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Gastrointestinal parasites in backyard poultry of subtropical hilly region of Meghalaya

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Abstract
The aim of the present study was to determine the prevalence, species diversity and intensity of gastrointestinal (G.I.) parasitic infections in the backyard poultry of Meghalaya. A total of 1775 numbers of fecal samples were collected from different age groups *viz.* < 8 weeks (523 nos.), 8-28 weeks (602 nos.) and > 28 weeks (650 nos.) and examined by flotation, sedimentation and modified McMaster techniques. Overall prevalence of G.I. parasitic infections was 37.97%. Eight species *viz. Eimeria* sp. (30.12%), *Heterakis gallinarum* (14.09%), *Ascaridia galli* (21.22%), *Strongyloides avium* (12.46%), *Capillaria* sp. (7.57%), *Raillietina* sp. (8.61%), *Syngamus trachea* (3.56%) and *Choanotaenia infundibulum* (2.37%) were recorded. Highest and lowest infections were recorded in October (52.88%) and February (26.34%), respectively. Season wise highest infection recorded during monsoon (44.71%) followed by autumn (44.34%), winter (27.22%) and spring (36.62%). *Eimeria* sp. was recorded highest in monsoon (33.87%), winter (27.78%) and spring (12%) seasons while *A. galli* (31.63%) in autumn season. Age wise variations in infections were observed in < 8 (25.24%), 8-28 (48.17%) and > 28 (38.77%) weeks old birds. *Eimeria* sp. was observed highest in both < 8 (68.18%) and 8-28 (25.86%) weeks. *A. galli* (27.38%) was recorded highest in > 28 weeks old birds.

Keywords: Backyard poultry, gastrointestinal, parasites, Meghalaya

Introduction
Animal husbandry is an important subsector of Indian agriculture and backyard poultry farming is one of the important components of animal husbandry among the tribal farmers of Meghalaya. Backyard poultry farming is increasing rapidly due to low establishment cost, cheap source of proteins and employment [1, 2]. As per the 20th Livestock census, the total poultry population of India is 851.81 million, increased by 16.8% from the previous census. Total backyard and commercial poultry in the country is 317.07 million and 534.74 million, respectively [3]. Parasitism is an association in which the parasite is metabolically dependent to a greater or lesser extent to the host. Poultry birds gets infection by ingestion of contaminated feed, water, litter, intermediate host etc [4]. Gastrointestinal (G.I.) parasites are most prevalent and devastating parasites affecting its productivity [5]. Severe infections with G.I. parasites may decrease production performance as well as cause high morbidity and mortality [6, 7]. Bhowmik *et al*. [8] observed that in growing chicks parasitism causes 17% reduction in weight gain, high morbidity and mortality while in egg laying hens it causes 12.5% reduction in egg production. They are also associated with catarrh, diarrhea, intestinal obstruction, loss of appetite, anemia, weakness, paralysis and poor feathering in birds [9, 10]. The climatic condition of the North Eastern region is highly congenial for the development and propagation of different parasites. Though there are reports on the prevalence of G.I. parasitic infections in the poultry from different states of India like Chhattisgarh [11], Assam [12], Uttar Pradesh and Uttarakhand [13], Maharashtra [14], Madhya Pradesh [15], Jammu [16], Karnataka [17] but no information is available from Meghalaya. Thus, the present study has been undertaken to explore the prevalence of G.I. parasites in the backyard poultry of hilly region of Meghalaya.

Materials and Methods
Study area
The present study was conducted in the Ri Bhoi district of Meghalaya which lies between 25°15´ and 26°15´ North latitudes and 91°45´ and 92°15´ East longitudes. The district is characterized by rugged and irregular land surface and includes a series of hill ranges. (https://en.wikipedia.org/wiki/Ri-Bhoi_district).

Study period

The study was conducted for two years (2018, 2019) and divided into four seasons, *viz.* Spring (March, April), Monsoon (May, June, July, August, September), Autumn (October, November) and Winter (December, January, February).

Sample collection

Freshly voided fecal samples were collected from the poultry shed of different locations i.e. Umiam, Umsawkhwan, Mawphrew, Nalapara, Borkhatsari, Sarikuchi, Umthan and Lalumpam in marked plastic pouch/vials. All the birds were categorized according to age *viz.* < 8 weeks, 8-28 weeks and >28 weeks. A total of 1775 numbers of fecal samples of poultry were collected from different age groups i.e. < 8 weeks (523nos.), 8-28 weeks (602nos.) and >28 weeks (650nos.).

Parasitological techniques

To detect G.I. parasitic infections in the backyard poultry of hilly region of Meghalaya, faecal samples were examined by direct flotation technique using saturated salt (sp.gr. 1.20) and sucrose (sp.gr. 1.27) solution [4]. Positive samples were then quantified to estimate the egg per gram (EPG) of faeces by using modified McMaster technique [18]. Samples not being examined on the same day were preserved at refrigerated temperature (4°C) for next day examination.

Results and Discussion

Prevalence of G.I. parasitic infections in backyard poultry of Meghalaya

The overall prevalence of G.I. parasitic infections in the backyard poultry of hilly region of Meghalaya was 37.97% (Table 1). Eight species of G.I. parasites were recorded *viz. Eimeria* sp. (30.12%), *Heterakis gallinarum* (14.09%), *Ascaridia galli* (21.22%), *Capillaria* sp. (7.57%), *Syngamus trachea* (3.56%), *Raillietina* sp. (8.61%), *Choanotaenia infundibulum* (2.37%) and *Strongyloides avium* (12.46%) (Fig.1). In congruence to the present findings, Kumari *et al.* [11], Hembram *et al.* [19], Katoch *et al.* [16] and Naphade and Chaudhari [14] reported 25%, 58.75%, 72% and 84.05% parasitic infections from Chattishgarh, Odisha, Jammu and Madhya Pradesh, respectively. Similarly, Nguyen *et al.* [20], Wamboi *et al.* [21], Islam *et al.* [22] and Berhe *et al.* [23] reported 54.2%, 86.6%, 19.4% and 90.97% infections from Vietnam, Kenya, Bangladesh and Ethiopia, respectively. Variation in the percent prevalence from the current study may be due to difference in the geographical location, environmental condition and management practices adopted by the farmers.

Table 1: Season wise prevalence of G.I. parasites in backyard poultry of Meghalaya

Season	Sample examined	Sample positive	*Eimeria* sp.	*H. gallinarum*	*A. galli*	*Capillaria* sp.	*S. trachea*	*Raillietina* sp.	*Choanotaenia* sp.	*S. avium*
Winter	529	144 (27.22)	40 (27.78)	25 (17.36)	31 (21.53)	12 (8.33)	3 (2.08)	13 (9.03)	-	20 (13.89)
Spring	325	119 (36.62)	39 (12)	20 (6.15)	18 (5.54)	12 (3.69)	5 (1.54)	7 (2.15)	5 (1.54)	13 (4)
Monsoon	700	313 (44.71)	106 (33.87)	33 (10.54)	63 (20.13)	24 (7.67)	9 (2.88)	27 (8.63)	6 (1.92)	45 (14.38)
Autumn	221	98 (44.34)	18 (18.37)	17 (17.35)	31 (31.63)	3 (3.06)	7 (7.14)	11 (11.22)	5 (5.10)	6 (6.12)
Total	1775	674 (37.97)	203 (30.12)	95 (14.09)	143 (21.22)	51 (7.57)	24 (3.56)	58 (8.61)	16 (2.37)	84 (12.46)

Figures in parentheses indicates percent positivity

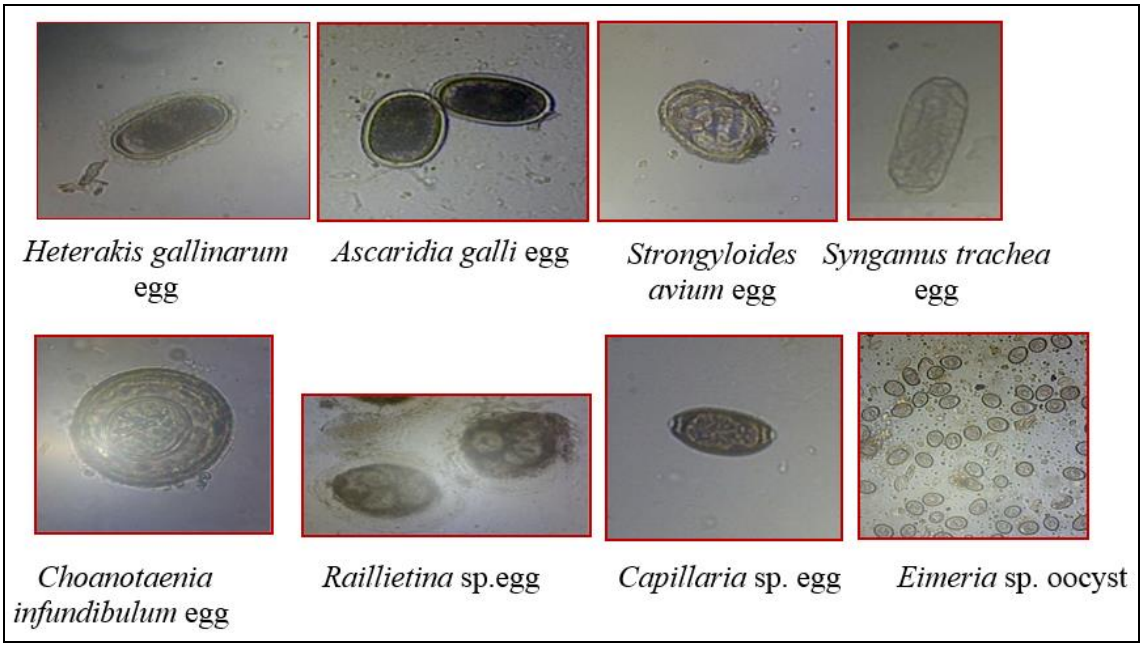

Fig 1: Eggs/oocyst of G.I. parasites in backyard poultry of Meghalaya

In the present study, monthwise highest and lowest infections were recorded in the month of September (49.52%) and February (26.34%), respectively. The intensity of infection i.e. egg per gram (EPG) of faeces ranges from 50-550. Maximum and minimum mean intensity (EPG) of infection was recorded in the month of July (285.43) and February (149.35), respectively (Fig. 2).

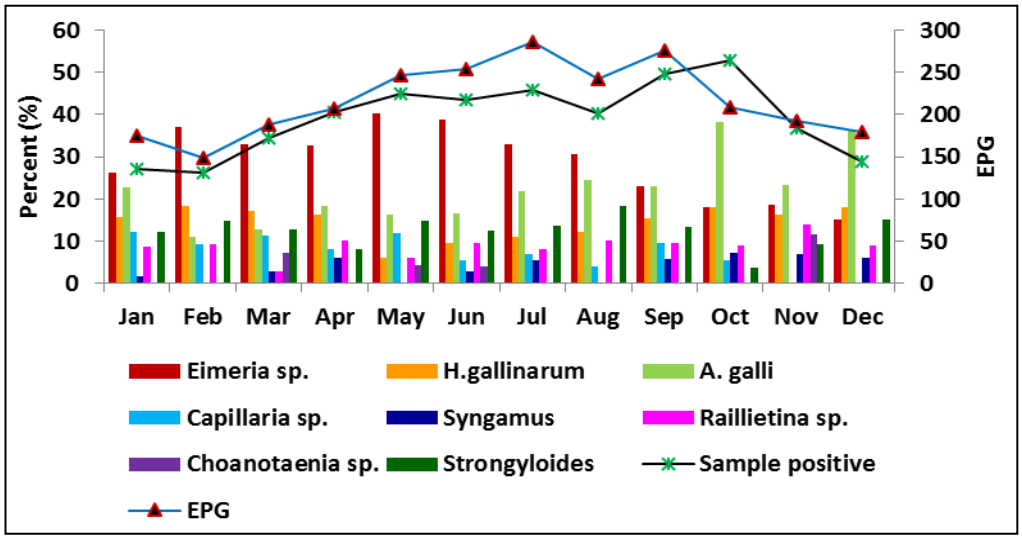

Fig 2: Month wise prevalence of G.I. parasites in backyard poultry of Meghalaya

Season wise infection was recorded highest during monsoon (44.71%) followed by autumn (44.34%), winter (27.22%) and spring (36.62%) seasons (Table 1). In agreement with the present findings, earlier Islam *et al.* [22], Sreedevi *et al.* [24], Hembram *et al.* [19] and Salam *et al.* [25] from Bangladesh, Andhra Pradesh, Odisha and Kashmir reported 26.5%, 43.41%, 68.88% and 33.62% infections during rainy/monsoon seasons, respectively. Environment, management practices, level of bio-security, availability of intermediate hosts and reservoirs are also key factors for the high prevalence of parasitic infections in poultry [26, 27]. Taylor *et al.* [28] observed that optimum temperature and relative humidity for development and hatching of eggs or oocyst are 26-29°C and >80%, respectively. The development is decreased below 10°C and low relative humidity. This shows that monsoon season is very conducive for the development and propagation of parasites in the backyard poultry of Meghalaya.

During monsoon season, *Eimeria* sp. (33.87%) was recorded highest followed by *A. galli* (20.13%), *S. avium* (14.38%), *H. gallinarum* (10.54%), *Raillietina* sp. (8.63%), *Capillaria* sp. (7.67%), *S. trachea* (2.88%) and *C. infundibulum* (1.92%) (Table 1). However, in autumn season *A. galli* (31.63%) was recorded highest followed by *Eimeria* sp. (18.37%), *H. gallinarum* (17.35%), *Raillietina* sp. (11.22%), *S. trachea* (7.14%), *S. avium* (6.12%), *C. infundibulum* (5.10%) and *Capillaria* sp. (3.06%). In spring season, *Eimeria* sp. (12%) was recorded highest followed by *H. gallinarum* (6.15%), *A. galli* (5.54%), *S. avium* (4%), *Capillaria* sp. (3.69%), *Raillietina* sp. (2.15%), *S. trachea* (1.54%) and *C. infundibulum* (1.54%). In winter season also *Eimeria* sp. (27.78%) was recorded highest followed by *A. galli* (21.53%), *H. gallinarum* (17.36%), *S. avium* (13.89%), *Raillietina* sp. (9.03%), *Capillaria* sp. (8.33%) and *S. trachea* (2.08%). Different species of G.I. parasites are prevalent throughout the year in hilly region of Meghalaya which may be due to sufficient moisture in the litter, humidity and ambient temperature for growth and development of parasitic egg/ova throughout the year.

Age wise prevalence of G.I. parasitic infections in backyard poultry of Meghalaya

Age wise G.I. parasitic infections was recorded in all age groups of poultry *viz.* < 8 weeks (25.24%), 8-28 weeks (48.17%) and > 28 weeks (38.77%) (Table 2). The prevalence of *Eimeria* sp. was recorded highest in the birds of < 8 weeks (68.18%) followed by 8-28 weeks (25.86%) and > 28 weeks (15.08%). In birds of < 8 weeks age, *Eimeria* sp. (68.18%), *H. gallinarum* (18.18%) and *Capillaria* sp. (13.64%) were only observed. While in the birds of 8-28 weeks age, all the eight species of G.I. parasites were observed *viz. Eimeria* sp. (25.86%), *A. galli* (25.52%), *H. gallinarum* (14.13%), *Capillaria* sp. (6.89%), *Raillietina* sp. (6.89%), *S. trachea* (3.45%), *C. infundibulum* (3.45%) and *S. avium* (13.79%). However in the birds of > 28 weeks age, the percentage of infection is lower in comparison to 8-28 weeks old birds i.e. *A. galli* (27.38%), *S. avium* (17.46%), *Eimeria* sp. (15.08%), *Raillietina* sp. (15.08%), *H. gallinarum* (11.90%), *S. trachea* (5.56%), *Capillaria* sp. (5.16%) and *C. infundibulum* (2.38%). Age wise variation in the prevalence of G.I. parasitic infection in poultry was also reported by Islam *et al.* [22]; Wokem and Obiyor [29]; Sheikh *et al.* [30] and Hembram *et al.* [19]. High rate of infection in young birds may be due to decreased immunity as well as continuous exposure to infections from the contaminated litter. In the present study, *Eimeria* sp. was recorded in all age groups and highest in birds of < 8 weeks (68.18%) which is responsible for causing coccidiosis. It is characterized by dysentery, bloody diarrhoea, enteritis, poor growth, drooping wings, emaciation and decreased production [31]. According to Bera *et al.* [32] approximately US$ 20 million/annum coccidiosis associated economic losses were recorded in India. Sharma *et al.* [33] and Debbou-Iouknane *et al.* [34] from Jammu and Algeria reported 58.86% and 54.28% *Eimeria* sp. infection in young poultry birds, respectively. However, Badran and Lukesouna [35] reported *Eimeria* sp. infection in all ages. In the present study, *A. galli* infection was recorded highest in > 28 weeks (27.38%) birds in comparison to 8-28 weeks (25.52%) old birds, which may be due to frequent contact with the intermediate host and external environment. Earlier Rashid *et al.* [36], Fatima *et al.* [37] and Zada *et al.* [38] also observed *A. galli* infection more in adults, than young birds which corroborates with the present findings.

The present study has significance because eight species of G.I. parasites were recorded for the first time in the different age groups of backyard poultry in the hilly region of Meghalaya. Usually birds pick up infection from contaminated litter having parasitic eggs/ova or intermediate host [39] and heavy infection in birds will decrease egg production, weight gain and haemoglobin depression [40].

Table 2: Age wise prevalence of G.I. parasites in backyard poultry of Meghalaya

Age (weeks)	Sample examined	Sample positive	*Eimeria* sp.	*H. gallinarum*	*A. galli*	*Capillaria* sp.	*S. trachea*	*Raillietina* sp.	*Choanotaenia* sp.	*S. avium*
< 8	523	132 (25.24)	90 (68.18)	24 (18.18)	-	18 (13.64)	-	-	-	-
8-28	602	290 (48.17)	75 (25.86)	41 (14.13)	74 (25.52)	20 (6.89)	10 (3.45)	20 (6.89)	10 (3.45)	40 (13.79)
> 28	650	252 (38.77)	38 (15.08)	30 (11.90)	69 (27.38)	13 (5.16)	14 (5.56)	38 (15.08)	6 (2.38)	44 (17.46)
Total	1775	674 (37.97)	203 (30.12)	95 (14.09)	143 (21.22)	51 (7.57)	24 (3.56)	58 (8.61)	16 (2.37)	84 (12.46)

Figures in parentheses indicates percent positivity

Conclusion

The present study revealed that different species of G.I. parasites are prevalent throughout the year in backyard poultry of Meghalaya. Highest infection observed during rainy season and young age groups are more susceptible. Regular screening and deworming of bird is necessary for profitable backyard poultry farming.

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