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RESEARCH ARTICLE

Prevalence of Gastrointestinal Helminths in Chickens in Afyonkarahisar District, Turkey [1]

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Summary

This study was carried out in Afyonkarahisar region of Western Turkey, where chickens and eggs are produced intensively, for determining the prevalence of the gastro-intestinal helminths in chicken. This research was conducted on 200 broilers, collected from 10 modern farms, 200 layer hens, from different 10 modern farms and on 100 free ranging backyard chickens. According to the necropsy findings, none of gastro-intestinal helminths was found in broiler chickens. In total 4 modern layer farms, *Choanotaenia infundibulum* was detected in 23 (11.5%) chickens out of 200. A total of 58 (58%) free-range backyard chickens were infected with various helminth species, which were: *Heterakis gallinarum* 38%, *Ascaridia galli* 19%, *C. obsignata* 15%, *Capillaria caudinflata* 13%, *Trichostrongylus tenuis* 3%, *Subulura differens* 2%, *Choanotaenia infundibulum* 14%, *Raillietina echinobothrida* 6%, *R. cesticillus* %3. The predominantly seen helminth species was *H. gallinarum* (38%) and the rarely seen species was *S. differens* (2%). In total 9 species were detected, which 6 of them were nematodes and 3 of them were cestodes. In infected chickens, minimum one and maximum 3 helminth species were detected. No trematode species was detected in necropsied and fecal examinated chickens. A total of 81 (16.2%) chickens out of 500 were found infected with various helminth species in necropsy and fecal examination. The helminth infection rates and species numbers in modern farms obtained less than in free-ranging systems.

Keywords: *Prevalence, Chicken, Gastro-intestinal helminths, Afyonkarahisar, Turkey*

Afyonkarahisar Bölgesi Tavuklarında Mide-Bağırsak Helmintlerinin Yayılışı

Özet

Bu çalışma, yoğun olarak tavuk yetiştiriciliği ve yumurta üretimi yapılan Afyonkarahisar Bölgesinde tavuklarda mide-bağırsak helmintlerinin yaygınlığını ortaya koymak için yapılmıştır. Araştırma, 10 tane modern çiftlikten 200 adet broyler, 10 tane modern çiftlikten 200 adet yumurtacı tavuk ve 100 adet serbest olarak yetiştirilen tavuk üzerinde gerçekleştirilmiştir. Nekropsi bulgularına göre, broyler tavuklarda hiçbir helmint türüne rastlanmamıştır. Toplam 4 modern yumurtacı tavuk çiftliğinde tavukların 23 tanesinde (%11.5) *Choanotaenia infundibulum* tespit edilmiştir. Serbest yetiştirilen köy tavuklarının 58 (%58) tanesi çeşitli helmint türleri ile enfekte olduğu tespit edilmiştir. Serbest yetiştirilen köy tavuklarında enfeksiyondan sorumlu helmintler: *Heterakis gallinarum* %38, *Ascaridia galli* %19, *C. obsignata* %15, *Capillaria caudinflata* %13, *Trichostrongylus tenuis* %3, *Subulura differens* %2, *Choanotaenia infundibulum* %14, *Raillietina echinobothrida* %6, *R. cesticillus* %3'tur. Serbest yetiştirilen tavuklarda en sıklıkla görülen helmint türü *H. gallinarum* ve en az görülen tür ise *S. differens*'tir. Altısı nematod ve 3'ü cestod olmak üzere toplam 9 tür helmint tespit edilmiştir. Enfekte tavuklarda en az bir, en fazla 3 helmint türü teşhis edilmiştir. Nekropsi ve dışkı bakısında trematod bulunmamıştır. Nekropsi ve dışkı bakıları yapılan 500 tavuğun 81 tanesi (%16.2) çeşitli helmint türleri ile enfekte bulunmuştur. Modern işletmelerde yetiştirilen tavuklarda helmint enfeksiyonları, serbest yetiştirilen tavuklara göre enfeksiyon oranı ve enfeksiyondan sorumlu tür sayısı bakımından daha az olduğu gözlenmiştir.

Anahtar sözcükler: *Yayılış, Tavuk, Mide-bağırsak helmintleri, Afyonkarahisar, Türkiye*

INTRODUCTION

Poultry is bred in family run farms and commercial farms worldwide. Although the numbers of poultry are less comparing to other farm animals bred, poultry is still one of the important sources of protein [1]. To provide the protein needs of people, the number and capacity of modern farms has been on increase, recently. According to the data provided by Food Agriculture Organization (FAO) in 2005, the world population of poultry was 16.725.336.000 and 296.876.000 in Turkey. In 2005, 70.008.289 ton

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poultry meat and 64.375.085 ton eggs were produced worldwide. In Turkey, 940.000 ton poultry meet and 830.000 ton eggs were produced [2]. Helminth infections have an important role causing hidden economic losses in production of poultry meat and eggs. Studies done show that due to increase in the numbers of closed system modern farms and preventive measures taken in these farms, there have been a significant decrease in helminth infections. However, helminth infections show wide distribution especially in free range breeding worldwide [3-11].

There have been studies to determine the prevalence of gastro-intestinal helminths in chicken and other domestic poultry worldwide. In some of these studies, helminth infections in different breeding systems have also been compared. It has been observed that the prevalance of helminth infections in closed system modern farms is less than in free range breeding systems and traditional breeding methods in country side. Furthermore, helminth species show a wider spectrum in free range and traditionally bred poultry than in poultry bred in closed system farms [3-11]. The prevalences of gastro-intestinal helminths in free range poultry have been reported to be 91.01% in Ethiopia [12], %100 in Ghana [11], %90.9 in India [13], 37% in North Africa [14], 87% in Sudan [15], 90.78% in Kenya [16]. In the previous studies in Turkey, the prevelance of helminth infections in chickens reported to be between 59.13% and 93.44% [4,5,7-9].

No helminth infections have been reported in broilers bred in closed system farms in Turkey, while 16.30% of parent stock chickens [4] and 2.50-40% of layers were infected [4,5,7-9].

In this study, the prevalence of gastro-intestinal helminths was determined in layers and broilers bred in modern farms in Afyonkarahisar and in chickens bred traditionally in villages.

MATERIAL and METHODS

The research material of chicken gastro-intestinal tracts in this study were obtained from 10 modern broiler (Ross PM3) farms, 10 layers (Ross Brown) farms with modern cage system and free-range chickens from 10 rural areas. A total of 200 broilers, 200 layers and 100 free-range chickens were examined. Their race, age, sex and farm records were noted.

Gastro-intestinal tracts of chickens were separated to proventriculus, gizzard, duedonum, jejenum, ileum, secum and colon by necropsy method in 150 mm sieves. Separated parts were opened longitudinally. The mucosa of the gastro-intestinal tracts were scraped and washed under top water. Keratin layer of gizzards were removed and examined carefully. Contents and scrapings of gastro-intestinal tracts were sieved and transfered to the petri dishes. Large helminths seen by naked eye were collected in serum physiologic. Small helminths were collected using a stereo microscope [4,10,11].

Helminths collected in necropsy were washed with distilled water and serum physiologic. Nematode and cestode helminths and their scolexes were placed in individual dishes. Nematodes were fixed in 70% hot ethyl alcohol and cestodes in hot AFA solution. Fixed helminths were preserved in ethyl alcohol with glycerin (95 part 70% ethyl alcohol+5 part glycerol) until identification. Nematodes were identified after lactophenol clearing. Cestodes were identified by examining their scolexes and mature proglottids dyed with borax carmin stain [4,17-20].

Before necropsy, faeces collected from chickens were examined for gastro-intestinal helminths using $ZnCl_2$+NaCl solution by centrifuge flotation (750xG-force) [1,4,21,22].

Statistical Analysis

Chi-square option of Statistica for Windows® Release 5.0 was used for statistical analysis.

RESULTS

From the total of 500 chickens examined, 81 (16.2%) were found to be infected with various helminths. Based on necropsy findings, in 4 layer farms out of 10, *Choanotaenia infundibulum* was detected in 23 (11.5%) chickens out of 200 *(Table 1)*. There was a problem of house flies *(Musca domestica)*, which are one of intermediate hosts, in layer farms where cestode infections were diagnosed. No helminths species were detected in 200 chickens from 10 modern system broiler farms in necropsy.

In rural scavenging chickens, 3 cestode and 6 nematode species were detected. Necropsy of 100 chickens showed that 58 (58%) of them were infected with various of helminth species as follows; *Heterakis gallinarum* in 38 (%38), *Ascaridia galli* in 19 (19%), *Capillaria caudinflata* in 13 (13%), *C. obsignat*a in 15 (15%), *Trichostrongylus tenuis* in 3 (3%), *Subulura*

Table 1. *The rates of helminth species and mean of per chichen*
Tablo 1. *Tavuklarda helmint türlerinin oranları ve aritmetik ortalamaları*

Helminth species	Prevalence (%)				Mean intensity* (min-max)
	Layer (n=200)		Scavenging (n=100)		
	Necropsy	Fecal examination	Necropsy	Fecal examination	
Nematodes					
H. gallinarum	-	-	38	23	42 (3-215)
A. galli	-	-	19	16	4 (1-7)
C. caudinflata	-	-	13	18 **	16.46 (2-36)
C. obsignata	-	-	15	18 **	8.86 (1-35)
T. tenuis	-	-	3	5	12(7-18)
S. differens	-	-	2	-	5(4-8)
Cestodes					
C. infundibulum	11.5	4.5	14	7	1.54 (1-3)
R. cesticillus	-	-	3	-	6 (3-8)
R. echinobothrida	-	-	6	-	6.33 (2-12)

****:*** *Based on necropsy findings*
*****:*** *Capillaria sp.*

differens in 2 (2%), *C. infundibulum in 14 (14%), Raillietina echinobothrida* in 6 (6%) and *R. cesticillus* in 3 (%3) chickens *(Table 1)*. Predominant species of nematode and cestode were *H. gallinaru*m and *C. infundibulum* in necropsy, respectively. *S. differens* was the helminth species seen the least. Chickens were infected with one or the most with three helminth species. When it was examined in terms of sexes, helminths were detected in 34 (68%) layers (n= 50) and 24 (%48) cocks (n= 50) in necropsy. No trematode species was detected in necropsy. Based on necropsy findings, a significant difference was found in helminth infections between layers from with cage system farms and rural scavenging chickens (P<0.01).

In examination of faeces from broiler farms, no helminth species was detected, where as *C. infundibulum* eggs with filaments were detected in 9 (4.5%) layers out of 200 from with cage system farms *(Table 1)*.

In examination of faeces from rural scavenging chickens, eggs of one cestode and four different nematode species were diagnosed. Based on fecal examination, the prevalence of helminths in rural scavenging chickens was found as 45%. Fecal examination of 100 rural scavenging chickens showed that 16% of them were infected with A. galli, 23% *Heterakis spp.,* %18 *Capillaria spp.*, 5% *Trichostrongylus sp.* and 7% *C. infundibulum*. Helminths were detected in 28 (56%) rural scavenging hens (n=50) and 17 (34%) cocks. A significant difference was observed in helminth infections between layers from with cage system farms and rural scavenging chickens based on fecal examination (P<0.01).

The number of helminth species and their prevalence were higher in necropsy than fecal examination (P<0.05) and the difference was significant *(Table1*).

DISCUSSION

The studies indicate that the prevalence of helminth infections in chickens varies depending on several breeding systems. In a study performed in Nigeria, the prevalence of gastro-intestinal helminth infections were reported as 10% in cage system, 58% in perforated system and 87% in rural scavenging chickens [23]. In another study, the prevalence of helminth infections was found to be 16-92% in cage system chickens, while 8-100% in perforated system chickens [24]. Furthermore, different breeding systems in Denmark were compared in terms of gastro-intestinal helminths. It was observed that the prevalence of helminth infections were much more higher in organic systems (free range breeding), in backyard (rural scavenging) breeding and perforated system chickens comparing to cage system and broiler parents stock farms [10]. In a study in Turkey, Dik et al.[5] reported the prevalence of helminth infections to be 60% in small farms, 40.35% in perforated system and 10% in cage system farms in Konya district. According to Güçlü [7], helminth infections were detected in 30.7% of commercial layers in the Ankara region. Kurt and Açıcı [9] reported the prevalence of helminth infections to be 41% in the total of examined chickens, but 88% in scavenging chickens

and 4% in layers where as no helminth infections were detected in broilers in the Samsun region. In this study, only *C. infundibulu*m was diagnosed in necropsy with prevalence of 11.5% in cage system layer farms. No helminth species were detected in modern system broiler farms. The prevalence of helminth infections in rural scavenging chickens has been found as 58% in necropsy. The reason for helminth infections not being detected in broilers bred in modern farms is related to the short breeding period [4]. Studies show that the prevalence of helminth infections is quite high in scavenging chickens. Güçlü [25] found 15 helminth species in the Ankara region. Köroğlu et al.[8] reported 10 helminth species in Elazığ and Kurt and Açıcı [9] found 16 helminth species in the Samsun Region including the record of *Echinoparyhium recurvatum* first time in chickens in Turkey. In the present study, 6 nematode and 3 cestode species were found.

The prevalence of *H. gallinarum*, which is a common nematode of chickens, shows variations depending on breeding types. It was reported that *H. gallinarum* was the most common helminth species in Denmark having the prevalence of 72.5% in free range organic system, 19.4% in perfored system and 68.8% in backyard chickens [10]. The prevalence of this nematode infection was reported in Ghana as 31% in rural scavenging chickens [11], while Eshetu et al.[12] found it as 17.28% in rural area chickens of Ethiopia. Güçlü [25] found *H. gallinarum* in the 9% of commercial and 76% of non-commercial free range flocks in the Ankara region. Kurt and Açıcı [9] found *H. gallinarum* in the 63% of scavenging chickens, 2% of layers and 29% of the total examined chickens in the Samsun region. In this study, *H. gallinarum* was found to be predominant species with the prevalence of 38% in rural scavenging chickens in necropsy.

Ascaridia galli is also common helminth species in chickens. It shows high prevalence especially in free range chickens in rural areas. Wilson et al.[26] reported *A. galli* with the prevalence of 3.9-37.3% in commercial broilers in Arkansas. Mpoame and Agbede [27] reported as 51.6% in Cameroon, Permin et al.[10] reported as 63.8% in organic breeding system chickens and as 37.5% in rural scavenging chickens in Denmark. Poulsen et al.[11] reported the prevalance of 24% in Ghana. The prevalence of *A. galli* infections were reported between 9.97-45% in Turkey [4]. Güçlü [25] found *A. galli* as 29% in Ankara, Köroğlu et al.[8] identified it as 30% in scavenging chickens in Elazığ and Kurt and Açıcı [9] found this species as 35% in scavenging chickens in Samsun. In this study, based on the necropsy findings, *A. galli* was found with the prevalence of 19% in the rural scavenging chickens.

Capillaria spp. are common nematode species in chickens worldwide [10,11,27,28]. Güçlü [25] found *Capillaria caudinflata, C. obsignata, C.bursata,* and *C. retusa* to be 11%, 5%, 3% and 3% in Ankara, respectively. Köroğlu et al.[8] identified *C. bursata* as 2% and *C. retusa* as 4% in the scavenging chickens in Elazığ. Kurt and Açıcı [9] found *C. caudinflata* as 27%, *C. retusa* as 13%, *C. bursata* as 10% and *Capillaria annulata* as 1% in the scavenging chickens in Samsun. In this study *C. obsignata* and *C. caudinflata* were detected with the prevalence of 15% and 13% in necropsy, respectively. *Capillaria spp.* eggs had the prevalence of 18% in the rural scavenging chickens in fecal examination.

Trichostrongylus tenuis comparing to other nematodes shows lower prevalence in chickens. Poulsen et al.[11] reported the prevalence of 2% in Ghana, Irungu et al. [16] 1.04% in Kenya and Magwisha et al.[29] found 7% prevalence in adult chickens in Tanzania. Güçlü [25] found *T. tenuis* as 1% in Ankara. In this study, *T. tenuis* was found having the prevalence of 3% in necropsy.

Another nematode species with a low prevalence is *S. differens*. Altınöz [4] reported this nematode species as 0.28%, while Güçlü [4] found this species as 13% in the chickens in Ankara. Köroğlu et al.[8] identified it as 14% in Elazığ. In this study, *S. differens* was detected in the rural scavenging chickens as 3% in necropsy and 5% in fecal examination.

Cestode infections are also common in chickens. *C. infundibulum* can be seen in rural scavenging chickens as well as in modern farm chickens. Permin et al.[10] determined this cestode species at the level of 3.3% in cage system chickens, where as Eshetu et al.[12] reported a prevalence of 4.49% in rural scavenging chickens in Ethiopia. Poulsen et al.[11] determined a prevalence of 13% in village chickens. Magwisha et al.[29] reported a prevalence of 15% in young and 6% in adult chickens in rural areas of Tanzania. Güçlü [25] found *C. infundibulum* as 7% in Ankara and Köroğlu et al.[8] identified it as 8% in Elazığ. Kurt and Açıcı [9] found *C. infundibulum* as 4% in Samsun. Based on the necropsy findings, the prevalence was determined to be 11.5% in layers from the cage system farms and 14% in the rural scavenging chickens in this study.

Raillietina species are common cestode species seen worldwide in chickens. Wilson et al.[26] determined

R. cesticillus at levels of 67.2-69.2% in commercial broilers in Arkansas. Poulsen et al.[11] reported *R. cesticillus* and *R. echinobothrida* at levels of 12% and 81%, while Eshetu et al.[12] found the levels of 5.62% and 25.84% in Ethiopia, respectively. Güçlü [25] found *R. echinobothrida* as 10%, *R. cesticillus* as 6%, and *R. tetragona* as 5% in Ankara. Köroğlu et al.[8] identified *R. echinobothrida* to be 49% and *R. tetragona* as 23% in Elazığ. Kurt and Açıcı [9] found *R. echinobothrida, R. cesticillus,* and *R. tetragona* as 29%, 28% and 14% in Samsun, respectively. In this study, *R. cesticillus* and *R. echinobothrida* were detected at levels of 3% and 6% in necropsy, respectively.

Studies done to determine the prevalence of gastro-intestinal helminths of chickens revealed that the detected species of helminths and the prevalence of species were higher in necropsy method than the fecal examination [4,6,7,30]. In this study, 3 cestode and 6 nematode species were diagnosed using necropsy method and one cestode and 4 nematode species by fecal examination. Furthermore, the prevalence of helminth infections was higher in the necropsy method.

Some researchers [4,7] report that helminth infections are seen less in cocks. Similarly in this study, the levels of helminth infections were found to be lower in cocks than in layers.

In conclusion, while no helminth infections were detected in modern broiler farms in Afyonkarahisar district, existence of cestode infections at noticable levels in layer farms was found to be interesting. As in whole world, helminth infections occur with high prevalence in rural backyard chickens in Afyonkarahisar distirict. Therefore, rural backyard chickens act as a reservoir in terms of helminth infections and this poses a risk of contamination for modern chicken farms.

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