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Research Article

A Study of Gastro–Intestinal Helminths in Native Peafowl and Comparative Efficacy of Albendazole and Pyrantel Pamoate against the Helminth Parasites

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ABSTRACT

The study was conducted to determine the infection rate of helminths in peafowls and to evaluate the comparative efficacy of two broad spectrum anthelmintics. For this purpose, fecal samples of 87 different breeds of peafowls were collected and tested for the presence of helminths. Fecal samples were examined by direct smear and centrifugal floatation methods for qualitative examination. For quantitative examination McMaster Egg Counting Technique was used. We found that 56.32% (49 out of 87) peafowls were positive for gastrointestinal helminths. Single or mixed infection of *Heterakis gallinae*, *Ascaridia galli*, *Davainea proglottina*, *Capillaria columbae and Acuaria spiralis* was present with their individual percentage was 36.73%, 26.53%, 6.12%, 18.37% and 12.24%, respectively. Out of these 49 birds 48 positive birds were divided in 3 groups A, B and C, each comprising of 16 birds. The uninfected and untreated birds were kept in group D. Chemotherapeutic trials were conducted to the birds of group A and B. While group C served as positive control and group D served as negative control for chemotherapeutic trials. Group A was treated with Albendazole 0.1ml/kg body weight and group B was treated with Pyrantel pamoate (0.1 mL /kg body weight). We found that Albendazole is more effective against gastrointestinal helminths having 94.92% efficacy as compare to Pyrantel pamoate which showed 78.34% efficacy on 10th day of drug treatment.

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INTRODUCTION

Peafowl (*Pavo Cristatus*) belong to the family Phasianidae. The genus has its origins in Asia and can be found in India, Java, Burma and the Malay Peninsula. The birds are typically very resilient. The most common disease that afflicts them is caused by internal parasites. Peafowl are beauty of nature and contribute a lot in eco–system and are commonest fancy birds throughout the world. The male peacock with its long train of ornate upper tail–coverts, resplendent colors, and spectacular courtship dance, is one of the world's most popular birds. In India the species has been protected by religious sentiment. Although parasitic infestation in birds is not acute in nature but are cause of continuous and sustained economic losses. The gastro–intestinal tract of peafowl harbors a wide variety of helminths, of which nematodes, trematodes and cestodes are the most deleterious parasites and are responsible for clinical and sub clinical parasitism. Nematode infections are sometime found in birds that are housed outdoor are invariably roundworms *AscarIdia galli* and *Capillaria sp.* infections (Darrel, 1996). The worms live in the intestine and they shed eggs in feces to re–infect the same bird or other birds by direct contact with the feces or by an intermediate host. When infected with these worms a bird can show a variety of signs from a poor health to diarrhea and ultimately to death. Endo–parasites in birds produce pathogenic conditions ranging from dilations of gut and nodule formation to severe enteritis. During heavy infections, these parasites adversely affect the health of birds with loss in body weight; lowering the host resistance against other infections, retarded growth, unthriftiness, damage to the gut epithelium, reduced egg production, emaciation and death especially in younger birds (McSorley and Maizels, 2010). The parasites also damage the health of host by consuming nutrients and vitamins, decreasing feed utilization by the host causing intestinal obstruction and producing toxins resulting in progressive loss of condition of the host birds. In a moderately infected flock, the overall production may drop by 25% (Urquhart et al., 1987). Like all gallinaceous birds, peafowl are susceptible to enteric parasites; notably the protozoa called *Histomonas meleagridis* that causes the disease popularly known as black head. This is passed from bird to

bird by an intestinal worm *Heterakis gallinae*, which live in the caeca (Harper, 1986). The worms that may be seen in cage birds are: Round worm (*Ascaridia galli*), Caecal worm (*Heterakis gallinae*) and gizzard worm (*Acuaria spp*). Modern anthelmintics generally have a wide margin of safety, considerable activity against immature (larval) and mature stages of helminths, and a broad spectrum of activity. Nonetheless, the usefulness of any anthelmintic is limited by the intrinsic efficacy of the drug itself, its mechanism of action, its pharmacokinetic properties, characteristics of the host animal (e.g., operation of the esophageal groove reflex), and characteristics of the parasite (e.g., its location in the body, its degree of hypobiosis, or whether it has developed anthelmintic resistance). The "ideal" anthelmintic should have a broad spectrum of activity against mature and immature parasites (including hypobiotic larvae), be easy to administer, have a wide margin of safety and be compatible with other compounds and be cost effective. A broad range of anthelmintics have been used against helminths such as albendazole and fenbendazole for their effectiveness in the treatment and prevention of histomoniasis (black head) in turkeys by Hegngi et al. (1999), levamisole against gastrointestinal nematodes in common peafowl (*Pavo cristatus*) by Ashraf et al. (2002) in different climatic areas. Good management practices and the chemotherapy are two major methods of suppressing parasitic infestation in birds, however, good management alone is not enough and the need of chemotherapy to get optimum growth gain and production in birds cannot be under rated.

The present study was designed to study the prevalence rate of helminths in peafowl, to evaluate the efficacy of various anthelmintics under local conditions and investigate the side effects of the anthelmintics. It is anticipated that findings of this work will provide the veterinarian and game bird owners an up to date knowledge on helminths infecting peafowl along with their medication to minimize the parasitic infection and with improving health and productivity planning effective control measures.

MATERIAL AND METHODS

The study was conducted on peafowl (n=87). The peafowl found positive for gastro–intestinal helminths and were not treated with any anthelmintic were selected in this study. The breeds which were included in the experiment were Blue peafowl, Pied peafowl and Black shoulder peafowl (Pavo cristatus), Java green peafowl, Emerald peafowl (Pavo muticus). All birds were of same age and were kept at the Lahore zoo Pakistan. They were provided with ad lib feed and water. The diurnal range of temperature during the study period was 14–30°C. Fecal samples of the birds were collected early in the morning at 7:00 AM. A total of 48 out of 49 birds found positive for helminths were randomly selected and divided into three groups: A, B and C. Each group consisted of 16 birds. Group C was untreated control while the peafowl that were found negative were kept in group D as negative control. The number of eggs per gram (EPG) found in different groups before the treatment starts were as follow (Table1). The prevalence of helminths and evaluation of the comparative efficacy of two anthelmintics, Albendazole (Methyl [5–(Propylthio)–IH–Benzimidazole–2–yl] carbonate), and Pyrantel Pamoate (1 Methyl–2–(2[2–thienyl]–1, 4, 5, 6–tetrahydropyrimidine, 4, 4–methylenebis (3–hydroxy–2–naphthoic acid) was evaluated at recommended dose rate under captive conditions. The laboratory work was carried out at the Department of Clinical Medicine & Surgery, University of Veterinary & Animal Sciences Lahore. All the cages of peafowl were tagged for the identification.

Table1: Examination of gastrointestinal helminths ova in common peafowl at Lahore zoo pre–medication

Groups	*EPG Pre–Medication*
A	630
B	748
C	564
D	0

Legends: EPG = Egg per gram

Fecal Examination

The fresh fecal samples were collected from 87 individual peafowl's cages and were properly tagged. Soon after sample collection, both qualitative and quantitative fecal examinations were performed for the detection of helminth's eggs. The qualitative examination was performed through direct smear method and centrifugal floatation method (Urquhart et al., 1996). McMaster Technique was employed for the quantitative examination. Two grams of fecal sample was used to determine the EPG of fecal sample.

Chemotherapeutic Trials

The groups A and B were treated with Albendazole and Pyrantel pamoate respectively at the doze rate of 0.1ml/kg body weight. The birds in group C were kept as untreated control. The group D was uninfected and remained untreated. The amount of drug required for each bird was calculated on body weight basis according to the manufacturers labeled recommended dose rate. Drugs were administered orally to each bird using crop needle. The pre–medicated fresh fecal samples were collected at day 0, while post medicated samples were collected at day 3, 7 and 10. McMaster egg counting technique was performed to counts the EPG of fecal sample. The drug efficacy was calculated according to the formula: Pretreatment EPG – Post treatment EPG / Pretreatment EPG] × 100 (Varady et al., 2004). The data obtained was analyzed calculating percentage positivity of helminthes parasites. The drug efficacy level was analyzed by using one way ANOVA.

RESULTS

The present study was performed to find out the prevalence and comparative chemotherapy of helminths. After finding out the gastro–intestinal helminths prevalence in different breeds of peafowl, the data was tabulated and analyzed. Chemotherapeutic efficacy of Albendazole (Methyl [5–(Propylthio)–IH–Benzimidazole–2–yl] carbonate) (*Selmore Pharma*) @ 0.1 ml/kg and Pyrantel pamoate (1 Methyl–2–(2[2–thienyl]–1, 4, 5, 6–tetrahydropyrimidine, 4, 4–methylenebis (3–hydroxy–2–naphthoic acid) (*Pfizer*) @ 0.1 ml/kg body weight orally against helminths was assessed. The prevalence percentage of gastro–intestinal helminths was 56.32%. The samples were found positive for *Heterakis gallinae* (18 birds; 36.73%), *Ascaridia galli* (13 birds; 26.53%), *Davenia proglottina* (03 birds; 6.12%), *Capillaria columbae* (09 birds; 18.37%) and *Acuria spiralis* (06 birds; 12.24%) (Table2).

Treatment

Comparative Anthalmintic Efficacy

The comparative efficacy of two drugs Albendazole and Pyrantel pamoate was determined in peafowl against gastro–intestinal helminths infection. Albendazole was provided to group A with the dose rate of 0.1ml/kg of body weight in drinking water. Pyrantel pamoate was provided to group B at the dose rate of 0.1ml per kg of body weight oral suspension for only one time during the experiment. Group C was left untreated. While group D consist of healthy birds. The drug efficacy was compared on the basis of reduction in EPG of feces count post–medication. The EPG count of gastro–intestinal helminths of group A and B after medication has been shown in table 3. The mortality rate of experimental birds was zero during the course of the study. Therefore no post mortem examination was conducted.

Table 2: Percentage prevalence of helminth species present in peafowl at Lahore zoo

Helminth spp.	*No. of positive birds (Infected)*	Prevalence rate of infection (%)
Heterakis gallinae	18	36.73%
Ascaridia galli	13	26.53%
Davenia proglottina	03	6.12%
Capillaria columbae	09	18.37%
Acuaria spiralis	06	12.24%
Total	49	56.32%

DISCUSSION

Parasitic infestation especially those of helminths is the cause of a potential health problem of animals including birds. These parasites invariably affect host production performance and resulted into great economic losses. The present study was aimed with the objectives to study the infection rate of helminths in peafowl and to evaluate the efficacy of various anthelmintics under local conditions. Different species of helminths were identified by examination of 87 fecal samples of peafowl, revealed the helminths infestation in 49 birds, with overall prevalence of 56.32% and relative prevalence of 36.73%, 26.53%, 6.12%, 18.37% and 12.24% of *Heterakis gallinae*, *Ascaridia galli*, *Davenia proglottina*, *Capillaria columbae* and *Acuaria spiralis* respectively. The overall prevalence of gastrointestinal helminths was 56.32% which was closely related with the result of Lierz et al. (2002), who investigates the prevalence of helminths in free range birds of prey and owls in Berlin State, Germany. He examined eighty four birds and found 58.3% prevalence of endoparasites. The results also correlate with Wojcik et al. (1999), who analyzed that parasitical invasions constitute a serious veterinary–economic problem in pheasant breeding, their results were 68%. Similar findings were reported by Patel et al., 2000; Varghese, 1987 and Pal and Ahmed, 1985. They calculated the percentage of prevalence of gastrointestinal helminths, which were 48%, 67.3% and 69% respectively. Whereas some other studies (Kurt and Acici. 2008); (Phiri et al., 2007); (Eshetu et al., 2001) and (Poulsen et al., 2000) reported higher incidence rate of (88%), (95.2%), (91.01%), (100%) respectively. The variation in infestation may be due to difference in management and climate conditions which was confirmed from the studies of Sascnyanga, (1982) who studied 49% *A. galli* infestation in birds kept under ordinary condition while 8% *A. galli* infestation in birds kept under good conditions. The prevalence of *Heterakis gallinae* infestation in the present study was 36.37%; the results were in agreement with Kurt and Acici, (2008) who analyzed the prevalence and intensity of helminths infection in chicken from northern Turkey who found 29% infestation. Some other studies from northern Jordan reported 33% prevalence of gastrointestinal helminths among chickens (Abdelqader et al., 2008). The prevalence of *Ascaridia galli* infestation in the present study was 26.53%; which was closely resembles with the findings of Phiri et al. (2007), who studied the prevalence and distribution of gastrointestinal helminths and their effect on weight gain, they found 28.8% *Ascaridia galli* prevalence. The prevalence of *Davenia proglottina* was observed 6.12% which is in agreement with the finding of Abdelqader et al. (2008), they found 1.4% prevalence.

Table3: Comparison of treatments on day 0, 3, 7 and 10

Groups	Treatment	Nematode Count ± S.E			
		Pre–Medication	Day '3' Post–Medication	Day '7' Post–Medication	Day '10' Post–Medication
A	Albendazole	630^{a}±19.86	348^{a} ±12.01	170^{a}±4.29	32^{a} ±2.18
B	Pyrantel pamoate	748^{a}±21.94	529^{b}±18.57	373^{b}±18.64	162^{b}±8.85
C	Untreated	564^{a}±16.22	586^{c}±14.93	625^{c}±15.83	672^{c}±16.04
D	Uninfected	0^{a} ± 0	0^{d} ± 0	0^{d} ± 0	0^{d} ± 0

The mean in the same column having different superscript are significantly different at $P < 0.05$.Where N = 16

The prevalence of *Capillaria columbae* in the present study was 18.37%, which was in agreement with Maurer et al. (2009) who analyzed a poultry litter as a source of gastrointestinal helminths infection, they found 13% prevalence. The prevalence of *Acuaria spiralis* was found to have 12.24%, which correlates with the result of Ehlers, (1985), who performed a survey to study the parasitic helminths of poultry in Thailand. Chemotherapy is considered as pre–requisite for effective control and protective programming of helminths. In present study the efficacy of albendazole (0.1 ml/kg) against helminth infection in group A of peafowl indicated that the efficacy was 44.76%, 73.01% and 94.92% at day 3, 7 and 10 of medication respectively. These findings were in close agreement with results of Tucker et al., (2007) who determined the anthalmintic efficacy of albendazole in treatment of chickens naturally infected with gastrointestinal helminths, they observed 98.2% efficacy. Results were also in close agreement with Ashraf et al. (2002), who observed the efficacy of Albendazole against gastrointestinal nematode; their percentage efficacy was 95.60%, 95.79% respectively. The efficacy does not correlate

with Villanua et al., (2007) who found the efficacy of Albendazole was equal to 38.8% in formed red legged partridges naturally infected with the nematodes. The effectiveness of Albendazole against *Ascaridia galli* was observed 100% by Jiang and Li, (1985). The results of current work might be due to genetic resistance of endoparasite to get 100% effectiveness of Albendazole, as Schou, (2003) observed the development of resistance in nematodes in cattle which correlates with suggestion that might be development of resistance of *Ascaridia galli* against Albendazole. Results of present study revealed that Pyrantel pamoate (0.1ml/kg b. w) eliminated 29.22%, 50.15%, 78.11% of helminths on day 03, 07, and 10 post–medications respectively. The present results were closely correlates with Verma et al. (1991), who reported that Pyrantel pamoate were tested for their anthelmintic efficacy against *Ascaridia galli* in poultry. Worm counts were decreased significantly in treated birds compared with untreated controls, showing 71% efficacy. The result of the present study was also in agreement with Cencek et al. (1992), who reported the efficacy of Pyrantel pamoate which was 88.4% respectively. The results do not correlate with the findings of Clark et al. (1992), and Ridley et al. (1991), who found Pyrantel pamoate (98.5%) and (99.3%) effective against hookworms and ascarids. The variation in results might be due to the difference in dose rates and species of animals. The resultant percentage efficacy on day 7 was obtained 50.13% against gastrointestinal helminths in peafowl. The efficacy not correlates with percentage efficacy as described by Grandemange et al. (2007), who analyzed the efficacy and the safety of a combination of oxantel/pyrantel/praziquantel in the treatment of naturally acquired gastrointestinal nematode and/or cestode infestations in dogs. On day seven there results show 91.1% efficacy. The difference might be due to the different drug combinations, species difference and variability in parasites. During the whole period of present study no side effects were seen of Albendazole & Pyrantel pamoate.

CONCLUSION

According to the results, Albendazole is comparatively more effective than Pyrantel pamoate.

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