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Prevalence of *Ascaridia galli* in white leghorn layers and Fayoumi-Rhode Island red crossbred flock at government poultry farm Dina, Punjab, Pakistan

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Abstract. Poultry farming not only provides high nutritious food but also creates employment opportunity for rural masses. Documented evidences elaborates that helminth parasitism is most deciduous problem of chickens especially in developing world. *Ascaridia (A.) galli*, a nematode of small intestine, has been considered as the most common and important parasite of chicken. The present study was carried out to investigate prevalence and severity of *A. galli* in White Leghorn layers (housing type: battery cage and deep litter, 50 each) and Fayoumi-Rhode Island Red crossbred (male and female: 50 each) flock rearing at Government Poultry Farm, Dina, Punjab, Pakistan. Two hundred faecal samples were examined by using standard parasitological and McMaster egg counting technique. The overall prevalence was 24.5% at farm, 13% in White leghorn layer (battery cage=2%, deep litter=24%) and 36% in Fayoumi-Rhode Island Red (male=34%, female=38%). It was also observed that White leghorn layer rearing in deep litter had more severe infection (EPG=1920) of *A. galli* compare with battery cages birds (EPG=500). Parasite prevalence was significantly related with sex ($P<0.05$) in Fayoumi-Rhode Island Red and male birds had less number of average parasites (0.34 ± 0.47) as compared to females (0.38 ± 0.490). Additionally, female birds were under serious threat of infection (EPG=2270) compared with its counterpart (EPG=1250). Given the high infection rates, particular attention should be paid to management and provision of feed supplement to White leghorn layer housing in deep litter and female bird of Fayoumi-Rhode Island Red crossbred.

INTRODUCTION

Poultry farming has been emerging as a profitable agro-based industry in Pakistan, during last few decades. It not only provides high nutritious food but also creates employment opportunity for poor rural masses. The poultry farming can easily incorporate into other farming activities like cropping and fish farming and provide additional income for small-scale farmers particularly in the off cropping season (Aini *et al.*, 1990). Various infectious and non-infectious diseases are hampering the poultry industry but parasitic infections are most fatal constrain in the development of this profitable sector. Although, a minute reduction in parasitic infection has been achieved in commercial production system due to improved housing, hygiene and management practices, gastrointestinal parasitism is still very rampant (Ogbaje *et al.*, 2012; Basit *et al.*, 2014).

Documented evidences elaborates that helminth parasitism is most deciduous problem of chickens especially in the developing world (Pam *et al.*, 2006; Luka & Ndams, 2007; Basit *et al.*, 2014). Among helminth, nematodes are the most important parasite group of poultry both in terms of number of species and extent of damage they cause; the main genera include *Capillaria*, *Heterakis* and *Ascaridia* (Jordan & Pattison, 1996; Ogbaje *et al.*, 2012). *Ascaridia galli* has been considered as the most common and important parasite of poultry birds (Hodasi, 1978; Pam *et al.*, 2006; Luka & Ndams, 2007). *Ascaridia (A.) galli* (syn. *A. lineata*, *A. perspicillum*) is a nematode occurring in the small intestine of chickens, geese, guinea fowl and wild birds (Soulsby, 1987; Anderson, 1992; Daş & Gauly, 2014); however, the principal host presumably is chicken (Kates & Colglazier, 1970; Daş & Gauly, 2014). Its life cycle comprises two phases: the sexually mature parasite in the gastrointestinal tract of host, and the infective stage (L3) in the form of eggs in the environment (Araujo & Bressan, 1977). Occasionally earthworms can ingest *A. gall* eggs and the parasite can be transmitted to chicken when chickens eat earthworms but this is not the principal route of transmission (Augustine & Lund, 1974). Infection causes decrease in production, blood loss, reduced blood sugar contents, retarded growth or weight loss, intestinal blockage and death in severe cases (Ikeme, 1971; Reid *et al.*, 1973; Danicke *et al.*, 2013; Daş & Gauly, 2014). In addition to this, parasite infection lowers the host's immunity and renders it susceptible to other pathogenic infections; finally this may result in heavy economic losses (Raza *et al.*, 2014).

Fayoumi-Rhode Island Red Crossbred flocks of both sexes, male and female, while only female birds of White leghorn layer are being reared in battery cages and deep litter at Government Poultry Farm, Dina, Punjab, Pakistan. Low egg production and high mortality was observed in both breeds. Upon postmortem examination, adult worms of *A. galli* were recovered from carcass and confirmed by Poultry Disease Diagnostic Laboratory, Jehlum. Due to above mentioned findings; the current research project was formulated to investigate the prevalence and predisposing factors of ascariasis at the farm.

MATERIALS AND METHODS

Sample collection

Two hundred faecal samples of Fayoumi-Rhode Island Red Crossbred (male and female; n=50 each) and White leghorn birds (housing type: battery cages and deep litter; n=50 each) were collected in sterile polythene bags from Government Poultry Farm, Dina, Punjab, Pakistan. Samples were placed into an airtight cool box and were brought to Poultry Disease Diagnostic Laboratory, Jehlum, Pakistan. Faecal samples were refrigerated at 4°C until analysis for the investigation of *A. galli*.

Sample analyses

Faecal samples were examined for eggs of *A. galli* by using standard direct and indirect parasitological techniques (flotation and sedimentation) as described by Ayaz (2010) and Soulsby (1987). Eggs were identified on the basis of morphological appearance and size with the help of keys (MAFF, 1979; Soulsby, 1987; Urquhart *et al.*, 1996).

To know the severity of infection, faecal samples were also examined through McMaster method (Soulsby, 1987) and numbers of eggs per gram (EPG) of faeces were calculated.

Data analyses

Differences between independent variables (host species, housing type and sex) with respect to prevalence of *A. galli* (dependent variable), were explored using Kruskal-Wallis test, whereby dependent variable had first been tested for normality (Kolmogorov-Smirnov test). Data was analyzed using SPSS 17.0 software (SPSS Inc., Chicago, USA). Prevalence of *A. galli* was calculated as follows:

Prevalence (%) = [Number of positive samples / Total number of samples examined] x 100

RESULTS

The present study was carried out to investigate prevalence and severity of *A. galli* in White Leghorn layers and Fayoumi-Rhode Island Red crossbred flock. The overall parasite prevalence in the 200 birds was 24.5% at farm, 13% in White leghorn layer (housing type: battery cage=2%, deep litter=24%; Figure 1) and 36% in Fayoumi-Rhode Island Red (male=34%, female=38%; Figure 2).

In White leghorn layer, housing type significantly (battery cages, $P<0.001$; deep litter, $P\leq 0.01$) affected the prevalence of parasite and birds residing in battery cages hosted less number of average parasite (0.02±0.141) compared with birds in deep litter (0.24±0.431) housing type (Table 1). It was also observed that White leghorn layer reared in deep litter had more severe infection (EPG=1920) of *A. galli* compared with battery cages birds (EPG=500; Table 1). Parasite prevalence was significantly related

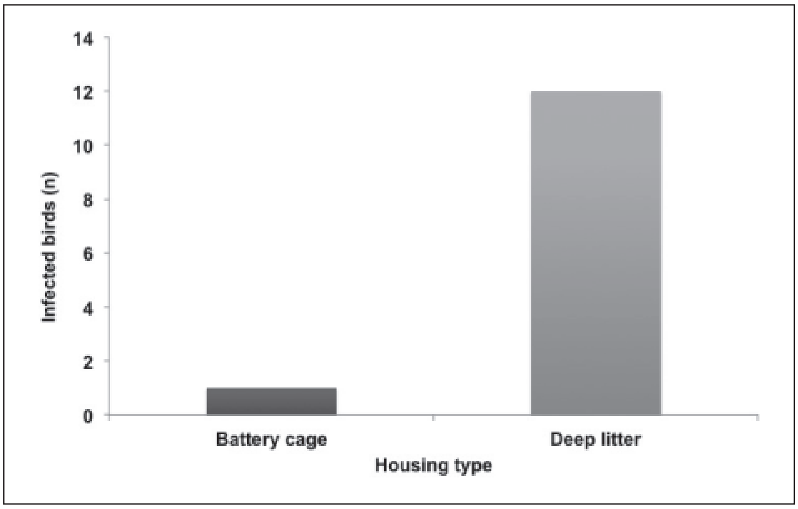

Figure 1. Prevalence of *Ascaridia galli* in White leghorn layer (housing type: battery cage and deep litter, n=50 each) at Poultry Research Farm, Dina, Punjab, Pakistan.

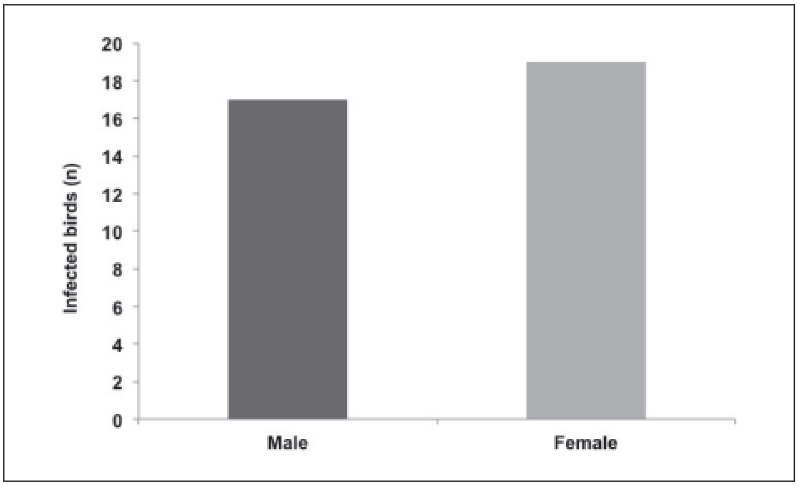

Figure 2. Prevalence of *Ascaridia galli* in Fayoumi-Rhode Island Red (male=50, female=50) at Poultry Research Farm, Dina, Punjab, Pakistan.

Table 1. Total mean number of *Ascaridia galli* (±SD) found in 200 White leghorn# and Fayoumi-Rhode Island Red# breeds of chicken at Poultry Research Farm, Dina, Punjab, Pakistan, and the respective statistical effects of housing type (battery cage, deep litter) and sex (male, female)

Breed	Housing type/ Sex	Mean±SD	Egg per gram (EPG)	*P*
White leghorn*	Battery cage	0.02±0.141	500	<0.001
	Deep litter	0.24±0.431	1920	0.011
Fayoumi-Rhode Island Red**	Male	0.34±0.478	1250	0.027
	Female	0.38±0.490	2270	0.034

#Kruskal-Wallis test; as breed has no effect on parasites, average values are presented across White leghorn and Fayoumi-Rhode Island Red breeds.
Age (weeks) = 65*, 25**

with sex (P<0.05) in Fayoumi-Rhode Island Red and male birds had less average number of parasites (0.34±0.47) as compared to females (0.38±0.490; Table 1). Additionally, female birds were under serious threat of *A. galli* infection (EPG=2270) compared with its counterpart (EPG=1250; Table 1).

DISCUSSION

In the present study, our focus was to investigate the prevalence and predisposing factors of *A. galli* infections as it caused major losses in tropical countries due to very favorable environmental conditions for parasite transmission, poor nutrition and poor sanitation (Raza *et al.*, 2014).

A. galli has been considered the commonest and most important helminth infection of poultry and has also been reported previously from different areas of Pakistan (Khan *et al.*, 1994; Basit, *et al.*, 2014) and other parts of the world (Jansen & Pandey, 1989: Zimbabwe; Schobries *et al.*, 1989: Germany; Kunjara & Sangvar, 1993: Thailand; Pam *et al.*, 2006: Nigeria). Yet, variation also exists in the prevalence and intensity in different counties, which may be attributed to different host factors and climatic conditions required for the development of the free-living stages of different parasites (Tariq *et al.*, 2010).

Chickens fed on diets containing animal protein acquire less worms compared with those fed mainly on plant protein. Increasing levels of essential amino acids especially, lysine and calcium, in feed also lessens the number and length of parasite (Cuca *et al.*, 1968). Furthermore, feed rich in vitamins A and B minimized the chances of *A. galli* establishment in the intestine (Walker & Farrell, 1976).

In the present study, bird reared in deep litter harbor high infection than in battery cages (Fig. 1). This notion is supported by Zeller (1990) and reported that poultry birds kept in battery cage systems had low prevalence of *A. galli* compared with deep-litter or free-range hens. In Switzerland, Morgenstern & Lobsiger (1993) compared 32 different commercial systems and found that the prevalence of *A. galli* was 24.3% in the free- range system, 8.5% in the deep-litter system and none in the battery cage system. Permin *et al.* (1997) also reported the high prevalence of *A. galli* in the free- range or organic (63.8%) and deep-litter system (41.9%) compared with battery cage system (5%). Improved hygienic measurements may eliminate the risk of *A. galli* infections in deep litter systems.

High prevalence in female birds of Fayoumi-Rhode Island Red crossbreed (Fig. 2) may be due to hormonal differences, stress during egg production and feeding habit (Sonaiya, 1990). Female birds are known to be more voracious in their feeding habits especially during egg production than the males that remain largely selective (Sonaiya, 1990). Ackert *et al.* (1935) investigated and proved that heavy breeds like Rhode Island

Reds, White Plymouth Rocks and Barred Plymouth Rocks, are more resistant against *A. galli* infection as compared with White Leghorns, Buff Orpingtons and White Minorcas.

At the Government Poultry Farm, Dina, Punjab, Pakistan, birds that are heavily infected with *A. galli* potentially entail substantial economic losses. Especially White leghorn layer hosted in deep litter and female bird of Fayoumi-Rhode Island Red crossbred with severe helminth infections, which indicates that particular attention should be given to their management. Furthermore, vitamin A and B, essential amino acids and animal origin protein should be provided to the infected birds as feed supplement.

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