprising 50 males and 50 females, and 51 adult pigeons, including 28 males and 23 females. This region is situated at a geographical location of latitude 32°22'39.12"N and longitude 15°05'31.26"E, as per the world map.

Sample collection

The chickens and pigeons in vicinity were humanely slaughtered and then subjected to dissection and necropsy, ensuring intact removal of their digestive systems. The different sections (oesophagus, proventriculus, gizzard, duodenum, jejunum, ileum, ceca, and rectum) were then separated and placed in Petri dishes with 0.9% physiological saline.

Sample examination

The content of each section was exposed by cutting it longitudinally and examined under a dissecting microscope to isolate the parasitic worms (Fatihu *et al.*, 1991). The macroscopic worms were isolated by washing them with water to remove materials stuck in the host alimentary canal. The Nematodes were killed by using hot 70% ethyl alcohol and preserved in 70% ethyl alcohol containing 5% glycerine. Lactophenol was used as a clearing agent (Kruse and Pritchard, 1982). Nematode species from the local chicken and pigeon digestive systems were identified according to Yamaguti (1959), Cheng (1973), Soulsby (1982), Ruff (1984), and Ruprah *et al.* (1986).

Statistical analysis:

T-test was used to compare the prevalence rates between nematode species of local chickens and pigeons. All tests were performed using the SPSS computer software.

Results and Discussion

Prevalence rates of nematode infections in Gallus gallus and Columba livia domestica

The findings indicated that out of 100 local chickens examined, 32 (32%) were infected with

gastrointestinal nematodes. Likewise, out of the 38 domestic pigeons examined, 15 (39.5%) were infected with gastrointestinal nematodes. It was indicated that the prevalence of nematode infection was higher in pigeons (39.5%) compared to chickens (32%).

The statistical analysis revealed non significant differences between males and females in both pigeons and chickens. However, there was a slightly significant difference in the overall infection rates of pigeons and chickens (P = 0.04) (Table 1).

Some of the nematode species found in local chickens and pigeons (Table 2). The recorded species included *Heterakis* spp., *Heterakis gallinarum*, *Ascaridia galli*, and *Capillaria columbae*. Among species, *Heterakis* spp and *Heterakisgallinarum* were found in female chickens, while *Capillaria columbae* was found in pigeons.*Capillaria columbae* had highest infection rate (35.4%) among pigeons, while *Heterakis gallinarum* had highest infection rate (22.1%) among chickens, with no significant differences between different species of intestinal nematodes (P>0.05).

Table 1. The prevalence of nematode infections in domestic chickens (*Gallus gallus*) and domestic pigeons (*Columba livia domestica*).

	Local chickens	Pigeons
Total infection	32 (32%)	15 (39.5%)
Male infection	12 (37.5%)	6 (40%)
Female infection	20 (62.5%)	9 (60%)
P value	NS	NS

NS. Non-significant differences

Table 2. The prevalence of intestinal nematode species in domestic chickens (*Gallus gallus*) and domestic pigeons (*Columba livia*)

	No. infected female pigeon	No. infected Male pigeon	No. infected total pigeons	No. infected female local chicken	No. infected Male local chicken	No. infected total local chicken
Heterakis spp.	(%0) 0	(%0) 0	(%0)0	(%5.4) 2	(%0) 0	(%2.6) 2
Heterakis gallinarum	(%0) 0	(%0) 0	(%0) 0	(%46) 17	(%0) 0	(%22.1) 17
Ascaridia galli	(%17.2) 5	(%13.9) 5	(%15.4) 10	(%32.4) 12	(%2.5)1	(%18.2) 13
Capilliaria columbae	(%27.6)8	(%41.7)15	(%35.4) 23	(%0) 0	(%0)0	(%0) 0

The nematodes (*Heterakis* spp.) discussed in the records were isolated from the cecum of female local chickens. The female nematodes were characterized by a sharp and straight posterior end with measured 32μ , while the male nematodes had a curved posterior end with two hook-like structures (Fig. 1).

The nematodes (*Heterakis gallinarum*) were found in the cecum of local female chickens. The adult worms were small, measuring about 2 cm in females and less than 1 cm in males. They had three lips surrounding the mouth. The female had a straight posterior end of short length and a tubal uterus filled with mature eggs. The male nematodes had a curved posterior end with two long hooks (Fig. 2).

The nematodes (*Ascaridia galli*) were found in the cecum of local chickens and pigeons. The adult worms had three lips at the anterior end and a rhabditiform esophagus. Female adult worms measured approximately 4–10 cm in length, while males were less than 6 cm long. The females had a straight, short posterior end (Fig 3).

Additionally, nematodes (*Capillaria* spp.) were discovered in the cecum of pigeons. The adult male worms had four rows of small hooks at the posterior end, while the adult female worms had a straight, sharp posterior end and a uterus filled with eggs (Fig. 4)

The current study aimed to determine the prevalence and identify nematode helminths that infect pigeons and local chickens on poultry farms. The study found a high prevalence rate of nematode helminth infection in pigeons (39.5%) compared to local chickens (32%) when reared in populations. This prevalence rate in pigeons was higher than rates recorded in other locations, such as Tripoli, Libya (27%) by Alkharigy *et al.* (2018), Medina, Saudi Arabia (3.57%) by Ali *et al.* (2020), and Aswan, Upper Egypt (16.66%) by El-Dakhly *et al.* (2019), however lower than in Misurata, Libya (65.5%) by Elmajdoub and Mshiheet (2016).



Fig 1A: General view of the posterior end of the female Heterakis spp. (arrow). B: The posterior end of the male shows two hooks (arrow). Fig 2-A: General view of the anterior end of the Heterakis gallinarum adult (arrow). B: The posterior end of the female shows a short, straight structure (arrow). C: General view of uterus with fertilized eggs of *Heterakis gallinarum*. D: Posterior end of male shows two long hooks (arrow). Fig 3A: General view of the anterior end of the *Ascaridia galli* adult. B: The posterior end of the female shows a sharp long, straight structure (arrow). C: The male posterior endof *Ascaridia galli* shows two long hooks and a sucking disk (arrow). Fig 4A: General view of the posterior end of the adult male of Capillaria spp. B: General view of the female uterus filled with eggs

These parasites can cause severe debility, morbidity, and deficiencies in essential nutrients like vitamins A, B1, and B12, as well as minerals, carbohydrates, and proteins (Smyth, 1994).

It was observed that 23 out of 65 pigeons (35.4%) were infected with *Capillaria columbae*, a higher prevalence than the 22.91% reported by Rabiu *et al.* (2017). This difference could be due to less favourable climatic conditions for the development of parasitic infections. On the other hand, the prevalence of local chickens in this study was 32%, which is much lower than the 90% reported by Kerrousha *et al.* (2022). Additionally, the 23.72% prevalence was lower than that mentioned by El-Dakhly *et al.* (2019) in Aswan, Upper Egypt.

In the study, the prevalence of *Heterakis* gallinarum was highest at 22.1%, followed by *Ascaridia galli* at 18.2%. In contrast, a study by Alam *et al.* (2014) in Bangladesh showed a different prevalence rate, with *Ascaridia galli* at the highest (41.56%), followed by *Heterakis gallinarum* (15.62%), and *Capillaria* spp (4.68%). Another study by

Abdullah (2019) in Bangladesh reported that the nematode parasites encountered were *A. galli* and *H. gallinarum*, with *A. galli* being the most prevalent at 47.61% and *H. gallinarum* at 38.09%.

Nematode helminth infections in pigeons and local chickens can be influenced by food supply, geographic location, and climatic conditions. Further studies are needed to determine the effects of the parasites on the health and productivity of pigeons and local chickens. The differences between the results of the present study and earlier works in other countries may be due to variations in geographical location, detection methods and sample sizes.

Conclusion

It was concluded that Nematode helminths are highly significant helminth problems of local free range Pigeons and chicken in the study area can make the birds more prone to bacterial and viral infection as well more easily available to the predators as the bird become very much unthrifty and weak. Therefore, measures should be taken to control these helminth parasites by educating the

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