

Research Journal of Animal, Veterinary and Fishery Sciences _____ Vol. 5(4), 1-4, May (2017)

Identification of existing coccidian species in broiler chickens of Bangladesh

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Available online at: www.isca.in, www.isca.me Received 23rd February 2017, revised 6th May 2017, accepted 20th May 2017

Abstract

One of the most devastating protozoan diseases of poultry is coccidiosis which causes a substantial economic impact to the poultry industry as well as to the food security of livelihood. Few reports on the avian coccidian species in Bangladesh have been documented even though there are limited published data on the occurrence of coccidian species in broiler chicken. The contemporary research work was designed to investigate the prevalence of different species of avian coccidiosis in broiler chicken of Bangladesh. Samples and other related data were taken aseptically by frequent visit to the affected farms. The coccidian species were identified depending on the oocyst size, sporulation time, shape and color of the oocysts by standard method. About 30% of broiler farms were found as infected with avian coccidia. Five coccidian species were found in broiler chicken like as Eimeriatenella, Eimeriaacervulina, Eimerianecatrix, Eimeria maxima and Eimeriabrunetti. The highest prevalence of E.tenella (25%) and the least prevalence of Eimeriabrunetti (3%) were found as mono infection of coccidiosis. Moreover the maximum prevalence of mixed infection with E. tenella and E. acervulina, was recorded as about 42%. This study was recommended that several avian coccidian species is circulating in commercial broiler farms of Bangladesh as mono and mixed infection which induce high mortality as well as less body weight gain.

Keywords: Prevalence, Coccidiosis, Infection, Mortality, Broiler chicken.

Introduction

In Bangladesh, commercial poultry farming is stared practically as an emerging agribusiness since 1980s¹. At present chicken contributes 51% of total meat production of the country². Coccidian species cause a common and fatal disease in poultry especially those reared under deep litter system and considered as one of the major threats for commercial broiler farming^{3,4}. The coccidiosis caused by genus *Eimeria* which is an obligatory intracellular parasite with a complex life cycle. Eimeria is distributed throughout the world⁵. In Bangladesh, an introductory report on the presence of E.tenella, E.necatrix and E.maxima was made by Mondal and Qadir in 1978 which was confirmed by the fecal examination of chicks from Bangladesh Agricultural University Poultry Farm⁶. For the first time, Eimeriaacervulina and Eimeriabrunetti were recognized in chickens of Bangladesh by necropsy examinations of naturally infected birds and the similar lesions also found in the experimentally infected chicken'. About 68% coccidian outbreaks were recorded in commercial poultry operation in Bangladesh⁸. After words about 36% general prevalence of coccidiosis in broiler chicken was found⁹. In fact, coccidiosis has been identified as a major disease in chickens of Bangladesh which causes a great economic loss to the poultry industry^{7,10}. Although the extent of the economic loss regarding certain coccidian species in Bangladesh is unknown but limited works

have been attempted concerning the topographical distribution of coccidian species in broiler chicken. Species identification is the most important parts to control and eradication of avian coccidiosis according to topographic location. Therefore, the present work was undertaken to identify the different coccidian species in a form of mono and mixed infection type in broiler chickens of Bangladesh.

Material and methods

Study design: The study was conducted on the basis of random physical visits and owner's complained of 520 broiler farms reared in different part of Sylhet, Bangladesh within a period of one year. On the basis of clinical findings and characteristic gross lesions in intestine, only 50 positive samples (droppings and intestine) were selected finally for laboratory identification of oocysts. Necropsy examination of dead birds was performed carefully at the farm as soon as possible.

Clinical and necropsy finding: Depression, diarrhea and/or blood mixed droppings, enteritis, emaciation, drooping wings, wastage of feed, slow, stunted and uneven growth were considered as clinical sign. The thickened intestinal and hemorrhagic caecalwall, bloody diarrhea, enlargement of intestinal wall was considered as post mortem lesion for the detection of coccidiosis (Figure-1 and 2). Postmortem

Research Journal of Animal, Veterinary and Fishery Sciences _ Vol. 5(4), 1-4, May (2017)

examinations were carried out by the processes: i. necropsy examination and ii. microscopic examination of mucosal scrapping. By postmortem examination, intestinal contents were collected and cultured. The sporulated oocysts of *Eimeria* species were stained by modified Ziehil-Neelsen technique for microscopic examination. At least 10sporulated oocysts from each area of the intestinal tract (anterior, middle, posterior parts of small intestine and from the caecalpouches) were measured for their morphological characteristics (length, width and shape). Detail of findings was given in Table-1.



Figure-1: Caecal form of broiler coccidiosis at 21 days age.



Figure-2: Clotted blood in opened cecum of broiler bird at 17 days age.

Species identification: The intestinal and fecal samples of affected birds were collected from the broiler farms that showed an identical clinical signs of coccidiosis. On the basis of clinical signs and pathological lesions only 50 positive samples (Intestine, cecum, and droppings) were sent to the Veterinary Laboratory of Aftab Bahumukhi Farms Ltd. Bhagolpur, Bajitpur, Kishoregonj, Bangladesh for species identification ensuing all hygienic precautions. The species were identified in the field samples by observing the oocyst size, shape, sporulation time and color of the oocysts. Saturated sodium

chloride salt solution was used to harvest the oocytes via the floatation technique of Conway and McKenzie¹¹. At least 10 oocytes were measured to analyze the actual size of oocysts of each certain species. The microscope objective lens was calibrated according to Conway and McKenzie technique¹¹. The oocyte's sporulation time was analyzed by means of the procedure of Conway and McKenzie after the sporulation of about 90% of the oocytes at $29-30^{\circ}c^{11}$.

Statistical analysis: Data were collected and managed by computerized system like as database in MS-Access and descriptive statistics were performed using MS-Excel version 2010.

Results and discussion

This study was attempted to identify the different Eimeria species circulating in broiler farms causing less weight gain and high mortality. Coccidian species viz. E.tenella, E. necatrix, E.acervulina, E.maxima and E.brunetti were identified in descending order of their predilection sites (Table-1). The morphological feature (viz. color and size) of the coccidial species was considered to determine the species identity but E.maxima was found with the biggest size and brownish red color. Details of different species and their identification characteristics were listed in Table-1. The shape index often quoted as criteria for species identification but less variation was found in shape index between species. The most coccidian species were limited to the specific part of the intestine. In addition, E.acervulina and E. maxima were found to inhabit in the most part of the small intestine compared to other *Eimerias*pecies. Oocytes sporulation time for *E. acervulina* and E.brunetti were found smaller about 18 hours in contrast to other species. E.tenella and E.necatrix had almost equal sporulation time (20 hours) and E. maxima were taken about 30 hours for at least 90% of oocytes sporulation at 29-30°C.

The sites of inhabitant of certain *Eimeria* species with identical lesions were considered to differentiate the species. E.tenella was caused massive haemorrage, thickened mucosa with clotted blood and caecal cores considering the extent and duration of the infection. However coccidian lesions were often found in the duodenum and cecum with concurrent bacterial infections. E.necatrix and E. maxima was usually produced similar lesions in the same intestinal part. On the other hand, E.necatrix were produced more severe lesions in the mid intestine of yolk sac diverticulum with hemorrhage and whitish plaques. Hence, the mucoid exudates were usually produced in the duodenum by E. maxima and E. acervulina. In addition, the white spots were observed in the serosal site and eroded mucosal membranes. Details of mono and mixed infection were shown in figure 3. Out of 50 positive cases of coccidiosis, the highest (42%)prevalence was found in the form of mixed infection by E.tenella and E. acervulina. E. tenella was found as the highest (25%) prevalence and least E.brunetti (3%) in a form of monospecies infection.

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Characteristics of coccidian species	E. tenella	E. necatrix	E. acervulina	E. maxima	E. Brunetti
Av. Oocyst length (µm), (Mean±SE)	20.39±1.17	20.91±1.01	17.31±0.94	31.55±2.47	24.86±1.05
Av. width (µm) of oocyst (Mean±SE)	17.14±1.09	17.13±1.10	13.95±0.55	23.54±1.26	20.72±1.06
Shape index	1.19	1.22	1.24	1.34	1.20
Prevalence	25	07	15	08	03
Shape of Oocyst	Ovoid	Oblong ovoid	Ovoid	Ovoid	Ovoid
Sporulation time (hrs.) at 29-30°C	20	20	18	30	18
Location	Cecum	Mid intestine (Jejunum and ileum)	Upper intestine (Duodenum)	Mid intestine (Jejunum and ileum)	Posterior small intestine
Pathological Lesions induced in host intestine	Hemorrhage and bleeding, thickening of cecal wall	Balloning of intestine. Mucoid blood filled exudates	Transverse Whitish band on duodenal loop, streaks and mucoide exudates.	Petechial hemorrhage, mucoid exudates & thickening of wall	Muciod, Bloody Enteritis

Table-1: The identification characteristics of different coccidian species.



Figure-3: Prevalence of Mono and mixed infections of Eimeria species.

Discussions: About 30% of commercial broiler farms were found infected with different species of avian coccidian. On the basis of biological characteristics like as lesion, location and morphological characteristics, the species of *Eimeria* viz. *E. tenella, E. acervulina, E. necatrix, E. maxima,* and *E.brunetti* were identified in broiler chicken of the study area. These species was located in different site of chicken intestine which caused profound lesions. Depression, diarrhea and/or blood mixed droppings, enteritis, emaciation, drooping wings, wastage of feed, slow, stunted and uneven growth were showed by affected birds as clinical signs. The thickened intestinal and hemorrhagic caecalwall, bloody enteritis with mucoid exudates

was found at necropsy. This finding is partially similar to the report of Adhikari *et al.* and Franco^{12,13}. These identified *Eimeria* species except *Eimerianecatrix* have been reported in the local chickens of eastern hills of Nepal by earlier study and also in Bangladesh^{14,15}. Nevertheless the different *Eimeria* species was found all over the world which infects the domestic poultry⁵. The morphological characteristics, location and nature of intestinal lesions were corresponded to the description made by Gorden and Jordan¹⁶. In the present study coccidiosis were found as like as mono and mixed infection in the commercial broiler farm of Bangladesh. The highest prevalence was found in broiler chickens as mixed infection (42%) caused by

Eimeriatenella and Eimeriaacervulina and mono infection (25%) caused by Eimeriatenella. Adhikari et al. was found as a mixed (50%) and Eimeriatenella namely monococcidian infection (25%) in layer chicken¹². Aryal and Gari et al. was also reported the avian coccidiosis occurring in the form of mixed and mono infection of *Eimeria tenella*^{17, 18}. The highest prevalence of mixed infection might be found due to opportunistic nature of the mild pathogenic species of Eimeria species. i.e. Eimerianecatrix and Eimeriabrunetti which starts infection in the birds under sufficient stress due to initial infection with pathogenic (*E. tenella*) species¹⁹. The prevalence of mono and mixed infection may vary on the basis of several factors like species, management, seasons and topographical location of the farms. The highest prevalence of Eimeriatenella might be due to its highly pathogenic and predominant in nature.

Conclusion

In conclusion, coccidiosis was identified as the cause of direct and indirect losses in the broiler farms resulting vulnerable food security. There are five species were identified in broiler birds which causes mass loses in commercial broiler farming. Losses occurred due to high mortalities, coccidiost at costs, reduced weight gains with high FCR and reduced market value of affected birds. Coccidiosis is one of the most important disease threats for commercial broiler production in Bangladesh and its treatment and control measures should have prime importance on the basis of species variation depending on their predilection sites.

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