

Prevalence Of Avian Coccidiosis In The Upper Kuttanad, Kerala

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Abstract- The *Coccidia* are the cause of coccidiosis. The *Coccidia* of birds is divided into two separate genera, *Isospora* and *Eimeria*. The present study was conducted for a period of one year from June 2014 to May 2015 from Upper Kuttanad, Kerala to determine the prevalence of coccidia. A total of 485 pooled faecal samples were investigated with floatation method and a prevalence rate as found to be 13.19 %. Three species of *Isospora* and three species of *Eimeria* were recorded from the study area namely *Isospora pycnonotae*, *Isospora benghalensis*, *Isospora corviae*, *Eimeria vagabundae* and *Eimeria colombae* and *Eimeria tropicalis*. Investigation gives an idea that the eight affected species, seven of which are coming under the order Passeriformes.

Keywords- Coccidia, *Isospora*, *Eimeria*, oocysts, Sporocysts

I. INTRODUCTION

In natural animal populations, parasites are considered as the important group of predators (Hudson, 1997). Parasites comprise a great selection pressure on the host, simply because of their abundance and diversity (Price, 1980). The great majority of bird endoparasites are protozoa. The most successful genus of intestinal coccidia in passerine birds is *Isospora*, it represents about 90-95 % of known intestinal coccidia fauna of passerine birds (Pellerdy, 1974) and in some bird populations, 50% to over 90% of individuals are infected with *Isospora* spp. (Scholtyssek & Przygodda 1956, Grulet *et al.* 1985, Dolnik 1998). Isosporiasis is a disease of passerine birds, canaries, finches, sparrows, and species of the Sturnidae family (starlings, mynahs) are most often affected and rare cases of infection have been observed in raptors (Arnaud J. Van Wettere, 2017). On contrary, the genus *Eimeria* (Eimeriidae) is very well studied, because of the high economic importance. Domestic animals, especially poultry, cattle sheep, and goats are more susceptible to coccidiosis (Datus M.H and Peter LL, 1973). These parasites belonging to the phylum Apicomplexa (Levine, 1982) characterized by the presence of an assemblage of organelles (polar rings, conoid, rhoptries, microneme system etc.) within the anterior end. This apical complex facilitates the penetrative entry of the parasites (in sporozoite and merozoite stage) into the host cell. The coccidia have a high a degree of specificity than any other group of infectious agents. Not only are they

naturally limited to a narrow range of host species ,but they have an affinity for certain organ systems portions of the system, specific type of cells and ultimately, even specific locations within the cells which they inhabit (Datus M.H and Peter LL, 1973).

The Apicomplexa includes in the Coccidia (Suborder-Eimeriornia), the malarial parasites (Suborder-Haemosporina) the prioplasma, the heteroxenous haemogregarines and the gregarines together forming more than 4000 species belonging to over 300 named genera (Levine, 1988; Barta, 2001). The Coccidia of medical and veterinary importance belonging to three of the more than nine families of true coccidia of the Suborder Eimeriornia .Most of the species of coccidia with in the family Eimeriidae are intestinal parasites of the homoxenous genera *Eimeria* and *Isospora*. They are transmitted by environmentally resistant oocytes voided in the faeces of infected hosts. Species of *Eimeria* cause a heavy economic loss in livestock especially, in bovine, ovine and caprine hosts.

Coccidia usually invades the intestinal tract, but some invade other organs, such as the liver and kidney. In most cases, the bird that infected with coccidia will develop immunity from disease and it will recover unless it is reinfected. The occurrence of the disease depends, in part, upon the number of host cells that are destroyed by the juvenile form of the parasite, and this is moderated by many factors. Severely infected birds may die very quickly. Often, tissue damage to the bird's intestine results in interrupted feeding, nutrient absorption, dehydration, anaemia and increased susceptibility to other disease agents.

A possible manner of infection is the direct transmission between individuals, e.g., during the nesting period when oocyst could be transmitted to nestlings with food contaminated by faeces of infected parents. Przygodda and Scholtyssek (1961) found that the prevalence of infection with *isospora* spp. Is higher in older nestlings of passerine birds; however, they did not examine parent birds. The aim of this study was to ascertain which genera or species of monoxenous coccidia occur in birds from Upper Kuttanad and their level of infection.

II. MATERIALS AND METHODS

Fresh faecal samples of birds were collected from different locations of Upper Kuttanad using a clinical spatula; faecal samples were collected in a specimen bottle. Powdered the sample carefully and about 20 gms of samples were taken in petri dishes and treated with 2.5 % Potassium dichromate solution for three days at room temperature. The Petri dish was closed bearing a little space for aeration and kept for sporulation of oocyst. The samples were stirred as often as possible to permit maximum aeration. Portions of the samples were examined under a microscope at 3, 5, 9, 18, 24, 26, 30, 48, 72, and 98 hours to ascertain sporulation time as well as stages of exogenous development.

For the microscopic examination of the oocyte, they were floated and concentrated using the centrifugal floating technique Faust et al (1939) in supersaturated salt (NaCl) solution. The length, width and diameter of sporulated oocyst were measured in micrometre (μ) under oil immersion objective and their morphological characteristics recorded. The number of layers, oocyst wall, the thickness of the wall and the structure of the sporocyst and sporozoites were studied. Detailed line drawings and photographs were taken to identify them in species level (Plate 1). The oocysts were examined under 45 X and 100 X objectives of calibrated Microscope.

III. RESULT

In the present study, 485 samples collected from 40 different bird species were examined. Out of which 64 samples from eight species was positive with an overall prevalence of 13.19%. (Table-1). Six species of coccidia were identified *Isospora pycnonotae* shows highest prevalence (5.15%) followed by *Eimeria columbae* (4.53%), *Isospora bengalensis* (3.55%), *Eimeria vagabundae* (2.06%), *Eimeria tropicalis* (1.85%) and *Isospora corviae* (1.44%) (Fig-1). Oocytes of monoxenous coccidia (*Eimeriidae*) were found in the 41 individuals (8.45 %) and 47 individuals (9.69%) are infected with *Isospora*. The descending order of prevalence of coccidial infection in birds is 73.33% in *Columba livia*, 62.5 % in *Turdoides striatus*, 40 % in *Corvus splendens*, 25 % in *Passer domesticus*, 23.07 in *Copsychus saularis*, 11.11 % in *Dicrurus macrocercus*, 10 % in *Dendrocitta vagabundae* and 8% in *Corvus macrorhynchos* (Fig-2). Sporulation time varied from 24 hrs. to 3 weeks in *Eimeria*, depending on the species and factors such as temperature and moisture Hammond (1973).

A. Taxonomic characteristics of species identified

Type-I

The oval oocysts measure 23.1 by 19.2 μ . The cyst wall consists of two layers, the outer being the thinner. A light refractile area appears at the site corresponding with the micropile after the sporocysts have formed.

The sporulated oocyst lacks a residuum, but a scattered granular sporocyst residuum is present. The sporocysts are piriform, 17.0 by 7.1 μ in size, and bear a stieda body on the pointed end. The 11.1 μ long slender sporozoites have central nuclei. The morphological characteristics resembled that of *Isospora pycnonotae*.

Type-II

The oocysts were broadly ovoid, averaged 25.2 by 23.2 μ , shape index (L: W ratio) was 1.07, and had double layered 1.5 μ thick wall with the inner wall darker and thicker. Micropile and oocyst residuum absent but a refractile polar granule was present. Ovoid sporocysts averaged 4.1 by 13.2 and were devoid of stieda body. The two sporozoites broader at one end and tapering at the other end, lay head to tail around the sporocyst residuum of small dark granules. The morphological characteristics resembled that of *Eimeria vagabundae*.

Type- III

The oocysts measure 15.2 by 13.8 μ . The thin wall is bilayered, the inner layer being thicker. The sporont is 11 μ in diameter. An oocyst residuum is present; the sporocyst residuum is indistinct. The ellipsoid sporocyst measure 6.2 by 3.8 μ . The morphological characteristics resembled that of *Eimeria columbae*.

Type- IV

The spherical or sub spherical oocytes are 18.24 by 17.23 μ in size (on average 20 μ in diameter). The smooth wall consists of two layers, of which the inner is the thicker. Most oocyst contains a residuum 3 μ in diameter. The ellipsoid sporocysts measure 9 by 5 μ and bear a stieda body on the tapering end. Each sporocyst gives rise to two sporozoites. The sporocyst residuum is a compact mass of dark granules. The morphological characteristics resembled that of *Eimeria tropicalis*.

Type- V

Oocysts were round with an average diameter 20.5 μ . Oocyst wall comparatively much thinner (1.0 μ), oocyst

residuum absent but a polar granule present. The two sporocysts were piriform averaged 15.4 by 8.1 μ , and had small conical stieda body at the narrower ends. The four coma shaped sporozoites in each sporocyst lay in an orderly fashion around the residuum composed of small dark granules. The morphological characteristics resembled that of *Isospora bengalensis*.

Type- VI

Oocytes were roughly ovid 20.5 by 16.8 μ with double layered wall, and without micropile oocyst residuum and polar granule. The two sporocysts were also roughly roundish ovid 10.3 by 8.1 μ , with an almost indistinct stieda body at one end. The four pear shaped sporozoites in each sporocyst were arranged around a granular residuum and each showed a large refractile globule at the broader end. The morphological characteristics resembled that of *Isospora corviae*.

Table No.1 prevalence (%) of coccidia in the birds of upper kuttanad

| S.I.N | Name of the Host | Total examine d | Total positiv e | Prevalenc e |
|-------------------------|------------------------------------|-----------------|-----------------|-------------|
| Phalacrocoracida | | | | |
| 1. | <i>Phalacrocorax niger</i> | 18 | 0 | 0 |
| 2 | <i>Phalacrocorax fuscicollis</i> | 2 | 0 | 0 |
| Ardeidae | | | | |
| 3 | <i>Egretta garzetta</i> | 24 | 0 | 0 |
| 4 | <i>Casmerodius albus</i> | 2 | 0 | 0 |
| 5 | <i>Mesophoyx intermedia</i> | 1 | 0 | 0 |
| 6 | <i>Bubulcus ibis</i> | 24 | 0 | 0 |
| 7 | <i>Ardeola grayii</i> | 12 | 0 | 0 |
| 8 | <i>Nicticorax nicticorax</i> | 17 | 0 | 0 |
| Ciconiidae | | | | |
| 9 | <i>Mycteria leucocephala</i> | 5 | 0 | 0 |
| Threkiornidae | | | | |
| 10 | <i>Threskiornis melanocephalus</i> | 12 | 0 | 0 |
| Rallidae | | | | |
| 11 | <i>Amaurornis</i> | 2 | 0 | 0 |

| | | | | |
|---------------------|---|----|----|-------|
| 12 | <i>phoenicircus Porphyrio porphyrio</i> | 7 | 0 | 0 |
| Scolopacidae | | | | |
| 13 | <i>Tringa glareola</i> | 1 | 0 | 0 |
| 14 | <i>Limosa limosa</i> | 13 | 0 | 0 |
| Glareolidae | | | | |
| 15 | <i>Glareola lactea</i> | 14 | 0 | 0 |
| Columbidae | | | | |
| 16 | <i>Columba livia</i> | 30 | 22 | 73.33 |
| 17 | <i>Streptopelia chinensis</i> | 3 | 0 | 0 |
| Psittacidae | | | | |
| 18 | <i>Psittacula krameri</i> | 35 | 0 | 0 |
| Cuculidae | | | | |
| 19 | <i>Eudynamis scolopacea</i> | 3 | 0 | 0 |
| 20 | <i>Centropus sinensis</i> | 4 | 0 | 0 |
| Alcedinidae | | | | |
| 21 | <i>Halcyon smyrnensis</i> | 6 | 0 | 0 |
| Meropidae | | | | |
| 22 | <i>Merops orientalis</i> | 8 | 0 | 0 |
| Capitonidae | | | | |
| 23 | <i>Megalaima viridis</i> | 12 | 0 | 0 |
| 24 | <i>Hirundo daurica</i> | 13 | 0 | 0 |
| 25 | <i>Pycnonotus jocosus</i> | 2 | 0 | 0 |
| Turdinae | | | | |
| 26 | <i>Copsychus saularis</i> | 13 | 3 | 23.07 |
| Timalinae | | | | |
| 27 | <i>Turdoides striatus</i> | 32 | 20 | 62.5 |
| Sylviinae | | | | |
| 28 | <i>Orthotomus sutorius</i> | 1 | 0 | 0 |
| 29 | <i>Lonchura striata</i> | 3 | 0 | 0 |
| Passeridae | | | | |
| 30 | <i>Passer domesticus</i> | 16 | 4 | 25 |
| Ploceinae | | | | |
| 31 | <i>Ploceus philippinus</i> | 23 | 0 | 0 |
| Sturnidae | | | | |
| 32 | <i>Sturnus malabaricus</i> | 8 | 0 | 0 |
| 33 | <i>Acridotheres tristis</i> | 30 | 0 | 0 |
| 34 | <i>Acridotheres fuscus</i> | 15 | 0 | 0 |

| | | | | |
|-------------------|------------------------------|----|---|-------|
| Oriolidae | | | | |
| 35 | <i>Oriolus xanthornus</i> | 3 | 0 | 0 |
| Dicruridae | | | | |
| 36 | <i>Dicrurus macrocercus</i> | 9 | 1 | 11.11 |
| 37 | <i>Dicrurus paradiseus</i> | 5 | 0 | 0 |
| Corvidae | | | | |
| 38 | <i>Dendrocitta vagabunda</i> | 10 | 4 | 10 |
| 39 | <i>Corvus splendens</i> | 20 | 8 | 40 |
| 40 | <i>Corvus macrorhynchos</i> | 25 | 2 | 8 |

IV. DISCUSSION

Identifying oocytes from passerine birds, the morphology is still of utmost importance, despite the fact that their length, width and shape may change during infection and as a function of inoculum Cheissin (1968). The oocyst and sporocyst size varies amongst host individuals of one species, or among different species of one genus Gardner et al (1990). Precise information on size (average length and width, maximum and minimum size, number of measurement) in combination with morphological characters could facilitate species identification.

The present study shows that the coccidian infection prevalence is very low in birds of Upper Kuttanad. In addition, the investigation gives an idea that from the four affected species three of which are coming under the order Passeriformes. Passerine birds have been known as hosts of monoxenous coccidia for one hundred years.

Coccidiosis, according to dent (1983) “is contagious enteritis which occurs in most areas of crowded livestock and heavily stocked paddocks”. When large numbers of oocysts are found in the faeces of live birds concurrent with diarrhoea, emaciation, and pallor or pale skin colour, coccidiosis should be suspected as the cause of illness.

Fig. No.1 Prevalence of coccidia infection in birds

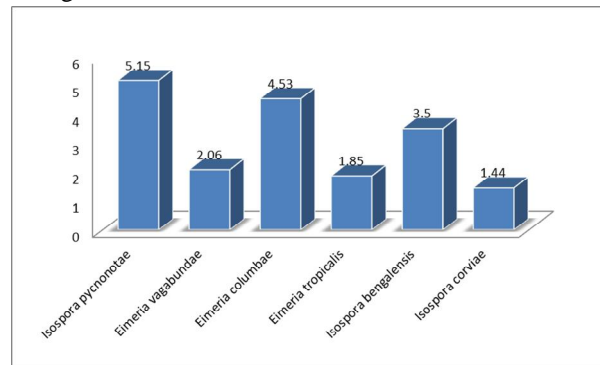
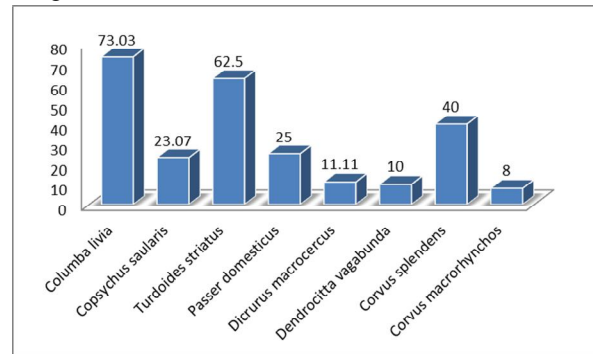


Fig.No.2 Prevalence of host infected with coccidian



V. CONCLUSION

Coccidia are protozoan parasites that are frequently observed in the fecal samples collected from Upper Kuttanad. In the present investigation, prevalence of coccidia was found to be 13.19%. Among the 40 observed species 8 species were infected with coccidia. The highest prevalence and density were observed in the family Columbidae. The study is extremely important for analyzing the biodiversity, host specificity and conservation.

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