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 Leukocytozoa, Plasmodium and Haemoproteus. Prevalence of Leukocytozoa 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 avaries 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 (Krystianaik 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 Leukocytozoa 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). Dermatophyssus 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, Proceedings of The National Conference and Training Workshop “Wildlife and Aerobiology” held on February 6-7, 2015 Lahore, Pakistan 359
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 %. Its 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). Eimerias 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 oocysts 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 Eimeriaspp. and Isospora was 40 % and 4 % respectively. The infectious stage of the Coccidias 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*.

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

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361
<table>
<thead>
<tr>
<th>Species</th>
<th>Eggs Deposited</th>
<th>Clinical Symptoms</th>
<th>Transmission</th>
<th>Control Measures</th>
<th>Impact on Birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capillaria spp.</td>
<td>43</td>
<td>Regurgitation, dysphagia, weight loss, diarrhea, and melena</td>
<td>Entire intestinal tract</td>
<td>Infective eggs may build up in the litter or in the soil. Spread through contaminated food.</td>
<td>Hygienic measures should be strictly enforced to avoid the contamination. Poor growth and weight loss in birds.</td>
</tr>
<tr>
<td>Syngamus trachea</td>
<td>51.5</td>
<td>Coughing, opening of the beak, and respiratory sounds.</td>
<td>Trachea and lungs</td>
<td>Ingestion of infective eggs or larvae.</td>
<td>Good ventilation and best hygienic measures should be available in the rooms. Usually infected birds declines and death arrives through asphyxiation.</td>
</tr>
<tr>
<td>Heterakis isolonche</td>
<td>13.6</td>
<td>Nodular lesion</td>
<td>Caeca</td>
<td>Ingestion of eggs.</td>
<td>Good management and sanitation in confined operations will generally lower the parasite levels in the birds. Mild health problems, reduced growth and egg production.</td>
</tr>
<tr>
<td>Heterakis gallinarum</td>
<td>8</td>
<td>Lesions characterized by congestion, thickening, petechial hemorrhages of the mucosa</td>
<td>Caeca</td>
<td>Ingestion of eggs.</td>
<td>Improvement of management and sanitation in confined operations will generally lower the parasite levels in the birds.</td>
</tr>
<tr>
<td>Isospora spp.</td>
<td>4</td>
<td>Asymptomatic in birds or cause melena, depression, and diarrhea</td>
<td>Small intestine</td>
<td>Coccidial oocysts are shed in the feces of infected birds and must be ingested to produce disease.</td>
<td>Good feeding practices and good management include in control measures.</td>
</tr>
<tr>
<td>Cryptosporidium spp.</td>
<td>2</td>
<td>Diarrhea and enteritis</td>
<td>Bursa</td>
<td>Contaminated water.</td>
<td>Best hygienic measures should be applied to control it.</td>
</tr>
</tbody>
</table>

**Ectoparasites**

<table>
<thead>
<tr>
<th>Species</th>
<th>Eggs Deposited</th>
<th>Clinical Symptoms</th>
<th>Transmission</th>
<th>Control Measures</th>
<th>Impact on Birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knemidocoptes mutans</td>
<td></td>
<td>Itching and irritation, plucking of feathers, weight loss and reduced egg production</td>
<td>Legs</td>
<td>Birds infected through direct contact.</td>
<td>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.</td>
</tr>
<tr>
<td>Amyrsidea perdicis</td>
<td></td>
<td>Extensive damage to feathers and marked irritation of the skin, which may cause overall weakening</td>
<td>Breast and legs</td>
<td>Birds infected through direct contact.</td>
<td>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.</td>
</tr>
<tr>
<td>Lipeurus maculosus</td>
<td></td>
<td>Feather damage, irritation, restlessness and weakness.</td>
<td>Skin</td>
<td>Birds infected through direct contact.</td>
<td>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.</td>
</tr>
</tbody>
</table>
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 was 13.6% 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 (Kotrláè 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 Lippeurus 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, 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 (Dranza, 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 (Phthiraptera: Amblycera, Ischnocera) Amyrsidea perdicis and Lippeurus maculosus were identified.

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