

## Coccidiosis in Fayoumi Chickens at Debre Zeit Agricultural Research Center Poultry Farm, Ethiopia

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**Abstract:** A study on coccidiosis in dead grower Fayoumi breed chickens, broilers, aged between of 6-10 months in Debre Zeit Agricultural Research Center (DZARC) poultry farm was conducted from November 2009 to April 2010. The study involved post mortem examination of dead birds, mucosal scraping examination, examination of gross and histopathological changes and identification of *Eimeria* species. Out of 300 dead bird samples, 215 (71.7%) of them were found to harbor different coccidian spp. In the attempt made to identify the prevalent species of coccidia in the farm, four *Eimeria* species namely *E. acervulina*, *E. tenella*, *E. necatrix* and *E. brunetti* were identified. Among the four species of *Eimeria* identified, *E. tenella* and *E. necatrix* with the incidence of 45% and 34.3% respectively were the predominant species identified followed by *E. acervulina* (31.3%) and *E. brunette* (27.6%). There was no significant differences ( $P>0.05$ ) in the prevalence of coccidiosis between the two sexes of the studied birds. It is possible to conclude that coccidiosis was the cause of the encountered mortality in this farm. This high prevalence in coccidiosis of chickens in the study farm requires an immediate professional intervention and implementation of strict hygienic and control measures.

**Key words:** *Eimeria* Species • Fayoumi Breed • Chicken • Coccidiosis Debre - Zeit Agricultural Research Center

### INTRODUCTION

The poultry population in Ethiopia has been estimated to be 34.2 million in [1]. Out of the total population, 99% consisted of native chickens and are managed in a scavenging system while the remaining birds are mainly kept in private farms under a modern management system [2]. To be able to feed her people and ensure food security as one option, Ethiopia needs to improve livestock production sector through intensification particularly the poultry production sector. The poultry sector has the potential to provide relatively cheap animal protein to the population and improve its nutritional status, to create both rural and urban employment and to generate income in time of economic difficulty [3].

The traditional poultry production system in Ethiopia is characterized by minimum inputs from the owners, usually kept in small numbers and fed leftovers including occasional grain feed and household wastes [4].

However the poultry production in Ethiopia has been hindered by different prevalent diseases among which important ones are Newcastle disease, coccidiosis, salmonellosis and chronic respiratory disease [5].

Coccidiosis in chickens is one of the major problems of poultry industry that is caused by protozoan parasites of genus *Eimeria*. It is considered as one of the most economically important diseases of domestic poultry that is responsible for significant economic losses to the worldwide poultry industry [6-7]. It is caused by one or several of seven *Eimeria* species infecting chickens [6]. These species differ in their localization in the gut and in their ability to induce morbidity and mortality [8]. This parasitic infection occurs in the epithelial cells of the intestine, despite the advances in nutrition, chemotherapy, management and genetics. Most *Eimeria* species affect birds between 3 and 18 weeks of age and can cause high mortality in young chickens [7].

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This disease continued to be a problem in Ethiopia as reported by Fessessework [9] prevalence rate of 50.8% and 11% in deep litter intensive system and backyard poultry production systems respectively. The disease coccidiosis is well reported in central Ethiopia by Kalifa [10] who reported 44.8% in Lemlem and 21.5% in Tsedey commercial poultry farms in Debre-Zeit. Recently, a prevalence of clinical coccidiosis in backyard chickens of central Ethiopia was reported by Safari [11] as high as 48.2% in different production system in Debre-Zeit and Addis Ababa.

As frequent death of chicken was reported in the poultry farm of the Agricultural Research Center (DZARC) and the cause of this mortality not established, the objectives of this study were to investigate if this chicken mortality is due to coccidiosis and also identify the *Eimeria* species circulating in the farm and suggest appropriate and feasible control and prevention strategies.

## MATERIALS AND METHODS

**Study Area:** The study was conducted in Debre-Zeit agricultural research center (DZARC) poultry farm. Debre-Zeit is located 45kms south east of Addis Ababa. The area is located at 9°N latitude and 40°E longitudes at an altitude of 1850 meters above sea level in the central high land of Ethiopia. It has an annual rainfall of 866mm of which 84% is in the long rainy season (June to September). The dry season extends from October to February. The mean annual maximum and minimum temperatures are 26°C and 14°C respectively, with mean relative humidity of 61.3% [13].

Farmers in the vicinity of Debre Zeit town use a mixed crop and live stock farming system. Moreover Debre-Zeit and its surrounding have variable and yet representative agro-ecologies of the country. These agro-climatic zones are inhabited with different plant and animal species [14].

**Study Animal:** The study was conducted on 300 dead Fayoumi chickens of similar age found in DZARC poultry farm.

**Study Design and Methodology:** A longitudinal study design was employed to establish coccidiosis in the farm.

**Postmortem Examination:** All obtained dead birds were opened to expose their abdominal cavity and viscera

following procedures described by Lobago *et al.* [15]. The abdominal cavity and viscera were thoroughly examined for gross pathological changes. The content of different segment of the intestine was examined after being rinsed in running tap water to remove trace of blood. The small intestines and large intestines were examined for gross changes of serosal surfaces. Using scissor, the intestine were opened at different position i.e. duodenum, mid intestine above and below the meckel's diverticulum, the lower intestine and the caeca according to method utilized by Lobago *et al.* [15].

**Microscopic Examination:** Mucosal scrapings for microscopic examination of development stage of coccidia were taken from segment of intestine with lesions. They were placed on microscopic slides, diluted with drop of tap water, mixed thoroughly and covered with cover slip and examined under light microscope according to the procedure utilized by Lobago *et al.* [15] and described by Luna [16].

**Histopathological Examination:** Tissue samples of intestines about 1-3 cm length were collected and submitted to the pathology section of the Faculty of Veterinary Medicine, University of Addis Ababa and processed for histo-pathological examination according to Luna [16].

**Recovery of Coccidian Oocysts:** The oocysts were collected from the infected tissues after removing the mucous deposit from the solid intestinal content. The mucus was collected from the surface of the intestinal epithelium by cautious scraping and then the mucous deposit was examined under the microscope for the presence of oocysts using a coverslip. A clean preparation of oocysts for morphological examination was conducted using method described in MAFF [17].

**Measuring of the Size of Sporulated Oocyst and Identification of *Eimeria* Species:** Samples of unsporulated oocysts were kept in 2.5% potassium dichromate solution for the purpose of sporulation and suspension containing sporulated oocyst was drawn from petridish using pasture pipette. One or two drops of the suspension was placed on a microscopic slide and covered with cover slip. The morphology and size of sporulated Oocysts was microscopically determined using calibrated ocular microscope at 40x magnification as described by Long and Reid [18].

Identification of the different species of *Eimeria* was carried out based on the site of gross lesion, shape and size of sporulated Oocysts. The information from all these findings was combined and the species of *Eimeria* were identified based on identification key given by Long and Reid [18].

**Data and Analysis:** The data collected were analyzed using Intercooled STATA (Version 7) soft ware. Chi square test and percentages were used to analyze the data. P-Value less than 0.05 at 95 % confidence interval was considered significant.

## RESULTS

**Incidence of Coccidiosis:** Out of 300 examined dead birds, 215 (71.67%) were found to be infected with coccidiosis (Table 1).

**Sex Coccidiosis Interaction:** There was no significant variation ( $p > 0.05$ ) in the occurrence of coccidiosis between the two sexes (Table 1).

**Identified of *Eimeria* Species:** Four *Eimeria* species namely *E. tenella*, *E. necatrix*, *E. brunetti* and *E. acervulina* were identified in this study. Among the four species, *E. tenella* and *E. necatrix* were the predominant species observed during the study (Table 2).

## DISCUSSION

An overall incidence rate of 71.7% coccidiosis was registered in this study. This high incidence rate might be attributed to high stocking density resulting in high contamination rate of the poultry house with oocysts of *Eimeria* and lack of regular disposal of litter from the farm.

The present result is similar to the report of Alamargot [19] who reported 80% incidence rate in and around Debre-zeit. Nevertheless, the present finding is relatively higher than that reported by Fessessework [9] who recorded 50.8% and 11% incidence rates in deep litter and back yard poultry production system respectively. However, the current finding is higher than the reports of Ashenafi *et al.* [20] (25.8%) in local strain chicken in central Ethiopia and Luna [16] who reported 38.4% in Kombolcha poultry multiplication and research center. The climate, agro ecological setup and breed difference, management system and possibility of drug resistance could contribute to this variation in the incidence of coccidiosis in different poultry establishments of the country.

Statistically, significant difference ( $p > 0.05$ ) was not observed in the incidence of coccidiosis between the sexes. This is in agreement with the finding of Getachew [21] who underlined the absence difference in the natural resistance between sexes to coccidiosis.

The biological characteristics of coccidia of chickens are well known and variable and can be used in the identification of species [7]. Some species are easily identified on the basis of oocyst size (*E. maxima*), whereas others produce unmistakable lesions (*E. tenella*, *E. necatrix*). We found high prevalences of four important species of coccidia: *E. tenella*, *E. brunette*, *E. necatrix* and *E. acervulina* were identified in this study. These results are in agreement with previous reports from Ethiopia [11], Jordan [22], France [23] and Argentina [6] suggesting that those species of *Eimeria* are widespread in most countries. The high prevalence of the infection in studied chicken farms in the current study indicates the maintenance of oocysts in the farm environment, improper cleaning and disinfections methods in the chicken houses. However, six *Eimeria* species namely *E. mitis*, *E. necatrix*, *E. maxima*, *E. acervulina* and *E. tenella*, *E. brunetti* were also previously reported in Ethiopia by [9, 12, 15, 21, 24].

In the present study *E. tenella* (45%) was the predominant species, followed by *E. necatrix* (34.33%), *E. acervulina* (31.33%) and *E. brunette* (27.67%). However, previous studies conducted in Ethiopia by Safari [11], Ashenafi [20] revealed that *E. acervulina* was the most prevalent species. On the other hand Lobago *et al.* [15] reported that *E. brunetti* was the most prevalent species. The probable reasons for this discrepancy could be the difference in virulence of the *Eimeria* species at different management system and/or due to the possibility of drug resistance. It was claimed by veterinary personnel of the farm that Amprolium was no more effective against coccidiosis. The only remaining anticoccidial drug in action in the farm was sulfadimidine, which is effective for the control of *Eimeria* species [25]. The high incidence of *E. tenella* and *E. necatrix* may indicate the possible appearance of Amprolium resistance strain of these species. The other contributing factors could be environmental and management differences. *E. mivati* and *E. maxima* which were identified by Fessessework and Safari [9, 11] respectively were not observed in this study.

In conclusion, coccidiosis is highly prevalent among Fayoumi chicken in Debre Zeit agricultural research center poultry farm and is found to be the main cause of chicken mortality. The coccidia species identified were *E. acervulina*, *E. brunette*, *E. necatrix* and *E. tenella*

Table 1: Prevalence of coccidiosis between two sexes of the birds

Sex	No examined	No positive (%)
Female	162	116 (71.6)
Male	138	99 (71.74)
Total	300	215 (71.67)

$\chi^2 = 0.0007$  ( $P > 0.05$ )  $P = 0.979$  (statistically not significant)

Table 2: *Eimeria* species identified in the poultry farm

Species	Part of intestine affected	Shape of Oocysts	Size of Oocysts	% Prevalence
<i>E. brunetti</i>	Lower small intestine	Ovoid	26X22	27.67
<i>E. acervulina</i>	Duodenum/jejunum	Ovoid	10X14	31.33
<i>E. tenella</i>	Ceca	Ovoid	23X19	45.00
<i>E. necatrix</i>	Mid small Intestine	Ovoid	20X17	34.33

while *E. necatrix* and *E. tenella* were predominant species. The high infection rate detected in this study may suggest for the presence of favorable condition for biology and transmission of this pathogen. Efforts towards the control of the disease through good management practices and the proper use of anticoccidial drugs should be considered. However, to control this economically important parasitic disease of poultry, further studies need to be undertaken to devise sustainable and cost-effective prevention and control methods.

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