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STUDIES ON PARASITIC PREVALENCE IN RING NECKED PHEASANTS (*PHASIANUS COLCHICUS*) IN CAPTIVITY

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ABSTRACT

Fecal and blood samples of ring necked pheasants, *Phasianus colchicus* were analyzed to record the parasitic prevalence in these pheasants. A total of 1000 samples, 500 blood and 500 fecal samples were collected from Captive Breeding Facilities for Birds, Department of Wildlife and Ecology, Ravi Campus, University of Veterinary and Animal Sciences, Lahore. Parasitic genera identified from blood samples of *P. colchicus* include *Leukocytozoon*, *Plasmodium* and *Haemoproteus*. Prevalence of *Leukocytozoon* was 16 % while the prevalence of *Haemoproteus* was 14.3%. Parasitic genera identified from fecal samples of *P. colchicus* include *Eimeria*, *Isospora, Trichomonas* and *Giardia*. Eggs of five species of nematodes viz. *Capillaria*, *Syngamus trachea* and *Ascaridia*, *Heterakis isolonche* and *Heterakis gallinarum* were also identified from the fecal samples. The ectoparasites included one species of burrowing mite *Knemidocoptes mutans* and two species of chewing lice i.e. *Amyrsidea perdicis* and *Lipeurus maculosus*.

Key words: *Phasianus colchicus, Cryptosporidium*, endoparasites, ectoparasites, captivity

INTRODUCTION

Pheasant farming has tremendous potential for raising livelihoods of the people from developing countries by enhancing ecotourism, game reserves and hunting (Malik, 2003). Moreover, pheasant species can be used as biological indicators to monitor the health of the ecosystems and other associated wildlife species (Malik, 2003).

Confined systems are always helping to increase the population of game birds. In many countries birds are kept in aviaries on the ground. In such conditions, several factors such as stress and atmospheric conditions affect the health of these birds. Furthermore, birds remain in continuous contact with the ground, in which a number of pathogenic microorganisms as well as intermediate hosts of endoparasites exist (Krystianiak *et al*. 2007).

Bird growth, egg production rate and susceptibility to other infections is affected by parasites (Dranzoa, 1999). Parasite abundance depends upon many factors such as host size, host genotype, host condition, distribution in different geographical regions and seasonal variations (Gregory *et al,* 1990; Forbes and Baker, 1990; Weatherhead and Bennett, 1991). In confined system high density of birds is responsible for transferring the mycotic and parasitic agents which cause diseases and heavy losses. In wild and reared game birds, the breeding success is reduced by pathogenic species such as roundworms (*Syngamus trachea*, *Heterakis isolonche, Capillaria* spp., *Ascaridia* spp.) and coccidia (*Eimeria* spp.) (Goldová *et al*. 1993). Plasmodium, *Haemoproteus* spp. and *Leukocytozoon* spp. showed significantly higher intensity in a number of domestic and feral birds. However, they also cause serious mortality in wild avian species (Aguirre *et al*. 1986).

The mites (Acarina: Mesostigmata) are widespread and high infestation of mites and lices were reported in grey and black partridges from Khyber Pakhtoonkhawa Province of Pakistan (Khattak *et al.* 2012). *Dermanyssus gallinae* and *Ornithonyssus sylviarum* are important blood feeding mites of birds. These mites irritate birds, cause anemia and spread diseases. Infected bird loses egg laying ability and sometimes may die (Goldová *et al*, 2006). Chewing lice (Phtiraptera: Amblycera, Ischnocera) are mostly irritant to their hosts, the infected birds scratch their head and body which shows discomfort caused by these chewing lice (Wall and Shearer, 2001). Primary aim of this study was to know the prevalence of ecto- and endoparasites in ring necked pheasants in captivity. Complete knowledge of biological cycles and ways of transmission of parasites can help to prevent the outbreaks of diseases.

MATERIALS AND METHODS

This one year study extending from April, 2013 through March, 2014 was conducted at Captive Breeding Facilities for Birds, Department of Wildlife and Ecology,

Ravi Campus, University of Veterinary and Animal Sciences, Lahore. A total of 1000 (500 fecal + 500 blood) samples were collected to record internal parasites while the captive birds were examined on weekly basis to ascertain ectoparasites.

Blood samples were collected directly from brachial vein, a drop was placed on a clean microscopic slide and blood smear was prepared. The smear was then fixed with methyl alcohol and stained in Giemsa's solution for 10 to 15 minutes. The slides were washed with distilled water, dried and examined for blood parasites under a microscope following Greiner and Ritchie (1994). The examined parasites were identified up to genera using dichotomous keys following LaMann (2010). Furthermore, the fecal samples were collected on weekly basis to observe the fecal parasites. For this purpose, the collected fecal samples were processed by direct fecal smear method and qualitative floatation method following Seivwright *et al*. (2004). The parasites were identified up to species level where possible by examining morphology of the oocysts and eggs (Pellérdy, 1965).

To ascertain ectoparasites, the birds were visually inspected and their whole body was fully examined. The parasites were collected using forceps, observed under stereo microscope and were identified.

RESULTS AND DISCUSSION

The prevalence (%) of various parasitic genera identified during present study are presented in table 1.

Leukocytozoon spp., *Plasmodium* spp. and *Haemoproteus* spp. were identified from blood samples of ring necked pheasants (*Phasianus colchicus*). Prevalence of *Leukocytozoon spp.* was 16 %. It is the leading haemoparasite in birds which cause malaria and rigorous anemia in poultry and other avian species (Atkinson and Van Riper, 1991; Van der Heyden, 1996). Similarly, prevalence of *Haemoproteus spp.* was 14.3%. It has similar life cycle like *Plasmodium spp*. and *Leukocytozoon spp*. However, the schizonts develop completely in the endothelium of different visceral organs while the gametocytes mature in the circulating erythrocytes (Gylstorff and Grimm, 1998). During present study, the prevalence of *Plasmodium* spp. was recorded as 10%. *Plasmodium* sporozoites are transmitted through saliva of blood sucking mosquitoes and many major clinical problems leading to increased morbidity and mortality are common in many avian species (Gylstorff and Grimm, 1998).

Coccidian species such as *Eimeria* and *Isospora* are widely distributed around the globe (Zucca, 2000). *Eimeria* is strictly host-specific (Gylstorff and Grimm, 1998), commonly found in poultry, Galliformes, and Columbiformes. In *Eimeria* spp., sporulated oocysts have four sporocysts with two sporozoites each (Greiner and Ritchie, 1994). It is the most important protozoan pathogen of poultry industry (Zajac and Conboy, 2012) so removing of damp litter and wet spots can prevent the build-up of oocytes in the environment. During present study, *Eimeria* spp., *Isospora* spp., *Trichomonas* spp., *Giardia* spp. and *Cryptosporidium* spp. were identified from feces of *P. colchicus*. Prevalence of *Eimeria* spp. and *Isospora* was 40% and 4%, respectively. The infectious stage of the *Coccidia* is during the maturation process when the sporulated oocysts get divided into sporocysts with sporozoites (Greiner and Ritchie, 1994). The prevalence of *Trichomonas* spp. was 11.5%, *Giardia* spp. was 44% and *Cryptosporidium* spp. was 2%. *Trichomonas* spp. is transmitted by contaminated food or water. *Trichomonas gallinae* is most common pathogenic species in free-range as well as captive birds such as Passeriformes, Psittaciformes, Falconiformes, and Phasianiformes (Gylstorff and Grimm, 1998). In clinical symptoms, weight loss and walnut size lesions are formed in mouth, esophagus and crop. Birds show ruffled feathers and cannot eat properly (Greve, 1996a; Gylstorff and Grimm, 1998) so segregate the young birds from adults. Similarly, *Giardia* spp. are found in motile trophozoite and a cyst stage in many bird species (Greve, 1996a; Greiner and Ritchie, 1994). In juvenile birds, *Giardia* infestation can lead to weakness, poor plumage, reduced growth and high mortality rate of up to 50% (Greiner and Ritchie, 1994). *Cryptosporidium* spp. causes infection in more than 30 species of wild and cage birds (Fayer, 1997; Sreter and Varga, 2000; Ng *et al*, 2006) such as pheasants, chicken, quails, turkeys, geese, ducks as well as ostriches and swans (Fayer, 1997). The most important symptoms are severe diarrhea, depression, dehydration, ruffled feathers, and a high mortality rate (Xiao *et al*, 2002).

Five species of nematode eggs were found in pheasants. Higher prevalence of *Capillaria spp.* 43%, *Syngamus trachea* 51% and *Ascaridia spp*. 17.2% was found. This nematode can be found in poultry as well in many other avian species (Trainer *et al*, 1968). *Capillaria* spp. are thread like nematodes with typical two poles of the eggs and located in the gastrointestinal tract especially in the crop, esophagus and small intestine regions (Greiner and Ritchie, 1994; Zucca, 2000). In poultry, severe infections in the upper digestive tract can be observed while the clinical outline in other avian species is not unified (Gylstorff and Grimm, 1998). In environment, eggs can survive up to several months, especially in humid conditions and moderate temperatures (Zucca, 2000).The nematode *Syngamus trachea* affect respiratory tract of birds. Bird species that are generally affected are chicken, turkeys, quails, guinea fowl, peafowl, geese and pheasants (Ruff, 1984). Disease symptoms are opening of the beak and respiratory sound which lead towards death (Gylstorff and Grimm, 1998). The roundworms of the species *Ascaridia* can be

Table 1. Prevalence (%), symptoms, predilection site, transmission, control measures and economic significance of various parasitic genera in *Phasianus colchicus.*

Parasites	Prevalence (%)	Symptoms	Predilection site	Transmission	Control measures	Economic significance
Endoparasites						
Blood Parasites						
Leukocytozoon spp.	1	Severe anemia, in appetence, dyspnea, cough, diarrhea, infertility, and high mortality	Erythrocytes	Sporozoites are transmitted through the saliva of blood sucking black flies	Control invertebrate vectors by screening of aviaries.	Mortality rates are extremely high, especially among young birds.
Plasmodium spp.	10.9	Anemia, vomiting and cramps.	Erythrocytes	Sporozoites are transmitted through the saliva of blood sucking black flies	Control invertebrate vectors by screening of aviaries.	It causes high mortality in free range while commercially low loss recorded
Haemoproteus spp.	14.3	Erythrocytes are affected, poor feeding, apathy and anemia	Erythrocytes	Sporozoites are transmitted through blood sucking insects i.e. mosquitoes, biting midges and louse flies	Measures to control invertebrate vectors, such as screening of aviaries, help prevent transmission and heavy infections.	Mortality and flock loss.
Fecal Parasites						
Eimeria spp.	40	Asymptomatic in birds or cause depression and diarrhea	Small intestine	Oocysts are shed in the feces of infected birds and must be ingested to produce disease	Elimination of infected fecal material of birds. Prevent to build-up of oocytes in the environment by removing damp litter and wet spots.	Loss of egg production, morbidity and death.
Giardia spp.	44	Weakness, poor plumage, reduced growth, diarrhea, enteritis and depression	Intestinal tract	Cysts can be transmitted directly when the host ingests food with contaminated feces.	Reduced stress and molting in birds. Also provide good food and ventilation to birds.	Reduced growth and cause morbidity in birds.
Trichomonas spp.	11.5	Weight loss, lesions up to ulcer in the mouth, oropharynx, esophagus, and crop	Anterior end of the digestive and respiratory tracts	Infection may spread through stagnant pools, contaminated water, old straw stacks and generally moist, unsanitary conditions.	Segregate young birds from adults and recovered carriers from susceptible stock	Health problems
Ascaridia spp.	17.2	Inflammation and weight loss	Small intestine	Infection spread through contaminated water and feed.	Control of infestation is obtained through good sanitary practices	Loss of weight gain, meat production, egg production and death of birds

Capillaria spp.	43	Regurgitation, dysphagia, weight loss, diarrhea, and melena	Entire intestinal tract	Infective eggs may build up in the litter or in the soil. Spread through contaminated food.	Hygienic measures should be strictly enforced to avoid the contamination	Poor growth and weight loss in birds
Syngamus trachea	51.5	Coughing, opening of the beak, and respiratory sounds.	Trachea and lungs	Ingestion of infective eggs or larvae	Good ventilation and best hygienic measures should be available in the rooms	Usually infected birds declines and death arrives through asphyxiation
Heterakis isolonche	13.6	Nodular lesion	Caeca	Ingestion of eggs	Good management and sanitation in confined operations will generally lower the parasite levels in the birds.	Severe health problems by reducing growth and egg production
Heterakis gallinarum	8	lesions characterized by congestion, thickening, petechial hemorrhages of the mucosa	Caeca	Ingestion of eggs	Improvement of management and sanitation in confined operations will generally lower the parasite levels in the birds.	Mild health problems, reduced growth and egg production
Isospora spp.	4	Asymptomatic in birds or cause melena, depression, and diarrhea	Small intestine	Coccidial oocysts are shed in the feces of infected birds and must be ingested to produce disease.	Good feeding practices and good management include in control measures.	Damages the host's intestinal system, causing loss of egg production, morbidity and death
Cryptosporidium spp.	2	Diarrhea and enteritis	Bursa	Contaminated water	Best hygienic measures should be applied to control it.	High mortality rate in birds.
Ectoparasites						
Knemidocoptes mutans		Itching and irritation, plucking of feathers, weight loss and reduced egg production	Legs	Birds infected through direct contact.	Frequent inspection of the birds is key to mite control. The best control for mites is to treat their hiding places, such as cracks and crevices in housing.	Loss of plumage, weight loss and reduced egg production.
Amyrsidea perdicis		Extensive damage to feathers and marked irritation of the skin, which may cause overall weakening	Breast and legs	Birds infected through direct contact.	Prevent contact of healthy birds from infested ones by replacement. Inspect birds and housing at least twice per month. Several treatments on the birds and in their housing may be necessary to break the cycle of infestation.	It cause poor health conditions i.e. skin and feather damage in flock.
Lipeurus maculosus		Feather damage, irritation, restlessness and weakness.	Skin	Birds infected through direct contact.	Prevent contact of healthy birds from infested ones by replacement. Inspect birds and housing at least twice per month. Several treatments on the birds and in their housing may be necessary to break the cycle of infestation.	It causes poor health conditions such as feather and skin damage in flock.

commonly found in birds (Greiner, 1997). However, they are moderately common in cage and aviary birds (Greve, 1996a). It has ellipsoidal, smooth and colorless eggs that can survive in the environment for several months (Greve, 1996a). Infection spreads through contaminated water and feed. Control of infestation is obtained through good sanitary practices.

Prevalence for *Heterakis isolonche* was13.6% while for *Heterakis gallinarum* was 8%. In the Czech and Slovak Republics 83.6% of pheasants and 11% of partridges on game–bird farms were infected by *Heterakis isolonche*. In the wild 68.5% of game birds are infected (Kotrlá *et al,* 1984).

One species of burrowing mite *Knemidocoptes mutans* (Astigmata) was identified. The *Knemidocoptes* spp. mites can be found on the face and leg region of various bird species. These mites burrow into the epidermis where they lay eggs (Greve, 1996b). Frequent inspection of the birds is the key to mite control. The best control for mites is to treat their hiding places, such as cracks and crevices in housing.

Two species of chewing lice *Amyrsidea perdicis* and *Lipeurus maculosus* were identified. Chewing lice (Phthiraptera: Amblycera, Ischnocera) are familiar ectoparasites of domestic and wild birds. They are generally widespread among gallinaceous birds and cause massive infestations in some avian species (Kettle, 1990; Mullen and Durden, 2002). These lice's cause the damage to feathers and irritation of skin, which may cause overall weakening and even death of the birds (Porkert, 1978; Jurasek and Dubinsky, 1993). Inspect birds and housing at least twice per month. Several treatments on the birds and in their housing may be necessary to break the cycle of infestation.

These blood parasites can be controlled by controlling the invertebrate vectors and screening the aviaries. If control measures are not taken then these parasites can cause high mortality in flock. Similarly the parasites that identified from fecal material such as *Eimeria* spp., *Isospora* spp., *Trichomonas* spp., *Giardia* spp., *Cryptosporidium* spp., *Ascaridia* spp., *Capillaria* spp., *Syngamus trachea, Ascaridia* spp., *Heterakis isolonche* and *Heterakis gallinarum* can be controlled by providing good management conditions in captivity. Parasites affect bird growth, egg production rate and increase susceptibility to other infections (Dranzoa, 1999). While the ectoparasites damage to feathers and irritation of skin, which may cause overall weakening and even death of the birds (Porkert, 1978; Jurasek and Dubinsky, 1993).

Conclusion: This study confirmed the occurrence of endoparasites in pheasants. The incidence of parasites increased in relation with the concentration of pheasants. From the blood analysis *Leukocytozoon* spp., *Plasmodium* spp. and *Haemoproteus* spp. were identified. The most frequent species infecting the cage-breeding game birds were *Eimeria* spp., *Giardia* spp., *Trichomonas* spp., *Ascaridia* spp., *Capillaria* spp., *Syngamus trachea*, *Heterakis isolonche, Heterakis gallinarum, Isospora* spp. and *Cryptosporidium* spp. In ectoparasites one species of burrowing mite *Knemidocoptes mutans* (Astigmata) while two species of chewing lice (Phtiraptera: Amblycera, Ischnocera) *Amyrsidea perdicis* and *Lipeurus maculosus* were identified.

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