



Short Communication

Incidence of Gastrointestinal Parasites in *Pavo cristatus* under Cage System and Comparative Efficacy of Two Anthelmintics

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ABSTRACT

A study was conducted on *Pavo cristatus* (Indian peafowl) kept in captivity at Jallo Wildlife Park to find the comparative efficacy of Albendazole and Levamisole against gastrointestinal parasites. For this purpose, the fecal samples were collected from 30 peafowl. Sampling was done thrice from same birds i.e., once before treatment and twice after treatment with Albendazole and Levamisole. The efficacy of Albendazole and the Levamisole against parasites was calculated. The fecal samples were examined by using flotation and modified McMaster's egg counting technique. The results showed that 21 peafowl (8 males and 13 females) were infected with *Eimeria* sp. (66.33%), *Ascaridia* sp. (3.33%), *Strongyloides* sp. (3.33%), *Ascaris* sp. (6.67%), *Heterakis* sp. (3.33%), and *Hymenolepis* sp. (10%). The overall prevalence of gastrointestinal parasites was 70% having EPG 9150. The efficacy of Levamisole (97.26%) against gastrointestinal parasites was greater than Albendazole (94.53%). The results of the present study showed that birds in Jallo Wildlife Park, Lahore are infected with different gastrointestinal parasites. Also the results indicated that Levamisole was more effective anthelmintic against gastrointestinal parasites.

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SN, NAK, AT, SM conducted the study and wrote the manuscript. QU, FA, IK SB and RUK edited and revised the paper.

Key words

Pavo cristatus, Comparative efficacy, Gastrointestinal parasites, Anthelmintic drugs

Indian peafowl (*Pavo cristatus*) is the largest, most fancy and popular bird among the pheasants, because of its long train, attractive colours, and spectacular courtship. It is considered as a flagship (Icon) species for wildlife conservation. It also acts as indicator species of environmental conditions. Its presence or absence in area indicates the fitness of ecosystem. It is protected under Punjab Wild Life Act, 1974 (Hassan *et al.*, 2012). In wild, its population is facing a serious threat and continuous decline due to habitat destruction, poaching, contamination of its food source, human population pressure and intensive agricultural practices (Rajeshkumar and Balasubramanian, 2011; Kushwaha and Kumar, 2016).

Pea fowls are facing a number of problems related to the health and performance in wild as well as in captivity.

They are kept in captivity for conservation, recreation, study and research and to get economic benefits (Varadharajan and Kandasamy, 2000). The Punjab Wildlife Department has started the captive breeding program for pea fowls about ten years ago to increase their number in captivity, and for their reintroduction into wild. In captivity, they are under additional stress due to caged captivity, overcrowding, unnatural habitat, environmental conditions and suboptimal management. These captivity stressors reduced the immunity of bird and also cause change in behaviour (Athar *et al.*, 2001; Khursheed *et al.*, 2014).

Under captive conditions, the pea fowl are more susceptible to endo-parasites due to over-crowded enclosures, poor hygiene, improper use of anthelmintic drugs, poor and late health assessment (Khursheed *et al.*, 2014; Pradeep *et al.*, 2017). The nematodes, apicomplexans and platyhelminthes are the endo-parasites that infect the pea fowl. These parasites cause infections which are the

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most common health problem that distress the pea fowl and results either in a sub clinical condition or even death (El-Shahawy, 2010). The worst type of infections are those caused by gastrointestinal parasites which cause malnutrition and make the bird lethargic and sluggish (Badran and Lukesova, 2006). The gastrointestinal parasites harbour the intestine and lay their eggs in feces which reinfect the same bird and other birds either by direct contact with the feces or by an intermediate host. These parasites greatly affect the health of host by lowering the host resistance, causing damage to the gut epithelium and diarrhea, reduced the egg production and cause loss in body weight (Basit *et al.*, 2014). The gastrointestinal parasites cause various infectious diseases in pea fowls, the most common is coccidiosis, caused by protozoan species belonging to genus *Eimeria* (El-Shahawy, 2010). The reported gastro-intestinal parasites that cause infections in peafowls are *Hymenolepis* sp., *Davainea proglottina* the platyhelminthis, *Strongyloides* sp., *Strongyles* sp., *Heterakis gallinae*, *Ascaridia galli*, *Capillaria columbae* and *Acuaria spiralis*, the nematodes, *Cryptosporidium meleagridis* and *Eimeria* sp. the apicomplexans (Titilincu *et al.*, 2009; Basit *et al.*, 2014; Kathiravan *et al.*, 2017).

To eliminate the parasites, good management practices and the use of anthelmintic are the best methods. The anthelmintics are a group of anti-parasitic drugs that remove parasites from the body without causing any damage to the host. The modern anthelmintics are very effective and have wide range of activity against both larval and mature stages of endoparasites. Different anthelmintics have been reported in peafowl with wide range efficiency (Hegngi *et al.*, 1999; Ashraf *et al.*, 2002; Basit *et al.*, 2014). The current study was conducted to find out the comparative efficacy of Albendazol and Levamisole against the gastrointestinal parasites in Indian peafowl kept in captivity. The Indian peafowl were selected for this study because they are available in almost every zoo and wildlife park. In wild, it also exists in good number. Being a calm bird, its handling is easy. The findings of this work may provide an up to date knowledge about gastrointestinal parasites infecting peafowl along with their medication with suitable anthelmintic drugs to minimize the parasitic infection.

Materials and methods

This study was conducted at the Jallo Wildlife Park, Lahore. The fecal samples were collected from 30 peafowl. The freshly dropped feces free from stones and dust were collected in labeled fecal cups with the help of sterilized spatula. The fecal cups were labeled with sample number, gender, date and anthelmintic drug treatment status. For safe transportation, both fecal samples were placed in

cooler with ice packs. For examination samples were brought to Research Laboratory, Department of Zoology, Government College University, Faisalabad within 24 h.

The deworming of peafowl was done after first sampling by using two types of anthelmintic drugs, the Albendazole and the Levamisole. To check the efficacy of these two anthelmintic drugs, 30 peafowls were divided into two groups, each of 15 birds. One group was treated with Albendazole and the second was treated with Levamisole. After deworming, the fecal samples were again collected on day 7 and 15. The anthelmintic drugs were administered to the birds by mixing in drinking water. The dose of drug required for each bird was calculated on the basis of body weight as prescribed on the label (Khan *et al.*, 2010; Tanveer *et al.*, 2011).

The fecal samples were examined through qualitative and quantitative examination to detect the parasitic eggs and oocysts. The qualitative examination was performed by using flotation method. The flotation method was performed by using the protocol proposed by Dranzoa *et al.* (1999). Endo-parasites were identified by using identification key by Jaiswal *et al.* (2013). The quantitative examination was done by using modified Macmaster's egg counting technique. (Khan *et al.*, 2010).

The prevalence of gastrointestinal parasites was calculated by using following formula proposed by Fiaz (2013).

$$\text{Prevalence of parasites} = \frac{\text{No. of infected birds}}{\text{No. of examined birds}} \times 100$$

After measuring the EPG the drug efficacy was calculated by using following formula proposed by Basit *et al.* (2014).

$$\text{Drug efficacy} = \frac{\text{Pretreatment EPG} - \text{Posttreatment EPG}}{\text{Pretreatment EPG}} \times 100$$

The prevalence of the data was shown as percentage. To compare the efficacy of the drugs against the parasites, t-test was used.

Results and discussion

This study was conducted to check the prevalence of gastrointestinal parasites in peafowl kept in captivity at Jallo Wildlife Park and to select the best dewormer which gives a better remedy against the gastrointestinal parasites. The coprological examination revealed that 21 peafowl (8 males, 13 females) out of 30 examined peafowl (12 males, 18 females) were infected by the gastrointestinal parasites belonging to phyla Apicomplexa, Nematode and Platyhelminthes. The overall prevalence of gastrointestinal parasite was 70% having total EPG 9150. The species found were *Eimeria* sp., *Ascaridia* sp., *Strongyloides* sp., *Ascaris* sp., *Heterakis* sp. and *Hymenolepis* sp. with the relevant prevalence 66.33%, 3.33%, 3.33%, 6.67%,

Table I. Species wise and overall prevalence of gastrointestinal parasites in *P. cristatus* at Jallo Park, Lahore

Gastrointestinal parasites	No. of examined <i>P.cristatus</i>	No. of infected <i>P. cristatus</i>		Prevalence (%)	No. of gastrointestinal parasites observed	EPG
		Male	Female			
<i>Eimeria</i> sp.	30	6	13	66.33	150	7500
<i>Ascaridia</i> sp.	30	1	0	3.33	2	100
<i>Strongyloides</i> sp.	30	1	0	3.33	1	50
<i>Ascaris</i> sp.	30	1	1	6.67	22	1100
<i>Heterakis</i> sp.	30	1	0	3.33	1	50
<i>Hymenolepis</i> sp.	30	2	1	10	7	350

EPG, Egg per gram of feces.

Table II. Post-treatment comparative occurrence of *Eimeria* in *P. cristatus* at Jallo wildlife Park Lahore.

Anthelmintic drugs	Day 7			Day 15			
	Control (n=15)	Albendazole (n=15)	Levamisole (n=15)	Albendazole (n=15)	Levamisole (n=15)	Control (n=15)	
Mean \pm S.E	66.33 \pm 0.34	33.33 \pm 0.18	10 \pm 0.7	16.67 \pm 0.18	10.0 \pm 0.7	3.74	0.054 ^s

N, no. of samples examined; S, Significant ($p \leq 0.05$).

3.33 % and 10% respectively (Table I). The overall prevalence of gastrointestinal parasites (70%) recorded in the present study correlated with the findings of Ashraf *et al.* (2002) and Basit *et al.* (2014). They reported the overall prevalence of gastrointestinal helminthes as 56.32% and 80.77%, respectively in peafowl at Lahore zoo.

In the present study, the most dominant parasitic species was *Eimeria* sp. having a highest prevalence 66.33%, which closely resembles with the study of Marniche *et al.* (2017) who found the highest prevalence of *Eimeria* sp. in blue peacocks at El Hamma test garden (58.30%) and Ben Aknoun National Park, Algeria (33.30%), respectively. Similar findings were also reported by Kathiravan *et al.* (2017). The prevalence of *Hymenolepis* sp. in the present study was 3.33%, which resembled the findings of Kathiravan *et al.* (2017) who found the prevalence of *Hymenolepis* sp., as 4.16 %. The *Ascaridia* sp. and *Heterakis* sp. had least prevalence 3.33%, which deviated from the study of Basit *et al.* (2014) and Ashraf *et al.* (2002). The highest prevalence of *Eimeria* sp. and least prevalence of *Ascaridia* sp., *Strongyloides* sp., *Ascaris* sp., *Heterakis* sp., and *Hymenolepis* sp. in the present study was due to the reason that the peafowl at Jallo Wildlife Park were regularly treated with anthelmintic drugs (personal communication), which are effective against cestodes and nematodes but not effective against *Eimeria*.

In the present study, the infected peafowl were treated with two broad spectrum anthelmintics to reduce the gastrointestinal parasites and to check their comparative efficacy against these parasites (Table II). After the drugs

administration, only *Eimeria* sp. was observed. The post-treatment comparative occurrence of *Eimeria* sp. showed that the number of eggs of *Eimeria* sp. were significantly different ($t = 3.749$; $p = 0.054$) in Albendazole and Levamisole treated groups as the Albendazole mode of action was slow at day 7 and it progressively increase at day 15 while the Lemavisole mode of action was immediate. At day 7, the EPG of *Eimeria* sp. in Albendazole treated group was significantly higher than the Lemavisole treated group. At day 15, the EPG of *Eimeria* sp. in Albendazole treated group was significantly higher than the Levamisole treated group (Table II). The *Eimeria* sp. persisted even after the drug administration because it is coccidian while the Albendazole and Levamisole are anthelmintic drugs, therefore their EPG reduced to some extent but not eliminated completely.

Table III. Drug efficacy of Albendazole and Lavamisole against gastrointestinal parasites in *P. cristatus* at Jallo Wildlife Park Lahore.

Anthelmintic drugs	EPG	Day 7		Day 15	
		EPG	Efficacy (%)	EPG	Efficacy (%)
Albendazole	500	94.53	250	97.26	
Levamisole	250	97.26	150	98.36	
Control	975	----	979	---	

EPG, Egg per gram of feces.

The present study revealed that the both drugs

were effective in elimination of gastrointestinal parasites but Levamisole was more efficacious. The efficacy of Levamisole on day 7 and day 15 was greater than Albendazole on day 7 and day 15 (Table III). These results correlates with the study of Ashraf et al. (2002) who reported that the Levamisole efficacy was 88.65% on day 5 and 97.93% on day 10 was greater than Albendazole 83.15% on day 5 and 95.6% on day 10. However, our findings are different from that of Basit et al. (2014) who reported that the Albendazole was more effective against the helminths in peafowl having efficacy 94.92% as compared to Pyrantel pamoate (78.34%).

Conclusion

The peafowls at Jallo Wildlife Park were infected with gastrointestinal parasites but physically they were healthy and active. As the Jallo wildlife Park is a public recreation point, visitors presence distress the peafowl. They lived in close association with each other and could not fly because of limited cage space. The park had poor sanitary conditions and sand was used as bedding material in the cages, which was not cleaned properly and acted as a reservoir of parasites and facilitated the transfer of parasites from feces to the bird. However, the prevalence of gastrointestinal helminths was successfully controlled by Albendazole and Levamisole except *Eimeria* sp. which persisted even after the treatment. Although, its EPG reduced to some extent but it was not eliminated completely. The Levamisole was more effective anthelmintic against gastrointestinal parasites. The use of anti-coccidian drugs alone or in combination with other anthelmintic drugs are recommended.

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Conflict of interest statement

Authors have declared no potential conflict of interest.

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