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Original Article

Prevalence of parasites in selected captive bird species

Prevalência de parasitas em espécies de pássaros em cativeiro selecionados

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Abstract

Blood and fecal samples of chukar partridge (*Alectoris chukar*), albino pheasant (*Phasianus colchicus*), silver pheasant (*Lophura nycthemera),* rose-ringed parakeet (*Psittacula krameri*) and turkeys (*Meleagris gallopavo*) were analyzed to check parasitic prevalence. To record parasites these five avian species were placed kept in separate cages at Avian Conservation and Research Center, Department of Wildlife an Ecology, University of Veterinary and Animal Sciences, Lahore, Pakistan. 100 fecal and 100 blood samples for each bird species were inspected to analyze internal parasites. During present study, 17 species of endoparasites 14 from fecal samples and three from blood were examined. Two species of ectoparasites i.e. mite *Dermanyssus gallinae* 42% and fowl ticks *Args persicus* 41%were studied. Blood parasites included *Plasmodium juxtanucleare* 50%, *Leucoctoyzoon simond* having parasitic prevalence 40%, and *Aegyptinella pullorum* having parasitic prevalence of 40%. Parasitic species recorded from fecal samples included 6 species of nematodes viz. *Allodpa suctoria* 2%. *Syngamus trachea* with parasitic prevalence of 60%, *Capillaria annulata* 37.5%, *Ascardia galli* 24%, *Capillaria anatis* 40% and *Heterakis gallinarum* 28.3%. Similarly, two species of trematodes viz. *Prosthogonimus ovatus* having parasitic prevalence of 50% and *Prosthogonimus macrorchis* 21% were also documented from fecal avian samples . Single cestode species *Raillietina echinobothrida* having parasitic prevalence of 72% and 3 protozoan species i.e. *Eimeria maxima* having parasitic prevalence of 21%, *Giardia lamblia* 41% and *Histomonas meleagridis* 18% were documented during corpological analysis. In our recommendation, proper sanitation, medication and vaccination of bird's enclousres are suggested to avoid parasites.

Keywords: ACRC UVAS, *Giardia lamblia, Histomonas meleagridis, Capillaria annulata, Dermanyssus gallinae.*

RESUMO

Amostras de sangue e fezes de perdiz chukar (*Alectoris chukar*), faisão-albino (*Phasianus colchicus*), faisão-prateado (*Lophura nycthemera*), periquito-de-rosa (*Psittacula krameri*) e perus (*Meleagris gallopavo*) foram analisadas para verificar a prevalência de parasitas. Para registrar os parasitas, essas cinco espécies de aves foram colocadas em gaiolas separadas no Centro de Conservação e Pesquisa de Aves, Departamento de Vida Selvagem e Ecologia, Universidade de Veterinária e Ciências Animais, Lahore, Paquistão. Cem amostras fecais e 100 amostras de sangue para cada espécie de ave foram inspecionadas para analisar os parasitas internos. Durante o presente estudo, foram examinadas 17 espécies de endoparasitas, 14 de amostras fecais e 3 de sangue. Foram estudadas duas espécies de ectoparasitas, ou seja, o ácaro *Dermanyssus gallinae* 42% e o carrapato aviário *Args persicus* 41%. Os parasitas sanguíneos incluíram *Plasmodium juxtanucleare* 50%, *Leucoctoyzoon simond* com prevalência parasitária de 40% e *Aegyptinella pullorum* com prevalência parasitária de 40%. As espécies parasitas registradas em amostras fecais incluíram 6 espécies de nematoides viz. *Allodpa suctoria* 2%, *Syngamus traqueia* com prevalência parasitária de 60%, *Capillaria annulata* 37,5%, *Ascardia galli* 24%, *Capillaria anatis* 40% e *Heterakis gallinarum* 28,3%. Da mesma forma, duas espécies de trematódeos viz. *Prosthogonimus ovatus* com prevalência parasitária de 50% e *Prosthogonimus macrorchis* 21% também foram documentados em amostras fecais de aves. Espécies de cestoide único *Raillietina echinobothrida* com prevalência parasitária de 72% e 3 espécies de protozoários, isto é, *Eimeria maxima* com prevalência parasitária de 21%, *Giardia lamblia* 41% e *Histomonas meleagridis* 18% foram documentadas durante a análise corpológica. Em nossa recomendação, o saneamento adequado, medicação e vacinação de invólucros de pássaros são sugeridos para evitar parasitas.

Palavras-chave: ACRC UVAS, *Giardia lamblia*, *Histomonas meleagridis*, *Capillaria annulata*, *Dermanyssus gallinae.*

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1. Introduction

Parasitic prevalence in birds varies among species, age, gender and ecological conditions (Valkiūnas et al., 2005). Even closely related species may differ significantly in blood parasitic prevalence. Higher prevalence of parasites in juvenile birds than in adults is well documented. These blood parasites affect plumage coloration, reproductive rates, survival and community structure of their hosts (Fokidis et al., 2008). Birds interact with their natural environments in numerous ways and can respond to changes in their ambient environment such as resistance against parasites and changing climate (Wood et al., 2007; Loiseau et al., 2010; Wood et al., 2007). However, these interactions are not fully understood and need exploration (Forsman et al., 2008). To rear the birds on ground in aviaries is a common practice in many countries and such settings negatively affect the health of birds. *Pavo cristatus* are amongst highly diverse peafowl species and usually suffer from parasitic infections due to sanitary issues affecting wild populations. Infected birds mostly show subclinical conditions that may lead to death (Freitas et al., 2002). However, disease pathology in peafowls especially in case of parasitic diseases is less known, but it is an accepted fact that most diseases look like the ones faced by turkeys. Similarly, pheasant farming has lot of potential for raising livelihoods of the people from developing countries through enhancing hunting, game reserves and tourism. In addition, the pheasants can be used to monitor ecosystem health as they are considered excellent bio-indicators (Dzugan et al., 2010). Ring-necked pheasant (*Phasianus colchicus*) is a common bird of woodland habitats, modified to largely cultivated farmlands near bushy areas or woodland edges. Wild pheasants have suffered rigorous population decline over the last 30 years. Major pathogens of pheasants include roundworms (*Heterakis isolonche*, *Syngamus trachea*, *Ascaridia* spp. and *Capillaria* spp.) and coccidia (*Eimeria* spp.), which are widespread in reared and wild game birds and may reduce breeding rates (Edosomwan and Igetei, 2018). Ostrich farming has been started where these birds did not exist previously. Ostrich parasites and diseases reported in Africa include tapeworm, nematodes, anthrax, ophthalmia, ticks and lices. Health problems and mortality diagnosed mainly in juveniles and chicks include intestinal obstruction, leg abnormalities, starvation, malnutrition and coliform infections (Huchzermeyer, 1997). Investigations in ducks and chickens managed under parallel conditions like pigeons have exposed high prevalence of gastrointestinal helminths (Muhairwa et al., 2007) which impairs health and production of these birds (Adriano and Cordeiro, 2001). Characterization of pathogenic microbes and parasites from avian species has become mandatory to improve flock health (Roto et al., 2015; Gilbert et al., 2016). Changes in peoples' lifestyles and closer contacts with animals have accelerated parasitic and bacterial infections. It is perhaps due to closer interaction with adopted small animals, which are accepted and treated as a family member in communities. In addition, the microbes may also have zoonotic importance and can affect the attendants and farmers (Best et al., 2017). Present study is therefore planned to find out interspecific variations in ectoparasites and endoparasitic prevalence in selected avian species in captivity.

2. Materials and Methods

Selected captive avian species including chukar partridge (*Alectoris chukar*), albino pheasant (*Phasianus colchicus*), silver pheasant (*Lophura nycthemera),* rose-ringed parakeet (*Psittacula krameri*) and turkey (*Meleagris gallopavo*) (Figure 1) were maintained at Avian Conservation and Research Center, Department of Wildlife and Ecology, University of Veterinary and Animal Sciences, Ravi Campus (31.044398, 73.874542) (Figure 2) for parasitic analysis. At least ten mature birds (5♂ & 5 ♀) of each species were maintained at different cages. Each cage was provided with separate feeding and water facilities. Birds were vaccinated for chronic respiratory disease fowl cholera and Newcastle disease.

2.1. Ectoparasite analysis

To ascertain ectoparasites, the experimental birds viz. chukar partridge (*Alectoris chukar*), albino pheasant (*Phasianus colchicus*), silver pheasant (*Lophura nycthemera),* rose-ringed parakeet (*Psittacula krameri*) and turkeys (*Meleagris gallopavo*), at least ten birds of each species were visually inspected and their whole body was fully examined on weekly basis. The parasites were collected using forceps, and were observed under stereo microscope and identified (Fokidis et al., 2008).

2.2. Fecal sampling and parasite analysis

Fresh fecal droppings of chukar partridge (*Alectoris chukar*), albino pheasant (*Phasianus colchicus*), silver pheasant (*Lophura nycthemera),* rose-ringed parakeet (*Psittacula krameri*) and turkeys (*Meleagris gallopavo*) were collected and brought to the Postgraduate Lab, Department of Wildlife an Ecology, University of Veterinary and Animal Sciences, Lahore, Pakistan for corpological examination. The samples were examined by direct fecal smear method, simple floatation and sedimentation techniques to detect parasitic oocytes and/or egg. Later on, quantitative fecal sample examination, in term of oocysts per gram of feces was conducted using Macmaster's egg counting technique. The oocytes were repeatedly examined for micrometery (Soulsby, 2005). The species identification action was based on morphology of oocysts and eggs (Fokidis et al., 2008).

2.3. Blood sampling and parasitic analysis

For collection and identification of endoparsaites, the blood samples of chukar partridge (*Alectoris chukar*), albino pheasant (*Phasianus colchicus*), silver pheasant (*Lophura nycthemera),* rose-ringed parakeet (*Psittacula krameri*) and turkeys (*Meleagris gallopavo*) were collected on fortnightly basis for a period of one year. Blood was collected directly from brachial vein; a drop was placed on a clean microscopic slide and blood smears was prepared. The smear was then fixed with methyl alcohol and stained with Giemsa's stain for 10 to 15 minutes. The slides were washed with distilled water, dried and examined under microscope for blood parasites. Parasites were identified by using taxonomic key (Fokidis et al., 2008).

Figure 1. Selected captive avian species including A: Chukar partridge (*Alectoris chukar*) B: Albino pheasant (*Phasianus colchicus* C: Silver pheasant (*Lophura nycthemera)* D: Turkey (*Meleagris gallopavo*) and E: Rose-ringed parakeet (*Psittacula krameri*).

Figure 2. Avian Conservation and Research Center, Department of Wildlife and Ecology, UVAS , Ravi Campus.

3. Result and Discussion

Spatial and temporal dissimilarities are well documented in parasitic prevalence and these differences are recognized with intermediate hosts (Cooper, 2005). In Asia, Helminth species are greatly distributed and are highly diverse (Bagust, 1994). During present study, nine helminthes species were recorded including six of nematodes *C. anatis, Ascardia galli, Syngamus trachea, Capillaria annulata, , Heterakis gallinarum and Allodopa suctoria*, two species of trematodes *P. macrorchis, Prosthogonimus ovatus,* and one species of cestode *Raillietina echinobothrida*. *Heterakis gallinarum*, *Ascardia galli* and *Capillaria annulata* are main parasitic species of poultry. Important helminthic diseases of poultry are cestodiosis and ascariodiosis (Fatihu et al., 1991). One hundred helminth species have been identified from wild and domesticated avian species. Parasitic infections may result in stunted growth and egg laying in bird (Card and Neshein, 1972). Nematodes cause serious infection of digestive tract in bird (Gylstorff and Grimm, 1998).

Blood and fecal samples of chukar partridge (*Alectoris chukar*), albino pheasant (*Phasianus colchicus*), silver pheasant (*Lophura nycthemera),* rose-ringed parakeet (*Psittacula krameri*) and turkeys (*Meleagris gallopavo*) were analyzed to check parasitic prevalence in these birds (Table 1). To record parasites these five avian species were placed kept in separate cages. 100 fecal and 100 blood samples for each bird species were inspected to analyze internal parasites. During present study, 17 species of endoparasites 14 from fecal samples and three from blood were examined. Two species of ectoparasites i.e. mite *Dermanyssus gallinae* 42% and fowl ticks *Args persicus* 41%were studied (Table 2 and 3). Blood parasites included *Plasmodium juxtanucleare* 50%, *Leucoctoyzoon simond* having

Table 1. Fecal parasites of different captive avian species their prediction site, morphology, life cycle, clinical diagnosis and control measure.

Parasites	Prediction site	Morphology	Life cycle	Clinical diagnosis	Control measures
Nematodes					
Syngamus trachea	Lungs and trachea	Worms are medium sized and red in colour. Females are greater than male measuring 5 to 20 mm, and male is 2 to 6	Direct or indirect	Coughing, sneezing and respiratory disorder. Death occurs when mucus block the trachea.	Keep the bird's bedding as dry as possible and frequently change it.
Capillaria annulata	Mucosa of crop and Esophagous	Males are 15 to 25 mm, females are 37 to 80 mm,and eggs are ~30x70 um	Direct or indirect	Seriously harm the lining of crop and oesophagus.	Restrict their access to humid area. Strict hygiene of feeder and drinker.
Capillaria anatis	Cecum	Males are 15 to 25 mm, females are 37 to 80 mm,and eggs are ~30x70 micrometer	Direct or indirect	Diarrhoea	Anthelmintics are used.
Ascardia galli	Small intestine		Indirect	Enteritis, loss of appetite, unthriftiness, pale combs and wattles, droopy wings	Pasture rotation, Avoid to moisture content, anthelmintics are used.
Cestode (Tape worm)					
Raillietina echinobothrida	Small intestine	10 to 25 cm. size of egg is 74 to 93 um.	Indirect	Reduce growth, abdominal disturbance	Control intermediate host.
Trematodes (flukes)					
Prosthogonimus ovatus	Cloaca and rectum	8 to 9mm and egg is 22 to 24 um	Indirect	Milky discharge from cloaca, lay soft shell egg.	Control of secondary host
Prosthogonimus macrorchis	Intestine	7 to 9 mm and egg is 20 um	Indirect	Reduce growth, thriftiness, abdominal discomfort.	Sanitary practices, avoid from moisture area
Protozoa (single cell)					
Giardia lamblia	Intestinal tract	11 to 14 µm in length and 7 to 10 µm in width. Two forms trophozoite is active form and cyst is dormant.	Direct	Weight loss, Diarrhoea is foul smelling, scratching and preening	Keep drinking bottle clean.Use cool boiled water..
Eimeria maxima	Small intestine	Three developmental stages: schizonts, gamonts and oocysts.	Direct	Cause catarrhalic or haemorrhagic enteritis, bloody diarrhoea,	Continuous medication is given in food and and water. sulfonamides drug is most common.
Histomonas meleagridis	Caeca and liver	It has two forms: a tissue-dwelling (amoebic) form and a caecal lumen	Direct	Infection occur only when they penetrate from blood streams to liver.	Dimetridazole is very effective for treating histomonosis.

Table 2. Blood parasites, their prediction sites, morphology, life cycle and clinical diagnosis.

PARASITES	PREDICTION SITES	MORPHOLOGY	LIFE CYCLE	CLINICAL DIAGNOSIS	CONTROL MEASURES
Leucocytozoon simond	Leucocyte and erythrocyte	Oval in shape. Mature gametocyte is 14-22 um. gametocyte is elongated when found in leukocytes and round when found in erythrocytes.	Indirect	The animals are listless, anorectic, anaemic and have a laboured breathing. CNS symptoms.	Treatment mostly is not effective and medication is used in combination form pyrimethamine (1 ppm) nd sulfadimethoxine (10 ppm) in the feed
Plasmodium juxtanucleare	Erythrocyte	Round oval or irregular in shape mature gametocyte is 15.5 um	Indirect	Weight loss Even death	Treatment is difficult in birds. Because duration of disease is 2-3 days.
Aegyptinella pullorum	Erythrocyte	Small 5 to 10 um, round to oval bodies.	Indirect	Ruffled feather birds may become anorectic, droopy and may suffer from diarrhoea	biosecurity measures should be taken to reduce the introduction

Table 3. Ectoparasites, their prediction sites, morphology, life cycle and clinical diagnosis.

Parasites	Life cycle	Morphology	Prediction site	Clinical diagnosis	Control measures
Fowl tick: *Args persicus*	Direct	Soft bodied tick. The size of female is 10 x 6 mm	Skin	Anaemia, weight loss, paralysis And depression.	Houses should be cleaned,walls, ceilings and cracks should be sprayed with carbaryl.
Mite: *Dermanyssus gallinae*	Direct	The color of adult female mites is grey to deep red and size is 1 mm in length.	Skin	Reduction in egg production, anaemia and itching effect may change bird behaviour.	Cracks and crevices should be filled in-house should be clean and spray should be used.

parasitic prevalence 40%, and *Aegyptinella pullorum* having parasitic prevalence of 40%. Parasitic species recorded from fecal samples included 6 species of nematodes viz. *Allodpa suctoria* 2%. *Syngamus trachea* with parasitic prevalence of 60%, *Capillaria annulata* 37.5%, *Ascardia galli* 24%, *Capillaria anatis* 40% and *Heterakis gallinarum* 28.3%. Similarly, two species of trematodes viz. *Prosthogonimus ovatus* having parasitic prevalence of 50% and *Prosthogonimus macrorchis* 21% were also documented from fecal avian samples. Single cestode species *Raillietina echinobothrida* having parasitic prevalence of 72% and 3 protozoan species i.e. *Eimeria maxima* having parasitic prevalence of 21%, *Giardia lamblia* 41% and *Histomonas meleagridis* 18% were documented during corpological analysis (Table 4).

Table 4. Identification of parasites in different captive avian species during present study.

Parasites	Turkey	parrot	A.pheasant	s.pheasant	Chukar	diagnosis	Total samples	+ve samples	%age
Nematoads									
Syngamus trachea	••	•	••	••	•	Fecal smear analysis	500	302	60
Capillaria annulata	••	•	•	•	••	fecal smear analysis	500	257	51
Ascardia galli	•	••	••	•	••	Fecal smear analysis	500	367	73
Capillaria anatis	••	•	••	•	••	Fecal smear analysis	500	287	44
Heterakis gallinarum	••	••	•	•	•	Fecsl smear analysi	500	125	25
Allodapa suctoria	•	•	••	••	•	Fecal smear analysis	500	206	36
Cestode									
Raillietina echinobothrida	•	•	•	••	•	Fecal smear	500	403	72`
Trematode									
Prosthogonimus macrorchis	•	•	•	••	•	Fecal smear	500	104	23
Prosthogonimus ovatus	••	•	•	••	•	Fecal smear	500	300	50
Protozoa									
Giardia lamblia	•	••	•	•	•	Fecal smear	500	230	42
Histomonas meleagridis a	•	•	••	•	••	Fecal smear	500	89	28
Eimeria maxima	••	`•	•	••	•	fecal smear	500	105	21
Haemoparasite									
Plasmodium juxtanucleare	••	••	••	•	•	Blood smear	500	349	50
Aegyptinella pullorum	•	•	••	•	••	Blood smear	500	203	40
leucoctoyzoon simond	•	•	••	•	•	Blood smear	500	200	40
Ectoparasites									
Fowl tick Args persicus	••	•	•	•	••	Physical analysis	500	208	42
Mite Dermanyssus gallinae	•	••	••	••	•	Physical analysis	500	207	41

Present = • Absent = ••.

4. Conclusions and Recommendations

During present investigation, two species of ectoparasites and 17 endoparasitic species; 14 from fecal samples and 3 from blood were identified. Proper sanitation, medication and vaccination of bird's enclousres are suggested to avoid parasites.

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