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Helminth parasites in indigenous ducks: Seasonal dynamics and effects on production performance

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Abstract

Seasonal dynamics of helminth parasites affecting indigenous ducks and the effects of parasites on production performance under semi-scavenging conditions were studied. To study the seasonal dynamics ducks were collected from different areas of Mymensingh district and subjected to routine post-mortem examination for the collection of helminth parasites. A total of 300 ducks were examined of which 295 (98.33%) were positive for one/more species of helminth parasites. Thirty-one species of helminth parasites were identified, among them 16 species belonged to trematodes, 8 species belonged to cestodes, 5 species belonged to nematodes, and 2 species belonged to acanthocephala. Relatively higher prevalence was recorded in rainy season (100%) followed by summer (98.10%) and winter (97.99%). In case of trematodes and acanthocephala, the infection rate was the highest in rainy season (100% and 28.26%) followed by winter (89.93% and 7.38%) and summer (83.80% and 4.76% respectively). But in case of cestodes and nematodes first peak was observed in rainy season (67.39% and 47.83%) followed by summer (59.80% and 20.95%) and winter (42.95% and 17.45% respectively). The mean density of trematodes (21.93±2.05), cestodes (79.84±4.19), nematodes (6.82±1.13) and acanthocephala (52.08±2.59) was also the highest during rainy season. However, these variations were not statistically significant. On the other hand, this study revealed that the helminth parasitic infection greatly hampered the body weight gains and egg production. The mean body weight in the anthelmintic treated group was 1496.00±20.80 gm but in the untreated control group it was 1182.00±34.17 gm which was significant at 1% level. Besides, the onset of egg production was 32 days earlier in the treated group. The ducks of the treated group laid more eggs, 9.75 eggs /bird in contrast to 5.55 eggs/ bird in control group. The highest egg production was 55% in the treated group while in the untreated group it was 30%. The mean egg production per month in the treated group was 54.33±34.51 and in untreated group 37.00±31.19, which was significant at 5% level. Moreover, the birds of the treated group also laid relatively larger eggs. The mean weight of eggs of the treated group was 63.24±1.44 gm but that of untreated group was 55.60±1.50 gm.

Keywords: Helminth parasites, Indigenous ducks, Seasonal dynamics, Production performance

Introduction

Bangladesh has innumerable rivers, canals, tanks and other low-lying and depressed areas and paddy fields that remain under water for about 6 months in a year and this type of lands cover nearly 12 millions acres of land (BBS, 2001). For the above mentioned geo-ecological conditions and availability of foods, Bangladesh is more suitable for raising of ducks (Ahmed, 1986). In our country total duck population is about 13.47 millions (1993-1994), of which 6.58 millions are owned by small holder farmers (BBS, 2001) and about 98% ducks are reared in semi-scavenging system (Huque, 1991). But the duck rearing is hindered by various problems, among them parasitic diseases might be a major problem, because the mild winter and the long summer including the rainy season create a favourable environmental condition for the survival of various parasites. In fact, ducks are parasitised by various parasites in our country (Ahmed, 1969; Qadir, 1979 and Islam *et al.* 1988). But unfortunately very little attention has been paid to study the effects of parasites on the production performances of ducks in terms of weight gains, egg production and mortality. Besides, the seasonal variation of helminth parasitic infection has also not been studied thoroughly. From this point of view, the experiment was conducted to study the seasonal dynamics of helminth parasites in indigenous ducks and the effect of parasites on production performance under semi-scavenging condition.

Materials and Methods

Study of seasonal dynamics of helminth parasites occurring in ducks

For the study of seasonal dynamics a total of 300 ducks were purchased from local markets and farmers of different areas of Mymensingh district, from the period July, 2003-June, 2004. During the collection of ducks, information about their age, sex, breed, place of farming and production performance (e.g. egg production in case of female and body weight in case of male and female) etc. were carefully recorded. After collection, ante-mortem examinations were done. They were examined thoroughly to detect the body condition by close observation of keel bone, breast muscles, thigh muscles, condition of skin (thin/thick), presence or absence of dandruff etc. After ante-mortem examination, the ducks were slaughtered and allowed to bleed completely. Then post-mortem examinations were performed as described by Fowler (1990) to collect the parasites. Parasites were identified on the basis of the keys and description given by Yamaguti (1958) and Soulsby (1982) by preparing permanent slides (in case of trematodes, cestodes and acanthocephala) or temporary slides (in case of nematodes) according to the procedures described by Cable (1957). For the convenience of the study the year was divided into three seasons such as summer (March-June), rainy (July-October) and winter (November-February). The prevalence and density of different parasites in different seasons were compared.

Study of the effects of helminth parasites on the production performance of ducks

The effects of helminth parasites on the production performance of ducks were studied by the rearing of ducklings in semi-scavenging system.

Collection and rearing of ducks: Fifty indigenous ducklings of about 15 days of age were purchased from the local farmers. The ducklings were divided into two equal groups (Anthelmintic treated group and control group). Each of the groups was divided again into 5 replicates having 5 ducklings in each. Each replicates had 1male and 4 female ducklings. Sexing of ducklings was made according to the procedure described by Parkhurst and Mounteney (1988). Each of the ducklings was marked with wing tag. Two groups of ducklings were reared in two separate farmer's houses. The poultry sheds were properly cleaned, washed, dried and fumigated with formalin and potassium permanganate at the rate of 40 ml formalin and 20 gm potassium permanganate (2:1 ratio) for 1000 cu ft. (Mahanta, 1966) prior to placing the ducklings. Feeders and waterers (large plastic garbage bowl) were purchased and thoroughly cleaned with Iosan® before using. Ducklings were fed with boiled crushed rice mixed with ground turmeric for first 15 days. In this period, they were supplemented with earthworms as a source of protein and then with flesh of snails and oysters. Thereafter, rice bran was added with the feed stuff. This feed stuff was continued up to the termination of the experiment. In all stages, they were allowed to scavenge freely to collect their feeds from nature.

Anthelmintic treatment: Before giving treatment, some faecal samples from each group (ten from each house) were collected by random selection, brought to the laboratory by adding few drops of formalin and examined by simple sedimentation technique. At the age of about

28 days ducklings of the treated group were administered with albendazole @ 100 mg / kg body weight (Shuyu, 1982) and the treatment was repeated one month later. In addition, at the age of about 120 days, the ducklings of treated group also received mebendazole @ 10mg/kg for 3 consecutive days (Enigk *et al.,* 1973). The control group was not given any anthelmintic treatment. Both the groups were given almost same type of nutritional supplement and other management practices were same.

Collection and recording of data: The body weight of each duck (both male and female) of both the groups were taken near the end of research period. After 240 days, ten ducks from each group were selected randomly for post-mortem examination to detect the body condition and parasitic infection. In positive cases, the parasites were collected and identified. The rest of the ducks of both groups were autopsied within 1 week for same purposes. Eggs laid by both groups were observed carefully to detect any deformity. By random selection 16 eggs were collected from each group and brought to the laboratory. In the laboratory, weight of each eggs was taken by digital balance (Scaltec Digital Balance) and recorded. The data were analysed by SPSS package program using t-test.

Results and Discussion

Thirty-one species of helminth parasites were identified, among them 16 species belonged to trematodes, 8 species belonged to cestodes, 5 species belonged to nematodes, and 2 species belonged to acanthocephala (Table 1).

Table 1. Name of recovered parasites with their location in the host

Family	Name of parasites	Location in the host
Echinostomatidae (Poche, 1926)	*Echinostoma revolutum* (Froelich, 1802) Looss, 1899,	Small and large intestines
	E. paraulum, Dietz, 1909	Large intestine
	E. robustum, Yamaguti, 1935	Small intestine
	Echinochasmas beleocephalus (Linstow, 1873) Dietz, 1909	Small intestine and caeca
	Echinoparyphium recurvatum, Linstow, 1873	Small intestine
	Hypodaerium conoideum (Bloch, 1782) Dietz, 1909,	Small intestine
Psilostomatidae Odhner, 1913	*Psilochasmas oxyurus* (Creplin, 1825) Luhe, 1909,	Small intestine and caeca
Notocotylidae, Luhe, 1909	*Notocotylus attenuatus* (Rus, 1809) Szidat, 1933,	Caeca and rectum
	Catatropis verrucosa (Froel, 1789) Odhner, 1905	Caeca
Cyclocoelidae, Kossack, 1911	*Tracheophilus cymbius*,(Dies, 1850), Kossack, 1911,	Nasal passage, trachea and bronchi
Schistosomatidae, Looss, 1907	*Trichobilharzia* sp. Skrjabin and Zakharov, 1920,	Portal vein
	Ornithobilharzia odhneri, Foust, 1924	Portal vein
Opisthorchiidae, Braun, 1901	*Amphimerus anatis*, Yamaguti, 1933	Liver and gallbladder
	A. lancea, (Dies, 1850) Weski, 1900	Liver and gallbladder
	A. coudalitestis, Caballero, Grocott et Zerecero, 1953	Liver and gallbladder
	Metorchis orientalis, Tanabe, 1919,	Liver
Hymenolepidae, Railliet, 1897	*Hymenolepis coronula* (Duj, 1845), Railliet, 1892	Small intestine
	H. lanceolata, (Bloch, 1782), Railliet, 1892,	Small intestine
	Schillerius longiovum, Schiller, 1935	Small intestine
	Fimbriaria fasciolaris, Pallas, 1781	Small intestine
	Fimbriarioides intermedia, Fuhrm, 1913	Small intestine
	Lobatolepis lobulata, Mayhew, 1925,	Small intestine
	Abortolepis abortiva (Linst., 1904) Luhe, 1910	Small intestine
	Hispaniolepidoides villosoides, Solowiow, 1911	Small intestine

Table 1. Continued

Acuaridae, Seurat, 1913	*Echinuria uncinata*, Rudolphi, 1819	Gizzard
Trichuridae, Railliet, 1915	*Capillaria anatis*, Schrank, 1790	Caeca
	C. annulata, Malin, 1958	Crop and esophagus
	C. contorta, Creplin, 1839	Crop and esophagus
Amidostomidae bayliss and Daubney, 1926	*Amidostomum anseris*, Zeder, 1800,	Gizzard
Filicollidae, Petrotschenko, 1956	*Filicollis anatis* (Shrank, 1788), Petrotschenko, 1956	Small and large intestine
Polymorphidae, Meyer, 1931	*Arythmorhynchus anser*, Flurescu, 1941	Gizzard

Seasonal dynamics of helminth parasites recorded in ducks: The present study revealed that seasonal dynamics of helminth parasites in ducks were almost similar throughout the year (Table 2). A relatively higher infection rate with helminth parasites was observed in rainy season (100%) followed by summer (98.10%) and winter (97.99%). However, seasonal variations in the infections with helminth parasites were observed by Kharchenko (1960), Birova *et al.* (1990) Panda *et al.* (1996), and McJunkin *et al.* (2003). This contrast in between the present and earlier findings can be explained by the differences in the geographical location of the experimental area, topography and composition of soil types, ecology and availability of intermediate hosts and meteorological conditions.

Effects of helminth parasites on production performance in ducks

During the present study, it was observed that helminth infection had adverse effects on both weight gain and egg production of indigenous ducks reared under semi-scavenging system. In the duck of untreated control group twenty species of helminth parasites were identified, among them 11 species belonged to trematodes, namely, *Echinostoma revolutum, E. paraulum, E. robustum, Echinoparyphium recurvatum, Hypodaerium conoideum, Psilochasmas oxyurus, Notocotylus attenuatus, Catatropis verrucosa, Tracheophilus cymbius, Amphimerus anatis,* and *Metorchis orientalis*; 4 species belonged to cestodes, namely, *Hymenolepis coronula, H. lanceolata, Schillerius longiovum and Fimbriaria fasciolaris*; 5 species belonged to nematodes, namely, *Echinuria uncinata, Capillaria anatis, C. annulata, C. contorta* and *Amidostomum anseris.* In treated group only *A. anatis* was found in 3 ducks.

Effects on weight gains: We observed that the ducks of the treated group gained more body weight (1496.00±20.80gm) compared to untreated group (1182.00±34.17gm) which was significant at 1% level (Table 3). In treated group weight gain was 26.57% higher. Earlier scientists also observed the deleterious effects of helminth parasites in ducks on the weight gain. Ould and Welch (1980) recorded retarded growth in ducks experimentally infected with *E. uncinata*. Enigk and Dey-Hazra (1968) reported weight loss due to *A. anseris* infection in ducks. Soulsby (1965) reported wasting in ducks due to *Hymenolepis lanceolata*, *H. compressa*, *H. collaris* and *H. megalops* infection. Ruff and Norton (1997) reported gradual weight loss in pigeon due to parasitic infection. *Ascaridia galli* infection caused decreased weight gain in chicken (Permin and Hansen, 1998). Bhowmik and Sinha, (1982) recorded decreased weight gain in poultry due to *Raillietina cesticillus* infection. Permin and Hansen (1998) observed weight loss due to *R. tetragona*. Levine (1938) reported up to 12% weight loss in poultry by control experiment with *Daveinia proglottina*. The differences in the net weight gains among the present and pervious studies might be due to the species variation, management factors, like nutritional condition, age and variation in parasitic burden, etc. The helminth parasites suck nutrients and hampered digestion resulting diarrhoea. Thus they caused malnutrition (Vercruysse *et al.*, 1988 and Soulsby, 1982). Therefore, they were associated with stunted growth/poor growth rate in young individuals and actual loss of weight in older birds. Besides, in infected birds the percentage of water is higher and the deposition of fat, protein, skeletal calcium and phosphorus is lower than those in parasite free-controls (Vercruysse *et al.*, 1988; Khan and Iqbal, 1994). So, the live weight and carcass weight in parasite infected birds were much lower. Moreover, helminth parasites had been reported to cause functional loss of crop and esophagus. The parasites also caused necrosis and haemorrhages in duck-gizzard (Ruff and Norton, 1997), catarrhal and hemorrhagic enteritis (Mondal and Baki, 1989), swelling of caeca (Lee *et al.*, 1976), and thus they were reported to be associated with interruption of feed consumption, digestion and utilisation. All the above mentioned causes also might have role in the loss of weight in infected individuals.

Effects on egg production: In the ducks of the treated group, onset of egg production was 32 days earlier than that of the control group. Similar result was also found by Sazikova (1975) who reported that egg laying was delayed in White Leghorn hens infected with *A. galli.* The ducks in the of treated group laid more eggs, 9.75 eggs/ bird in contrast to 5.55 egg/bird in untreated group. In treated group, the highest egg production was 55% while in untreated group it was 30%. The mean egg production per month in the treated group was 54.33±34.51 and in untreated group 37.00±31.19. Similar findings were also recorded by Matta, (1981) and he found that egg production of infected birds was 36.5% compared to 50.2% from uninfected control birds. Bhowmik and Sinha (1982) reported 39.3% egg production in infected group and 51.6% in uninfected control. Kang and Suh (1987) gave single dose of treatment with fenbendazole and found that mean weekly egg production increased from 246.25 to 259.35 after treatment in hens. Glukhov and Malakhov (1986) reported that treatment with morantel at the recommended dose increased egg production in chickens (average 0.3 more eggs/ month/birds). Sazikova (1975) also observed that parasitic infection hampered egg production in poultry. Although the real mechanism is not known how the helminth parasites delay and reduce egg production but it can be assumed that they suck nutrients, hamper feed consumption and digestion and the birds suffer from malnutrition. Due to malnutrition the function of hypothelamo-hypophyseal axis is interrupted and thus the ovarian development is delayed (Ferrel, 1991 and Robinson, 1996) resulting in delayed egg production. On the other hand, malnourished weak birds lay eggs irregularly resulting in decreased egg production. In this experiment, observation was also conducted about size of eggs. In the treated group, eggs were relatively larger (mean wt. 63.24±1.44 gm) compared to that of untreated group (55.60±1.50 gm) which was statistically significant ($p<0.01$). Sazikova (1975) conducted experiment about the size of egg and he recorded that smaller eggs were produced by infected White Leghorn hens (49.9 gm instead of 54.3 gm). This might be due to the deposition of decreased amount of yolk protein and lipid and also due to the decreased amount of albumin produced by infected malnourished birds (Sturkie, 1954).

The present study revealed that indigenous ducks of Bangladesh are vulnerable to helminth parasitic infection throughout the year and they have adverse effects on the production performance of the ducks. So mass anthelmintic treatment of ducks is essential for the control of helminth parasites to enhance the productivity of the indigenous ducks.

Table 2. Prevalence and mean density of helminth parasites in ducks among rainy, winter and summer seasons

Phylum/ class	Rainy season			Winter season			Summer season		
	No. of infected ducks (n=46)	Percentage of infected ducks (%)	Parasitic load (Mean±SD)	No. of infected ducks (n=149)	Percentage of infected ducks (%)	Parasitic load (Mean±SD)	No. of infected ducks (n=105)	Percentage of infected ducks (%)	Parasitic load (Mean±SD)
Trematoda	46	100	21.93±2.05	134	89.93	18.04±2.14	88	83.80	19.94±1.97
Cestoda	31	67.39	79.84±4.19	64	42.95	61.90±3.07	62	59.04	76.03±4.61
Nematoda	22	47.83	6.82±1.13	26	17.45	4.58±1.31	22	20.95	5.09±1.95
Acanthocephala	13	28.26	52.08±2.59	11	7.38	49.09±1.91	05	4.76	41.80±2.01
Over all helminth infection	46	100	-	146	97.99	-	103	98.10	-

Table 3. Weight gain in ducks after anthelmintic treatments

Replicates	Weight gain in gm(Mean±SD)		Level of significance
	Treated	control	
A	1480.00±49.62	1110.00±87.18	*
B	1510.00±52.80	1238.00±61.95	*
C	1525.00±48.73	1190.00±74.41	**
D	1480.00±44.30	1170.00±84.56	*
E	1485.00±54.54	1210.00±93.74	*
Over all	**1496.00±20.80**	**1182.00±34.17**	**

Legend-

** = $p<0.01$

* = $p<0.05$

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