African Journal of Biotechnology Vol. 11(59), pp. 12364-12370, 24 July, 2012
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB11.3631
ISSN 1684–5315 © 2012 Academic Journals

Full Length Research Paper

Pathological study of parasitism in racing pigeons: An indication of its effects on community health

Ali Mohammad Bahrami[1]*, Ali Louei Monfared[1] and Mostafa Razmjoo[2]

[1]School of Veterinary Sciences, Ilam University, Ilam, Iran
[2]College of veterinary sciences, Razi University, Kermanshah, Iran.

Accepted 1 March, 2012

Several non-official reports from different clinics, governmental veterinary head-quarters and bird keepers indicate that most of the young pigeons die with suspicious infection to parasites. In addition, the pigeon owners were complaining of skin itching on their head. Thus, this research was conducted to determine the pathological study of parasitism in racing pigeons with an indication of its effects on community health. It was carried out from May to September 2011, by an experimental study on 250 (168 adults and 82 nestlings) blood and faecal samples (Soulsby, 1982) randomly collected from suspected pigeons (mostly young) and 25 specific free pathogen birds as control. Tissue samples of both infected and control birds were removed and compared with samples of the histological study. Moreover, 12 hair samples taken from pigeon owners were checked for external parasites. The data indicate prevalence rate of various helminthes including *Raillietina achinobothridia* (10.4%), *Syngamus trachea* (8.4%), *Capillaria colombae* (6%) and *Ascaridia colombae* (8.4%). The results reveal some porotozan infections including *Haemoproteus colombae* (20.8%), *Trichomonas gallinae* (26.8%) *Cryptosporidium* sp. (1.2%) and *Eimeria* sp. (21.6%) and also ectoparasites including *Lipeurus* sp. (3.2%), *Menopen gallinae* (15.2%), *Ceratophyllus colombae* (10.4%) and *Louse fly* (12%). Multiple infections observed with internal parasites were 19/4%. However, co-infection of internal and external parasites was 24.4%. Meanwhile, five out of the 12 hair samples taken from pigeon owners were infected with the fleas (*C. colombae)* and lice *(M. gallinae)* as seen by the clinical manifestation of allergic urticarial reaction and itching. Histological studies showed a visible vascular congestion and a massive lymphoplasmacytic infiltration inside the smooth muscular layer of the small intestine of infected pigeons. This result indicates that pigeons and their owners may be at high risk of single or multiple parasitic infections.

Key words: Endoparasite, ectoparasites, ovum, birds, fleas, epidemiology.

INTRODUCTION

Pigeons are seen in most regions of the world except in the poles. Pigeons live side by side with human and other animal species in nature and they are bred as a source of food, a hobby, symbol and for experimental aims (Cooper, 1984; Harlin, 1994).

Pigeons are probably the most common nuisance bird. They have adapted to life in the city, and they seem to be everywhere in urban environments. Unfortunately, the bird lovers of the world feed them, and they have developed a dependence upon people, thus reinforcing their dependency upon urban areas. They roost on signs, ledges, almost anywhere, and they bring nesting material and leave droppings everywhere. Pigeons, as everyone knows are swimming with filth and disease (Balicka-Ramis et al., 2007; Rehman, 1993). Those who watch these birds can barely imagine how detrimental their disorderly reproduction may be and how many risk they cause to human health (Tietz-Marques et al., 2007).

Pigeons can carry or transmit pigeon Encephalitis,

*Corresponding author. E-mail1: am.bahrami@ilam.ac.ir. Fax: 00988412224308

Histoplasmosis, Newcastle disease, Ornithosis Cryptococcosis, Coccidiosis, Toxoplasmosis, Pseudotuberculosis, and Salmonellosis. Pigeons can carry fleas, ticks, mites, and other parasites (Balicka-Ramis et al., 2007; Rehman, 1993). It interacts with man and other domestic and wild birds portend it as a potential carrier of zoonotic parasites (Adang, 1999). Several health problems can affect pigeon, but parasite infections play a major role. Information on the parasitic infection of domesticated pigeon in different region of Iran appears to be poorly documented (Radfer et al., 2011). The prevalence of pigeon parasites was studied on south Khorasan, Iran, were *Ascaridia colombae* (16.66%), *Cotugnia digonopora* (13.79%), *Raillietina achinobothridia* (32.35%), *Menopon galline* (44.11%), *Pseudolynchia canariensis* (63.72%), *Columbicola colombae* (79.41%), *Cryptosporidium oocyst* (2.94%), *Eimeria* sp. (40.19%) and *Haemoproteus colombae* (47.05%). In Costa Rica, *Haemoproteus* sp. was detected in 4.8% of birds; in Queensland, Australia, a total of 3, 059 birds were examined and *Haemoproteus* sp. was found in 31.4% of them (Valkiunas et al., 2004; Adlard et al., 2004). In the state of Minas Gerais, in southeastern Brazil, a research study with free living pigeons showed that all pigeons were infested with *P. canariensis* a blood feeding louse fly and with *H. colombae* and *Eimeria* sp. oocysts. *A. colombae* was detected in 4.91% of pigeons and 3.27% was presented with mixed infections caused by *A. colombae* and *Raillietina* sp. (Tietz-Marques et al., 2007).

The aim of this study was to determine the presence of ectoparasites and endoparasites in pigeons that assemble around the public squares of cages and to check the pigeon owners to see if there is any relationship of common ectoparasites between man and birds.

MATERIALS AND METHODS

Study area

Several non-official reports from different clinics, governmental veterinary headquarters and bird keepers indicated that most of the young pigeons die with suspicious infection of parasites. In addition, the pigeon owners were complaining of skin itching on their head. Thus, this research was conducted to determine the pathological study of parasitism in racing pigeons with an indication of its effects on community health of Ilam city, located in the western part of Iran sharing 465 km common border line with Iraq, and having sub climatically environmental condition.

Birds

This research was carried out from May to September 2011, by an experimental study on 250 (168 adults and 82 nestlings) blood and faecal samples (Soulsby, 1982) randomly collected from suspected pigeons (mostly young) and 25 specific free pathogen birds as control. Tissue samples of both infected and control birds were removed and compared with samples of the histological study. Moreover, 12 hair samples taken from pigeon owners were checked for external parasites. Care was taken to avoid any contamination been brought from outside into the animal house located at the School of Veterinary Sciences, Ilam University.

Sampling from pigeons

The tray at the bottom of cages of the control and experimental pigeons were completely washed and disinfected. Fresh faeces (at least 3 g) were collected from each bird. Data were collected according to the questionnaire form prepared before including information regarding, no. of birds, no. of death, no. of sick birds, weight of birds, environmental temperature, information regarding the previous medicine used for birds from 30 days, no. of feed per day, feed ingredient, the owner's name, date of sampling and characteristic of bird, and the samples were quickly tested in a laboratory.

Sampling from bird keepers

12 owners of pigeon were engaged with the birds for more than 2 h per day and they had a history of itching on their head; the person in charge of checking their hairs for ectoparasites said that the complaint about itching may be due to ectoparasites. For this purpose, we placed a white cloth around the neck of the person and then combed his hair with cotton mixed with ether. A trial was made to comb the hair from each direction, and then the cloth was placed in the jar and then a sample of the jar was taken for identification under the microscope.

Diagnostic methods

Faecal samples of control and experimental birds were examined by direct smear method, whereas egg per gram (EPG) was counted by modified McMaster technique and centrifugal flotation method using Sheather's saturated sugar solution (Soulsby, 1982). The ectoparasites were collected as described by Soulsby (1982), briefly after killing the pigeons by anaesthesia, they were immediately placed in a polythene bag and the parasites were collected after leaving the pigeons, 90% of the samples collected were dead pigeon. The nest material for ectoparasites was preserved for identification purposes in 70% alcohol. Subcutaneous nodules of each bird were fixed in 10% potassium, heated for 20 min in a jar containing water and their sediments searched for parasite.

The blood samples were collected from control and other experimental groups of the birds using an insulin syringe inserted through a brachial vein catheter. Each sample proceeded, fixed and stained with Giemsa dyes. For diagnosis of *Trichomonas gallinae*, wet and sterile swab were taken from surface of the mouth, throat and larynx of birds, and after preparation of slide smears, the samples were studied under the light microscope. All parasites were identified using the parasitological keys (Soulsby, 1982).

For internal parasites in the entire alimentary tract, the respiratory system, liver, heart, kidney and reproductive tract were searched and examined. The parasites were removed and washed by water and a number of nematodes were cleared in lacto phenol for identification and cestodes were fixed in 10% formalin and stained with carmine acid for further studies. SPSS version 9.0 for Windows was used for statistical analysis of the experimental data.

Histological study

Tissues of different organ including: thymus, intestine (jejunum, ceaca) liver of the infected and control birds were separated and

Table 1. Percentage of internal and external parasites and multiple infections in pigeons.

Parasite	No. of infection				Overall percentage*
	Adult		Nestling		
	No.	%	No.	%	
Multiple infection with internal parasites	23	13.69	12	14.63	16.625
Multiple infection with external parasites	27	16.07	18	21.95	20.08
Multiple infection with internal and external parasites	37	22.02	24	29.26	27.23
Total pigeon	168		82		

*Out of 224 infected pigeon.

preserved in 5% formalin. Tissues were prepared for microtome, cut in 8 µM and stained in haematoxylin and eosin. Slides were studied on Olympus camera attached microscope. Observation was recorded and microphotography was done for projection slides and photographs.

Statistical analysis

The computer software, SPSS Version 9.0 for windows (SPSS Inc., Chicago, LL, USA) and Chi-Square tests were used for statistical analysis.

RESULTS

Out of the 250 pigeon samples, 224 (89.6%) were positive with at least one parasitic infection. Among them, 16.62% had multiple infections with internal parasites, 20.08% were infected with ectoparasites and 27.23% presented infections with both internal and external parasites. The entire experimental birds control was free of any internal and external parasites (Table 1).

Symptoms of worms consist of weight loss and in case of sever multiple worm infestation, diarrheal were seen in the pigeons. Infected young birds grew slowly and were even losing much body weight resulting in high rate of mortality.

The data indicate prevalence rate of various helminthes including *R. achinobothridia* (10.4%), *Syngamus trachea* (8.4%), *Capillaria colombae* (6%) and *A. colombae* (8.4%). The results reveal some porotozan infections including: *H. colombae* (20.8%), *T. gallinae* (26.8%) *Cryptosporidium* sp. (1.2%) and *Eimeria* sp. (21.6%), and also ectoparasites including *Lipeurus* sp. (3.2%), *Menopen gallinae* (15.2%), *Ceratophyllus colombae* (10.4%) and louse fly (12%). Multiple infections observed with internal parasites were 19/4%. However, co-infection of internal and external parasites was 24.4%. Meanwhile, five out of the 12 hair samples taken from pigeon owners were infected with fleas (*C. colombae)* and lice *(M. gallinae)* as seen by the clinical manifestation of allergic urticarial reaction and itching (Table 2). The nest of the pigeon was checked for external parasites and we found *C. colombae* and *M. gallinae.* The maximum and minimum environmental temperature of the area measured was 32 and 43°C and the maximum humidity of the area was 6%.

Histological finding

A comparison of control and infected tissues shows that the thymus and intestinal tissue sample of infected young and adult birds became very small due to the infection, oedematous or with petechial haemorrhages. Histological studies showed a visible vascular congestion and a massive lymphoplasmacytic infiltration inside the smooth muscular layer of the small intestine of infected pigeons.

Multiple haemorrhages were seen in the mucosa of the intestine and ceaca. Patches of necrotic epithelial cells and multifocal areas of lymphocytic infiltrates in mucosa of jejunum of infected pigeon were observed. Extensive zone of necrosis were seen in infected young pigeon. The intestinal villous atrophy and shortening of microvilli were observed in infected birds. A cross-section of liver from pigeons infected by internal parasites showed massive congestion of central vein and dilation of hepatic sinusoids. (Figures 1 to 4).

The 12 hair samples of pigeon owners were checked for external parasites, five of which were carrying lice *(M. gallinae)* and one was found with fleas (*C. columbae)*; all of the five infected pigeon owners had a feeling of itching on their head with allergic urticarial reaction.

DISCUSSION

Parasites are emerging as a significant avian pathogen on a global scale, both ecologically and economically. However, important gaps remain in our understanding of its epidemiology and pathogenicity in wild populations, particularly in non-native hosts.

In Iran, only few studies have been carried out in relation to parasite infections in pigeons. This is the first study that is used to compare the prevalence and intensity rates of parasites among pigeon species in the Ilam province of western part of Iran. Categorization of birds into adult pigeon and nestling showed that *Eimeria* sp. were significantly more prevalent in nestling than in

Table 2. Prevalence of endoparasites and ectoparasites in pigeons.

Parasite	No. of infection				Overall percentage
	Adult		Nestling		
	No.	%	No.	%	
Helminths					
Raillietina sp	21	12.5	5	6.09	10.4
Syngamus trachea	19	11.3	2	2.43	8.4
Capllaria sp	15	8.92	0	0	6
Ascaridia colombae	18	10.71	3	3.65	8.4
Ectoparasites					
Lipeurus sp	6	3.57	2	2.43	3.2
Louse fly	19	11.3	11	13.41	12
Ceratophylus columbae	18	10.71	8	9.75	10.4
Menopen gallinae	21	12.5	17	20.73	15.2
Protozoan					
Haemoproteus columbae	42	25	10	12.19	20.8
Trichomonas gallinae	38	22.6	29	35.36	26.8
Cryptosporidium sp	3	1.78	0	0	1.2
Eimeria sp	23	13.96	31	37.8	21.6
Total parasites	243		118		

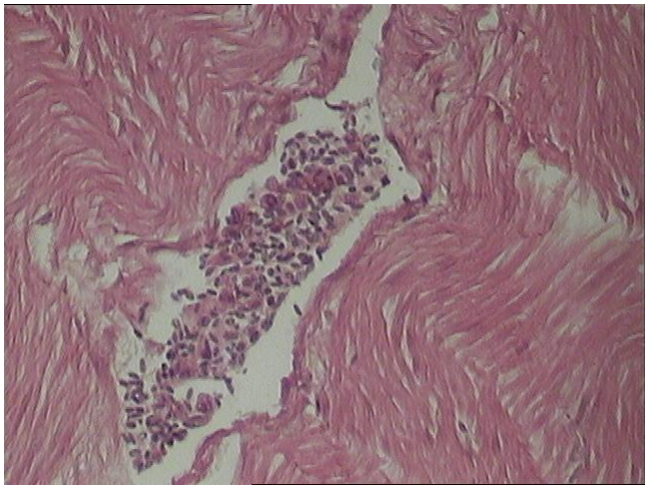

Figure 1. Photomicrograph showing a cross-section of a small vein of intestine from a pigeon infected by internal parasites. It shows a visible vascular congestion inside the smooth muscular layer of the small intestine (H&E 400×).

adults, while helminthiasis due to *T. gallinae, H. colombae* and *C. columbae. Eimeria* sp. were significantly higher in adults than nestling pigeon ($p<0.05$). *Louse fly*, *C. columbae* and *H. columbae* were significantly higher in adults pigeon than in nestling ($p<0.05$). The present study is more or less similar to the result that has been previously reported by Radfar et al. (2011) and Msoffe et al. (2011).

The helmenthes have been identified in this study including *R. achinobothridia, S. trachea*, *Capillaria colombae* and *Ascaridia colombae*. The present results are similar to those of previous reports which showed that *R. achinobothridia*, *S. trachea, C. colombae* and *A. colombae* were more pronounced than the other helmenths parasites in pigeons (Gicik and Arslan, 2001; Razmi et al., 2007; Sari et al., 2008). *R. achinobothridia* and *A. colombae* were shown to be important in helminthes of pigeons. Although, these are generally

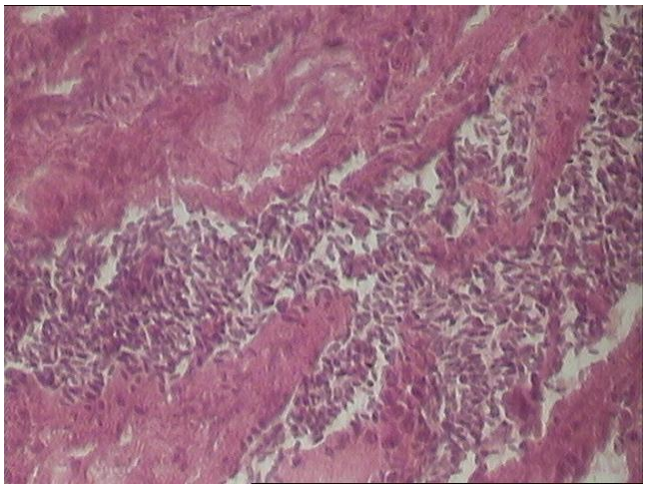

Figure 2. Photomicrograph showing a cross-section of the muscular layer of intestine from a pigeon infected by internal parasites. It shows a massive congested vessel inside the smooth small intestine (H&E 400×).

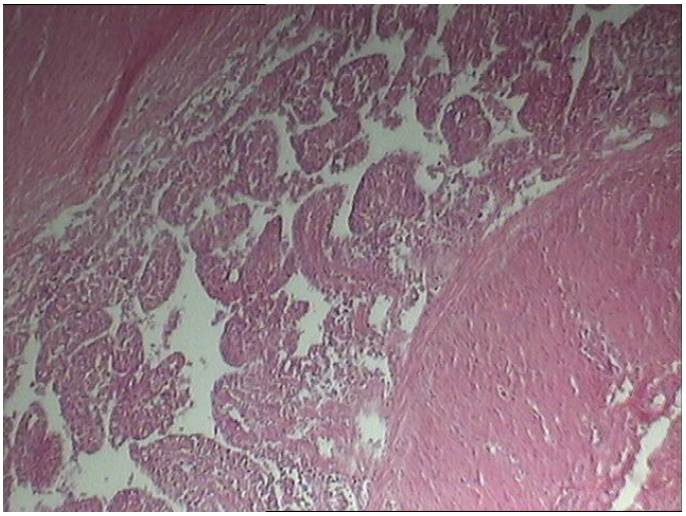

Figure 3. Photomicrograph showing a cross-section of the mucosal layer of intestine from a pigeon infected by internal parasites. It shows villous atrophy and shortening of microvilli (H&E 400×).

considered to be relatively harmless parasites, it will be interesting to study the reason why pigeons are more susceptible to helminthes as compared to other birds.

Protozoa parasites that were identified in this research study consist of *H. colombae, Ttichomonas gallinae, Crypospo*ridium and *Eimeria* which is similar to the report of Radfar et al. (2011). They worked on the external and internal parasites of the pigeon from the east of Iran. A comparison of the results of this research with that of previous study shows that the percentage prevalence of parasites is less than that reported by Tietz-Marques et al. (2007). All the samples collected from *Eimeria* infected pigeons were infected by multiple parasites, showing the associations between *Eimeria* sp. and other parasites that are in agreement with Tietz-Marques et al. (2007). In 13.96% of the adult pigeon and 37.8% of the nestling pigeon, *Eimeria* oocysts were detected. Coccidiosis is one of the important protozoan diseases found in birds. The disease has a subclinical course in adults but young pigeons exhibit such symptoms of clinical coccidiosis as fluffy feathers, anorexia and watery diarrhoea with mucus (Radfar et al., 2011 and Levine, 1985). The highest overall percentage rate of parasitic infection was *T. gallinae* (26.8%) that is in agreement with the report of

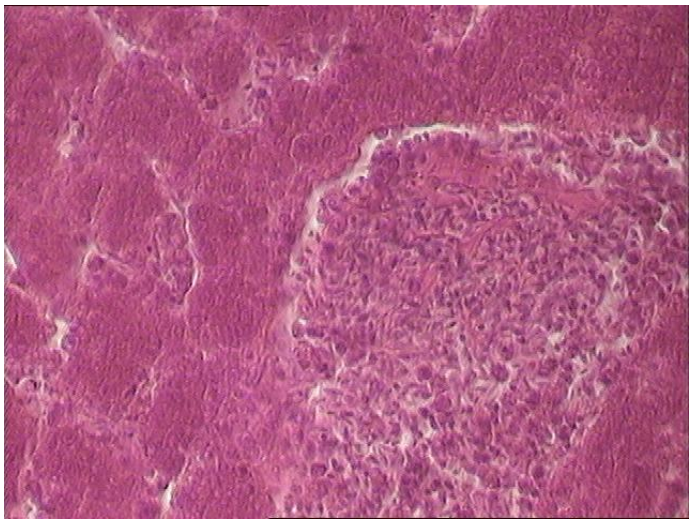

Figure 4. Photomicrograph showing a cross-section of the liver from a pigeon infected by internal parasites. It shows massive congestion of the central vein and also, dilation of hepatic sinusoids is obvious (H&E 400×).

Bunbury et al. (2008). The reason for high prevalence may be due to the fact that the transmission of the parasites occurs generally when the adults feed their young ones but can also occur through food in feeders and water (Kocan and Knisley, 1970). Adult birds may remain infected for a year or more and are a constants source of infection for their young ones (Soulsby, 1982). The results of the present study demonstrated lower rates of blood parasites than the other few studies carried out in Birjand, Iran for *H. colombae* (Radfar et al., 2011). The investigation of the prevalence of blood parasites in pigeon and other birds in Costa Rica, Alaska, and Japan revealed lower rates than 10%; in the United States, Colombia, Bulgaria and in Queensland, Australia, the prevalence rates ranged from 20 to 32% for *Heamoproteus* sp. (Valkiunas et al., 2004; Adlard et al., 2004; Deviche et al., 2001; Muratak, 2002; Rodrigues and Matta, 2001; Garvin et al., 1993; Shurlinkov and Golemansky, 2002).

In this study, we collected ectoparasites, which include feather lice (Lipeurus, *M. gallinae*), pigeon fleas (*C. columbae*) and louse fly. Radfar et al. (2011) reported four species of ectoparasites: *P. canariensis*, *C. columbae*, *M. galline* and *Laminosioptes cysticola* from east of Iran.

Also in this study, five persons were reported with lice and fleas (same species of parasites collected from the pigeons nest) and all of them had itching in their head and allergic urticarial reaction. Haag Wackermagel (2004) reported the concerns of a married couple who was repeatedly invaded by pigeon fleas (*C. columbae*) over a period of two months. The source of the fleas was a pair of breeding pigeons (Columba livia). The birds' nest was immediately located in the attic on top of the couple's apartment, and the fleas found their way along an unsealed heating pipe. The couple encountered up to 40 bites per night. With the invasions repeated almost every night, the man gradually developed allergic urticarial reaction. However, the most traumatic experience for the couple was to learn that they were invaded by fleas (initially, they had presumed they were bothered by mosquitoes). This information resulted in severe psychological distress with phobic reactions and insomnia. Despite the successful removal of the fleas and the pigeons that were source of the pest, the parasitophobia of the man persisted over four months. This case was discussed from the broader aspect of health risks related to pigeons and animal fleas.

Conclusion

Clean, sanitary lofts are the most beneficial to keeping worms in check, but since pigeons often mingle with many hundreds of other birds, a bird can become infected through ingestion of worm eggs from the basket or through contact with stray pigeons. Therefore, it is advisable to develop a preventative worming program in which all birds are wormed at least twice a year. The use of mask and cap for pigeon owners could protect them from the allergic reaction.

ACKNOWLEDGEMENTS

This work was partly supported with grants from the Research Administrative Committee of Ilam University. We thank students of Parasitology Department, especially

Mr. Arash Bahrami who assisted with various aspects of this research including field work, data collection, data entry and experimental data management.

REFERENCES

Adang LK (1999). Some aspects of the biology of four columbid species in Zaria, Nigeria. M.Sc. Thesis, Ahmadu Bello Univ. Zaria, Nigeria.

Adlard RD, Peirce MA, Lederer R (2004). Blood parasites of birds from southeast Queensland, Ornithol. 104: 191-196.

Balicka-Ramis A, Tomza-Marciniak A, Pilarczy B, Wieczorek-Dabrowska M, Bakowska (2007). Intestinal parasites of parrot's.

Bunbury N, Jones CG, Greenwood AG, Bell DJ (2008). Epidemiology and conservation implication of *Trichomonas gallinae* infection in the endangered Mauritian pink pigeon. Biological Conservation, 141: 153-161.

Cooper JE (1984). A veterinary approach to pigeons. J. Small Anim. Pract. 25:505-516.

Deviche P. Greiner EC, Manteca A (2001). Inter specific variability of prevalence in blood parasites of adult passering birds during the breeding season in Alaska. J. Wildl. Dis. 37:28-35.

Gicik Y, Arslan MO (2001). Blood parasites of wild pigeons in AnkaraDistricts. Turk. J. Vet. Anim. Sci. 25: 169-172.

Garvin MC, Remsen JV, Bishop MA, Bennett GF (1993). Hematozoa from passeriform birds in Louisiana. J. Parasitol. 79: 318-321.

Harlin RW (1994). Pigeons The veterinary clinics of North America. Small Anim. Pract. 24:157-173.

Kocan RM, Knisley JO (1970). Challenge infection as a means of determining the rate of diseases resistant *trichomonas gallinae* free birds in a pupolation. J. Wildl. Dis. 6: 13-15.

Levine ND (1985). Veterinary protozoology. Iowa State University Press, Ames. pp. 200-201.

Msoffe PLM, Muhairwa A.P, Chiwanga GH, Kassuku AA (2010). A study of ecto- and endo-parasites of domestic pigeons in Morogoro Municipality, Tanzania. Afr. J. Agric. Res. 5: 264-267.

Murata K (2002). Prevalence of blood parasites in Japenese wild birds. J. Vet. Med. Sci. 64: 785-790.

Razmi GR, Kalidari GA, Maleki M (2007). First reports of the *Hadjela truncata* infestation in pigeons of Iran. Iranian J. Vet. Res. Univ. Shiraz. 8: 175-177.

Rehman R (1993). A study on the prevalence of Ascaridia galli and the effects of experimental infection on various blood parameters and body weight in the chicken. M.Sc. (Hons) Thesis, Univ. of Agric. (CVS), Faisalabad-Pakistan.

Rodrigues OA, Matta NE, (2001). Blood parasites in some birds from eastern plains of Colombia. Mem. Inst. Oswaldo. Cruz., 96: 1173-1176.

Sari B, Karatepe B, Karatepe M, Kara M (2008). Parasites of domestic (Columba Livia Domestica) and wild (Columba Livia Livia) pigeons in Nigda, Turkey. Bull. Vet. Inst. Pulawy, 52: 551-554.

Shurlinkov P, Golemansky V (2002). Haemoproteids (Haemosporida: Haemoproteidae) of wild birds in Bulgaria. Acta. Protozool. 41: 359-374.

Soulsbey EJL (1982). Helminths, Arthropods and Protozoa of domesticated animals. 7th Edn., Bailliere Tindall, London.

Tietz-Marques SM, De Quadros, RM, Da Silva CJ, Baldo M (2007). Parasites of pigeons (Columba livia) in urban areas of lages, Southern Brazil. Parasitol. Latinoam, 62: 183-187.

Valkiunas J, Iezhova TA, Brooks DR, Hanelt B, Brant SV, Sutherlin ME, Causey D (2004). Additional observations on blood parasites of birds in Costa Rica. J. Wildl. Dis. 40: 555-561.