

Prevalence of Endoparasites in Indian Peafowl under captive facilities in Punjab, Pakistan

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ABSTRACT

To evaluate the prevalence of endoparasites in Indian peafowl (four mutant form; black shoulder, pied, white and common peafowl), freshly egested fecal samples (n=100) from six different captive facilities were collected. The prevalence of endoparasites among all the Indian peafowl ranged from 46.6%-66.7%. The highest prevalence was recorded in black shoulder peafowl 66.7% followed by pied peafowl (66.1%), white peafowl (59.1%) and common peafowl (46.6%). The prevalence of endoparasites was highest 74.3% at Gatwala Wildlife Park, Faisalabad and lowest 30% at Changa Manga Wildlife Park, Kasur. The overall prevalence in female was found higher (58.9%) as compared to male (56.8%). A total of seven species of endoparasites, *Capillaria* 34%, *Ascaridia* 29%, *Heterakis* 13.4%, *Eimeria* 12.5%, *Strongyloides* 12.5%, *Giardia* 7.31%, and *Syngamus* 4.55% were recorded, with mixed infection 34%. The variations in prevalence in study birds and in study sites were because of good and bad management strategies.

Keywords: Prevalence, Fecal parasite, Captive Indian Peafowl, Endoparasites, Oocysts

INTRODUCTION

Indian peafowl (*Pavo cristatus*) belongs to genus *Pavo*, order Galliforms, family Pheasianidae, subfamily Pavoninae and is known as common or blue peafowl. It is the largest flying bird of pheasant's family. Genus *Pavo* has three mutant forms of its species including white peafowl, black shoulder peafowl and pied peafowl (Abrar *et al.*, 2017). Native origin of peafowl is Asia, where they are predominantly found in South Asian countries like India, Nepal, Sri Lanka, Burma and Pakistan (Madge & Gowan, 2002).

A wide range of ectoparasites as fleas, mites, ticks and lice and a number of endoparasites insect larvae and nematodes were found in Peafowl. The ectoparasites are found on

body and feathers while endoparasites are mainly found in blood, lungs and intestines (Ashraf *et al.*, 2002). The arthropod vectors transfer these parasites from infected to healthy birds. The ectoparasites and endoparasites change the body temperature of peacock, cause respiratory distress, inability to fly and Lateral recumbence (Ponnudurai *et al.*, 2011).

Peafowl are facing various threats resulting in population decline. At present this bird is under severe risk due to multiple factors such as habitat degradation, poaching, crop rotation and infectivity of its food and extensive use of fertilizers and pesticides, poor sanitation and non-elimination of infected individuals in free ranging conditions (Kushwaha & Kumar, 2016). Under natural conditions, birds are less vulnerable to

endoparasitic infections whereas in confined places or under captivity, birds face stress due to which birds are subjected to weak immunological system which makes them more susceptible to parasite infections. The key factors for spreading of endoparasites in zoo birds and animals are mal-nutrition, crowding, and poor hygiene (Ashraf *et al.*, 2015). Unfortunately, there is lack of comprehensive studies on the prevalence of endoparasites in zoo birds (El-Shahawy & Elenien, 2015). Parasitic infections in Indian peafowl often remain unnoticed due to lack of investigation studies regarding the presence of parasites. Therefore, current study was designed to evaluate the prevalence of endoparasites in Indian peafowl kept at different captive facilities in Punjab, Pakistan.

MATERIALS AND METHODS

Study area

Fecal samples of Indian peafowl were collected from six different Wildlife breeding centers of Punjab including three Government breeding sites; Gatwala Wildlife Park, Faisalabad (31.485992° N to 73.215158°E), Jallo Wildlife Breeding Center, Lahore (31.570949°N to 74.477639°E); Changa Manga Wildlife Park, Kasur (31.570949°N to 74.477639°E); and three private breeding sites: Murgzar private breeding farm, Faisalabad (31.493734°N to 74.477639°E); Muhammad Din and son's private breeding farm, Lahore (31.24494°N to 74.33161°E) and Javed Muzaffar Butt private breeding farm, Lahore (31.21529°N to 74.29366°E) registered under Punjab Wildlife and Parks Department, Government of Punjab, Pakistan.

Fecal samples collection

One hundred freshly egested fecal samples of adult peafowl (44♂, 56♀) were collected. Polythene bags were used for storage of fecal samples to prevent them from loss of moisture, contamination with other material and dust. Sterile spatulas were used to avoid cross contamination with other bird's feces. Each fecal sample was labeled for each bird. Ice cold boxes were used for the storage of fecal sample for being transported to parasitological laboratory. Fecal samples were analyzed by direct fecal smear method and concentration methods (Qin *et al.*, 2010) at the Ornithological Laboratory, Punjab Wildlife Research Center, Gatwala, (31.485992° N to 73.215158°E) District Faisalabad, Punjab, Pakistan.

Direct smear method

A small amount of fresh fecal sample was placed on a clean microscopic glass slide and one or two drops of water was mixed with it thoroughly to form a homogenous mixture. The slide was tilted at an angle to allow the fluid to flow from the heavy debris. A cover slip was placed on the fluid for making the smear and then examined under low power (400X) of light microscope (XSZ-107BN). Fecal samples were found negative with direct smear method were examined either by direct floatation or centrifugal floatation method (Soulsby, 1982).

Concentration of samples

Direct floatation

Two grams of fresh feces were mixed homogeneously with 20 ml of saturated solution of sodium chloride. The homogenous suspension was strained with mesh and poured into the test tube up to the top. A cover glass was placed on the top of the test tube touching the meniscus of the mixture. It was allowed to stand for twenty minutes. The cover glass was then removed carefully from the test tube and placed on the glass slide and examined under low power (400X) of microscope (XSZ-107BN).

Centrifugal floatation

Two grams of feces were mixed with 30-50 ml of water. The solution was strained through a sieve (1mm mesh) to remove the coarse fecal material. The solution was kept for 10-15 minutes until the supernatant became clear. The sediment was mixed with the saturated solution of sodium chloride in a centrifuge tube and centrifuged at 1500rpm for one to two minutes. The floating oocysts were removed by touching with cover glass and transferred to clean glass slide and then examined with microscope. The parasites were identified by examining the morphology of the oocysts and eggs (MAFF, 2017).

Statistical analysis

The mean prevalence of each parasite and its percentage was calculated by using appropriate formula (Steel *et al.*, 1997) and data were analyzed by analysis of variance and tests for two proportions using SPSS-21 statistical software package.

RESULTS

The prevalence of endoparasites among four mutant types of Indian peafowl was evaluated and it ranged from 46.6% to 66.7%. The highest prevalence was recorded in black shoulder peafowl (66.7% (20/30)), followed by pied peafowl (61.1%

(11/18)), white peafowl (59.1% (13/22)) and common Peafowl (46.6% (14/30)). The overall prevalence of endoparasites in all types was 58% (58/100) and was different non-significantly ($p > 0.05$) (Fig-1). The prevalence of endoparasites was also determined separately in all the captive facilities under this study (Fig-2). The prevalence at six different facilities ($P < 0.05$) ranged from 30% to 74.3%. The highest prevalence were determined (74.3% (20/35)) at Gatwala Wildlife Park, Faisalabad, followed by 71.4% (5/7) at Javed Muzaffar Butt private breeding farm, Lahore, 60% (3/5) at Muhammad Din and Son's private breeding farm, Lahore, 59.1% (13/22) Jallo Wildlife Breeding Center, Lahore. 38.1% (8/22) at Murgzar private breeding farm, Faisalabad and 30% (3/10) at Changa Manga Wildlife Park, Kasur. Sex wise prevalence of endoparasites in all captive facilities was 56.8% (25/44) in males ($P > 0.05$) whereas black shoulder peafowl was most prevalent 75% (9/12) while common peafowl males were least prevalent 38.5% (5/13). White Peafowl and Pied Peafowl were infected 60% (6/10) and 55% (5/9) respectively. The overall endoparasites prevalence in female peafowl was recorded as 58.9% (33/56). The Pied peafowl was most prevalent 56.7%, black shoulder peafowl 61.1%, white peafowl 58.3% and common peafowl 53%. The females were more prevalent as compared to males (Fig-3).

The overall prevalence of parasitic species recorded was: *Capillaria* 34%, followed by *Ascaridia*

29%, *Heterakis* 13.4%, *Eimeria* 12.5%, *Strongyloids* 12.5%, *Giardia* 7.31%, and *Syngamous* 4.55% (Fig. 4). In common peafowl, three species of elminthes and one species of protozoan were recorded. Among these endoparasites, *Ascaridia spp* was most prevalent (33.33% (10/30)) followed by *Capillaria spp* (26.67% (8/30)), *Heterakis spp* (10% (3/30)) and *Giardia spp* 3.33% (1/30) whereas mixed infection was 26.67% (8/30). In black shoulder peafowl three species of helminthes and one protozoan species were recorded. Among these species *Capillaria spp* was found most prevalent 43.33% (13/30), *Acaridia spp* was 23.33% (7/30), *Heterakis spp* was 10% (3/30) and *Giardia spp* was 3.33% (4/30) whereas mixed infection was 30% (9/30). In pied peafowl, three species of helminthes and one species of protozoan were recorded. Among these species, *Capillaria spp* were more prevalent 33.33% (6/18) and all other three species were equally prevalent 22.22% (4/18) whereas mixed species infection was 38.89% (7/18). In white peafowl, five species of helminthes and two protozoans were recorded. Among these, *Ascaridia spp* were more prevalent 36.36% (8/22), *Capillaria spp* was 31.82% (7/22), *Heterakis spp* was 22.73% (5/22) whereas *Eimeria spp*, *Giardia species* and *Syngamous species* were equally prevalent 4.55% (1/22). The mixed infection in white peafowl was 45.46% (10/22) (Table-1).

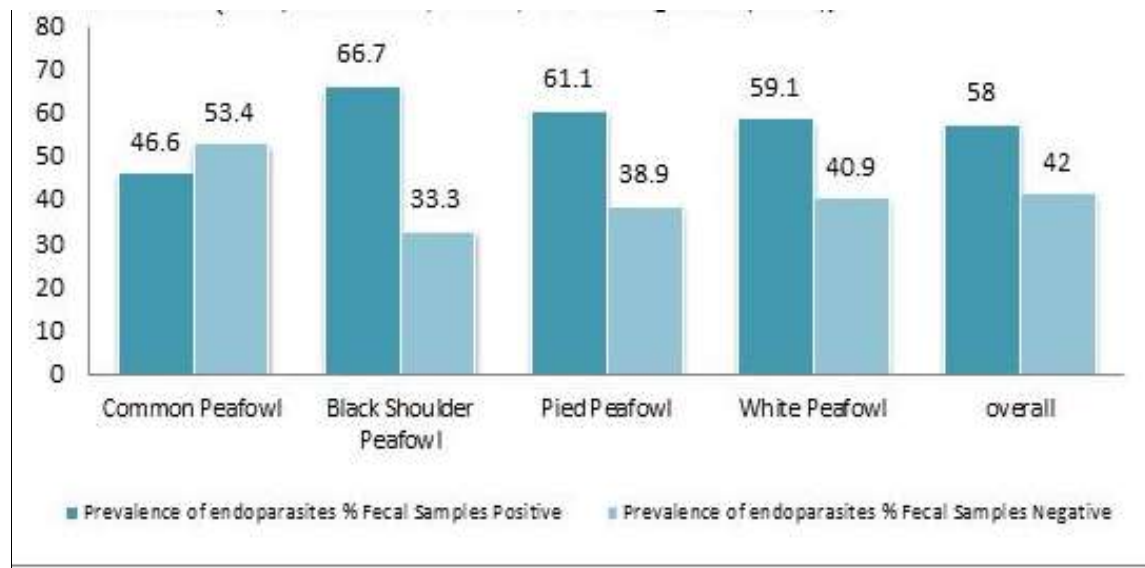


Fig. 1: Prevalence of Endoparasites in Indian Peafowl in Six Captive Facilities of Punjab Pakistan {Chi-square = 2.589^{NS}; P = 0.45, NS=Non-significant ($P < 0.05$)}

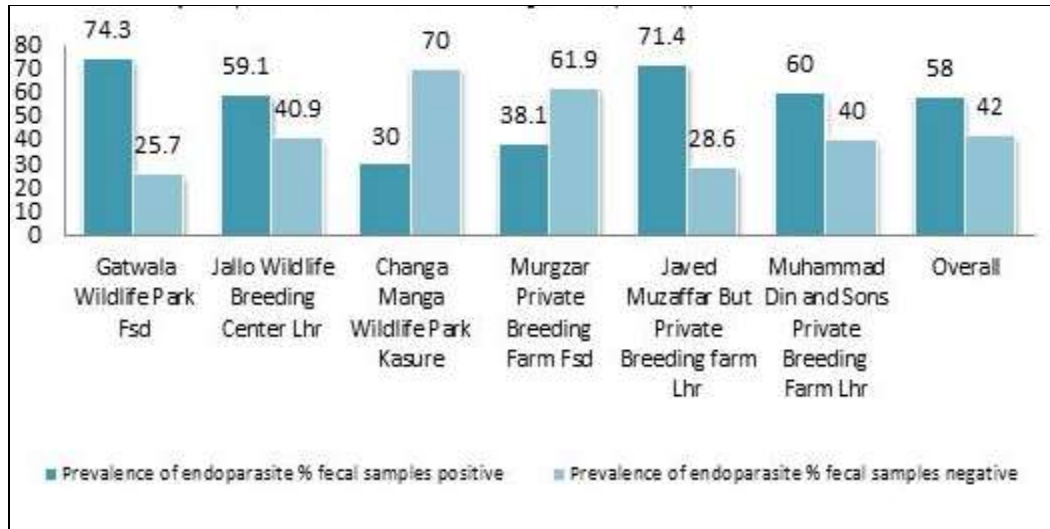


Fig. 2: Captive facility wise Prevalence of Endoparasite in Punjab, Pakistan {Chi-square = 10.98^{NS}; P = 0.050, = significant (P<0.05)}

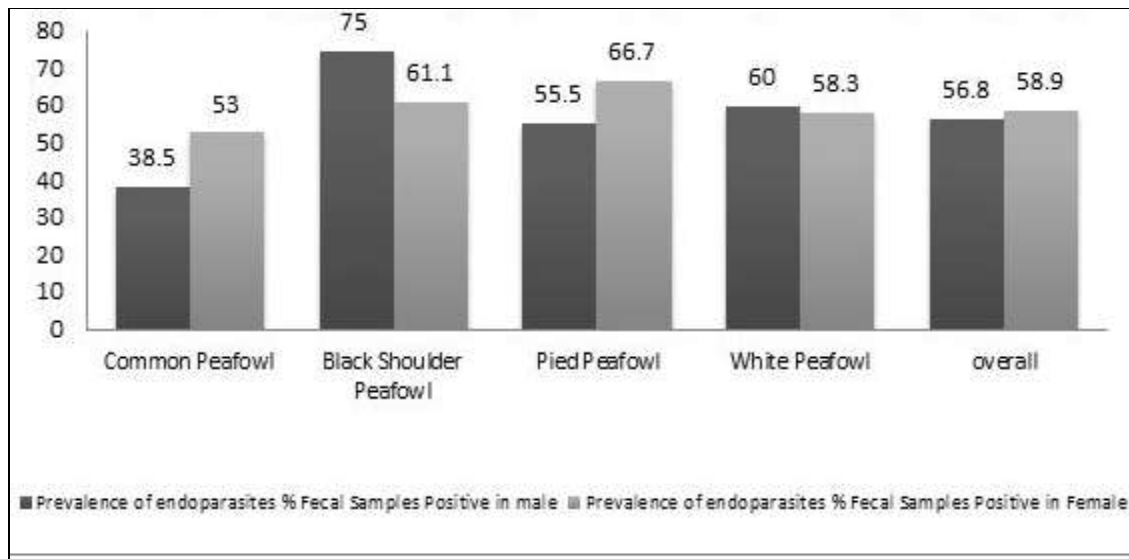


Fig. 3: Comparison of Sex wise Prevalence of Endoparasites in Indian Peafowl in Six Captive facilities of Punjab, Pakistan. {Chi-square = 2.589^{NS}; P = 0.45, NS=Non-significant (P<0.05)}

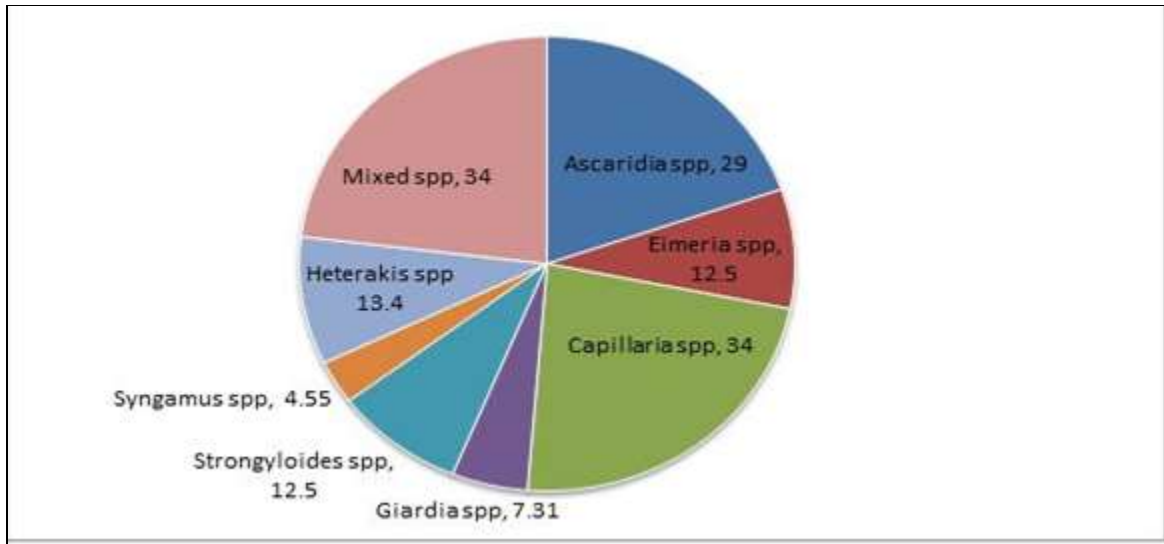


Fig. 4: Overall Prevalence of Endoparasite species in Six Captive Facilities of Punjab, Pakistan

Table-I: Prevalence of Endoparasite Species in Six Captive Facilities of Punjab, Pakistan

Indian Peafowl	Ascaridia spp %(+ve/n)	Eimeria spp %(+ve/n)	Capillaria spp %(+ve/n)	Giardia spp %(+ve/n)	Strongyloides spp %(+ve/n)	Syngamus spp %(+ve/n)	Heterakis spp %(+ve/n)	Mixed spp %(+ve/n)
Common peafowl	33.33(10/30)	-	26.67(8/30)	3.33(1/30)	-	-	10(3/30)	26.67(8/30)
Black shoulder Peafowl	23.33(7/30)	-	43.33(13/30)	3.33(4/30)	-	-	10(3/30)	30(9/30)
Pied peafowl	22.22(4/18)	22.22(4/18)	33.33(6/18)	-	22.22(4/18)	-	-	38.89(7/18)
White peafowl	36.36(8/22)	4.54(1/22)	31.82(7/22)	4.55(1/22)	4.55(1/22)	4.55(1/22)	22.73(5/22)	45.46(10/22)
Over all	29 (29/100)	12.5(5/40)	34 (34/100)	7.31(6/82)	12.5(5/40)	4.55(1/22)	13.4(11/82)	34 (34/100)

DISCUSSION

Review of various previous reports showed that health and captive status of Galliforms especially peafowl could be evaluated by analyzing prevalence of fecal parasites and reported that crowding, hygiene, stress and feeding plays a very critical role in endoparasitic infection in captive birds (Malan *et al.*, 1997). The findings of present study shows that prevalence of endoparasites among four mutant types of Indian peafowl was ranged from 46.6% to 66.7%. The same study was conducted by Patel *et al.* (2000) that showed 48.11% positive samples with parasitic infection. The current study evaluated the percentages as *Capillaria* 34%, followed by *Ascaridia* 29%, *Heterakis* 13.4%, *Eimeria* 12.5%, *Strongyloides* 12.5%, *Giardia* 7.31%, and *Syngamous* 4.55%. Eggs of *Ascaris* and

Capillaria species were observed 20.75% and 13.2% in faecal samples respectively, in wild birds (Soulsby (1982); Patel *et al.*, 2000). The oocysts of *Eimeria* spp were found in most birds either as pure infection or as a mixed infection with other helminthes. Helminthes have direct life cycle and were the most common parasites in all captive facilities. *Ascaridia* spp and *Capillria* spp were the highly concerned as they infected all types of peafowl, whereas *Heterakis* spp infection was recorded in black shoulder and pied peafowl. The *Strongyloides* spp infection was recorded in white and pied peafowl. However, *Syngamous* spp were recorded in only white peafowl. In agreement with present results, Globokar *et al.* (2017) reported that in Galliformes, the most prevalent parasite genera were *Eimeria*, *Capillaria* and *Ascaridia*, which is in accordance with previous studies (Tomza-Marciniak

et al., 2014; Orunc & Bicek, 2009). Titilincu et al. (2009) also reported infection in peacocks with nematode parasites as *Ascaridia spp*, *Heterakis spp*, *Singamus trachea*, *Capillaria spp* and *Strongyloides pavonis*.

The protozoan parasites i.e. *Giardia spp* infected all the types of peafowl except pied peafowl whereas *Eimeria spp* infection was recorded in only pied peafowl and white peafowl. In agreement with present results, Ashraf et al. (2015) reported the *Eimeria spp*, *Isospora spp*, *Trichomonas spp*, *Giardia spp* and *Cryptosporidium spp*. Prevalence of *Eimeria spp* and *Isospora spp* 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 & Ritchie, 1994). Similarly, the parasites that were identified from fecal material such as *Eimeria spp*, *Giardia spp*, *Ascaridia spp*, *Capillaria spp*, *Syngamus spp*, and *Heterakis*, can be controlled by providing good management conditions in captivity. The ecto and endoparasites increase susceptibility to other infections and affect egg production rate and bird growth (Dranzoa et al., 1999). *Giardia spp* are found in many birds as motile trophozoite and a cyst form. The *Giardia* infestation can lead to weakness, poor plumage, reduced growth and high mortality rate of up to 50% in juvenile birds (Greiner & Ritchie, 1994; El-Shahawy, 2010). Protozoan infections, especially the ones caused by the coccidian parasites, should not be overlooked while doing research on game bird population dynamics as they are of great importance for species conservation. Therefore, more parasitological studies are needed (El-Shahawy, 2010).

CONCLUSION

The findings of current study show that there was variation in parasitic prevalence among all the Indian peafowl. The highest prevalence was recorded in black shoulder peafowl and lowest in common peafowl. Similarly prevalence of endoparasites was highest at Gatwala Wildlife Park, Faisalabad and lowest at Changa Manga Wildlife Park, Kasur. The prevalence variations in study birds and in study sites were because of good and bad management strategies.

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REFERENCES

- Abrar, M., Ahmad, A.Q., Ali, Z., Iqbal, A.M., Altaf, S., Hussain, S.S.A., Hamidullah, Shafiq, Z., Farooq, Z. and Khan, L., 2017. Effect of cage spacing on production, fertility and hatchability of eggs in Indian Peafowl at wildlife breeding center (Gatwala), Faisalabad-Pakistan. *J. Ento. Zool.* 5: 354-360.
- Ashraf, S., Javid, A., Ashraf, M., Akram, M., Altaf, M., Irfan, A.H., Jabeen, G. and Ali, Z., 2015. Studies on parasitic prevalence in ring necked pheasants (*phasianus colchicus*) in captivity. *J. Animal Plant Sci.* 25: 359-364.
- Ashraf, M., Waraich, F.N., Ahmad, I.G. and Pervez, K. 2002. Chemotherapy of Gastro- Intestinal Nematodes in common Peafowl (*Pavo cristatus*). *Pak. Vet. J* 22(2).
- Dranzoa, C.M., Ocaido, and Katete, P., 1999. The ecto-gastro-intestinal and hemoparasites of live pigeons (*Columba livia*) in Kampala, Uganda. *J. Avian pathol.* 28: 119-124.
- El-Shahawy, S.I., 2010. *Eimeria pavaoegyptica* spp. nov. (Apicomplexa: Eimeriidae) in feces of Indian Peacocks, *Pavo cristatus* Linnaeus, 1758 (Galliformes: Phasianidae) from Egypt. *Mem Inst Oswaldo Cruz, Rio de Janeiro.* 105: 965-969.
- El-Shahawy, I.S. and Elenien, A.F., 2015. Enteric parasites of Egyptian captive birds: A general coprological survey with new records of the species. *J. Trop. Biomed.* 32: 650-658.
- Globokar, M., Fischer, D., Pantchev, N., 2017. Occurrence of endoparasites in captive birds between 2005 to 2011 as determined by faecal flotation and review of literature. *Berliner and Münchener Tierärztliche Wochenschrift.*
- Greiner, E. and Ritchie, B., 1994. Parasites In Avian Medicine, Principles and Application. Wingers Publishing 1006-1029.
- Kushwaha, S. and Kumar, A., 2016. A review on Indian Peafowl (*Pavo cristatus*) Linnaeus, 1758. Indian Biodiversity Conservation Society, Jhansi, Uttar Pradesh. *J. Wildlife Res.* 4: 42-59.

- Madge, S. and Gowan, M.P., 2002. Book on Pheasants, partridge and grouse including button quails, sand grouse and allies. 5th ed, Christopher Helm publisher, London.
- MAFF., 2017. Parasitological laboratory techniques, Technical Bulletin No. 18. Ministry of Agriculture, Fisheries and Food Manual of Veterinary, Her Majesty's Stationary Office, London.
- Malan, F.S., Horak, I.G., Vos, V., Van Wik, J.A., 1997. Wildlife parasites: lessons for parasites control in livestock. *J. Vet. Parasitol.* 71: 137-153.
- Orunc O, Bicek K (2009) Determination of parasite fauna of chicken in the Van region. *Turkiye Parazitol Derg.* 33: 162-164.
- Pande, B.P., Bhatia, B.B., Chauhan, P.P.S. and Garg, R.K., 1970. Species composition of coccidia of some of the mammals and birds of the Zoological Garden, Luknow. *Indian J. Anim. Sci.* 40: 154-163.
- Ponnudurai, G., Rajendran, K., Rani, N. and Harikrishnan, T.J. 2011. A note on parasitic infestation in Indian peacock. *Zoo's Print.* 27(4).
- Patel, V.P., Patel, I.A., Sahu, K.R. and Vyas, R., 2000. Prevalence of gastro-intestinal parasites in Captive Birds of Gujrat Zoos. *Zoo. Print. J.* 15: 295-296.
- Qin J, Li R., Raes, J., Arumugam, M., Burgdorf, K.S., Manichanh, C., Nielsen, T., Pons, N., Levenez, F., Yamada, T., Mende, D.R., Li, J., Xu, J., Li, S., Li, D., Cao, J., Wang, B., Liang, H., Zheng, H., Xie, Y., Tap, J., Lepage, P., Bertalan, M., Batto, J.M., Hansen, T., Le Paslier, D., Linneberg, A., Nielsen, H.B., Pelletier, E., Renault, P., 2010. A human gut microbial gene catalogue established by metagenomic sequencing. *Nature.* 464(7285):59–65.
- Steel, R.G.D., Torrie, J.H. and Dickey, D.A., 1997. Principles and procedures of Statistics. A Biometrical approach 3rd ed. McGraw Hill Book Co. Inc. New York, USA.
- Soulsby, E.J.L., 1982. Helminths, Arthropods & Protozoa of domestic animals. *Baillere Tindall, London,* 765-766.
- Titilincu, A., Mircean, V., Bejan, A., Iovu, A., Roxana, U.R. and Cozma, V., 2009. Prevalence of Endoparasites in Peacock. *Sci. Parasit.* 2: 101-105.
- Tomza-Marciniak, A., Pilarczyk, B., Tobianska, B. and Tarasewicz, N., 2014. Gastrointestinal parasites of free-range chickens. *Ani. Parasitol.* 60: 305-308.