

## Original Research Article

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## Epidemiological Investigation of Poultry Coccidiosis in and around Tarai Region of Uttarakhand

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### ABSTRACT

#### Keywords

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#### Article Info

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The present study aimed at epidemiological investigation of poultry coccidiosis in and around Tarai region of Uttarakhand. A total of 16 commercial poultry farms were screened and 9 were found positive for coccidiosis. Out of coccidiosis positive farms, 6 were broiler farms and 3 were layer farms. The overall prevalence of coccidiosis was 56.25 %, with 60% in broiler and 50% in layer flocks. The maximum prevalence was recorded during Aug-Sep (50%) followed by June-July (33.3%) and Dec-Jan (16.6%) in broilers, while there was equal prevalence during June-July (33.3%), Aug-Sep (33.3%) and Oct-Nov (33.3%) in layer farms. The management system mainly consisted of deep litter (87.50%) followed by cage system (12.50%). The identification of coccidian parasite was done by gross lesion site, oocyst morphology and coccimorph software. The most prevalent coccidian parasite identified was *E. tenella* (66.6%) in both type of farms followed by *E. maxima* (50%) and *E. necatrix* (33.3%) in broiler, while in layers *E. maxima* (33.3%) and 1 *E. acervulina* (33.3%).

### Introduction

Poultry is one of the most rapidly escalating segments of the agricultural sector in India. During the last four decades poultry industry has changed itself from backyard to a scientific industry. In recent years, livestock sector has emerged as one of the leading sector among Indian agriculture and within it; poultry farming has contributed substantially to the nation's economy (Rath *et al.*, 2015). In fact, India is ranked 3<sup>rd</sup> in egg and 6<sup>th</sup> in meat

production with an impressive growth rate of 6% and 12%, respectively (Karthikeyan and Neduchezhian, 2013; FAO STAT, 2015), while the poultry population, egg and meat production was around 729.21 million, 69.73 billion and 2.68 million tonnes, respectively, with an annual per capita consumption of 58 eggs and 2.26 kilograms meat (BAHS, 2014). The tremendous growth of poultry industry in India is often hampered by various factors with poultry diseases being of pivotal importance (FAO, 1998; Rushton *et al.*, 1999).

Among the various diseases that affect the poultry sector coccidiosis is one of the most important affecting domestic fowl, turkey, geese, ducks, etc. (Hadipour *et al.*, 2011) and is caused by the protozoa of phylum Apicomplexa, family Eimeriidae and in poultry primarily by species belonging to the genus *Eimeria* (Chauhan and Sushovan, 2003). There are about 1800 species of *Eimeria* that infects both animals and birds (Shirley, 1995), out of which ten species have been recorded from poultry in India with most common being *E. tenella*, *E. necatrix*, *E. brunetti*, *E. maxima*, *E. acervulina*, *E. mitis* and *E. praecox*. Among these, *E. brunetti*, *E. maxima*, *E. necatrix* and *E. tenella* are reported to be highly pathogenic, while *E. acervulina*, *E. mitis* and *E. mivati* are comparatively less pathogenic and least pathogenic are *E. praecox* and *E. hagani* (Bachaya *et al.*, 2012). The diagnosis of *Eimeria* species is of foremost importance for a successful management of an outbreak of coccidiosis. In the field outbreak coccidia infection is diagnosed by presence of oocysts in the faeces and intestinal scrapings in which oocysts and endogenous developmental stages of parasites are detected. The infection caused by *E. tenella* and *E. necatrix* is diagnosed easily on the basis of lesion but infections of other species are difficult to diagnose. Under these circumstances, it is the need of the hour for the poultry industry to develop better knowledge of the etiology and population dynamics of mixed coccidia infections in commercial poultry farms for the control of coccidiosis, in order to survive the global competition.

### **Materials and Methods**

For epidemiological investigation, a total of 16 commercial poultry farms were screened from different regions like Pantnagar, Khatima, Bareilly, Shantipuri, Khatima, Moradabad, Haldwani, Almora, Uttarkashi

etc. for poultry coccidiosis based on history of poor weight gain, anaemia, mortality and voiding of blood stained faeces. Identification of different *Eimeria* species was based on the site of gross lesions, morphology of sporulated oocysts and by use of COCCIMORPH software. The faecal or intestinal samples of unsporulated oocysts were kept in 2.5% potassium dichromate solution till the sporulation occurred. After sporulation one to two drops were placed on a microscopic slide and covered with cover slip and then the morphology of sporulated oocysts were determined microscopically as described by Long and Reid (1982). COCCIMORPH software was used to identify the different *Eimeria* species which was downloaded from internet (<http://www.coccidia.icb.usp.br/coccimorph>) and the photomicrographic images of the sporulated oocysts were uploaded and based on size, symmetry and internal structure different *Eimeria* species were identified. Post mortem examination of birds died due to coccidiosis was performed as per the procedure described by Conway and McKenzie (2007) to determine the site of gross lesion.

### **Results and Discussion**

Out of total 16 poultry farms screened, 9 were confirmed to be suffering from different *Eimeria* species representing an overall prevalence of 56.25%. The present study was supported by Bachaya *et al.*, (2012) who reported the prevalence of 59.60% in Muzzafargarh region but was considerably higher from those recorded by Nikam *et al.*, (2012) with an overall prevalence of 29.08% in Maharashtra, Sharma *et al.*, (2013) with 39.58% in Jammu and Kashmir, Kala *et al.*, (2013) with 16.54 % in Bihar and Jadhav and Nikam (2014) in Gangapur and Vaijapur region of Aurangabad, Maharashtra with 36.07% and 35.90%, respectively. The reason for the variation in prevalence can be

attributed to the fact that in these reports random samples were collected from different farms, i.e. healthy as well as diseased farms, while in our study only those farms which were suspected to be suffering for coccidiosis were considered for examination. Based on the type of birds, 6 out of 10 broiler farms and 3 among 6 commercial layer farms were confirmed to be positive for coccidiosis with the prevalence of 60% and 50%, respectively. Deo (1988), Kumar *et al.*, (2013) and Kala *et al.*, (2013) also found the prevalence to be higher in broilers as compared to layer birds. However, contrary to the present observations, Banu *et al.*, (2009) and Jatau *et al.*, (2012) recorded prevalence of coccidiosis to be higher in layer birds compared to broilers. Month wise prevalence of coccidiosis was higher during the monsoon season particularly during the months of July to September. The prevalence was recorded to be highest during August- September followed by June-July and equal in months of October- November and December- January with 44.4%, 33.3%, 11.11% and 11.11%, respectively. Based on type of birds reared, in broilers there were 2 outbreaks reported during the months of June-July (33.3%), 3 in August-September (50%) and 1 during December- January (16.6%) while in case of layer birds, there was one outbreak each during June- July (33.3%), August- September (33.3%) and October-November (33.3%). This is due to the fact that at this time of the year environmental are conducive for transmission and sporulation of oocysts, resulting in higher cases (Sharma *et al.*, 2013).

Management system in both broiler and layers mainly consisted of deep litter system. Out of the 10 broiler farms that were visited all of them had deep litter system of management (100%), while in case of layer farms 4 among 6 (66.6%) followed deep litter system including the 3 farms (75%) that were positive for coccidiosis. Meanwhile, 2 layer farms

(33.3%) used cage system of management. Singh and Meitei (2015) mentioned that in deep litter system due to litter pillage and crevices, the risk of infection increases. Thick layers of litter which is used to maximize the absorption, when gets wet it sticks to boots, utensils, shoes and vehicle and is thus transmitted from one farm to another (Chauhan and Sushovan, 2003 and Davou *et al.*, 2015).

Using different methods like site of gross lesions, morphology of oocysts and by use of COCCIMORPH software different *Eimeria* species were identified in the coccidiosis affected farms. There were mixed infection in most of the broilers as well as in layer flocks. In coccidiosis affected broiler farms, *E. tenella* (66.6%) was the most prevalent species followed by *E. maxima* (50%) and *E. necatrix* (33.3%), respectively. Likewise, in layer flocks also *E. tenella* has maximum prevalence (66.6%) followed by *E. maxima* (33.3%) and *E. acervulina* (33.3%).

Hadipour *et al.*, (2011), Bachaya *et al.*, (2012), Amare *et al.*, (2012), Dinka and Tolassa (2012), Kala *et al.*, (2013) and Singh and Meitei (2015) also mentioned that *E. tenella* was the most prevalent species among all species. This might be due to high pathogenicity and predominant nature of *E. tenella* (Adhikari *et al.*, 2008). However, Shirzad *et al.*, (2011), Kumar *et al.*, (2013) and Gharekhani *et al.*, (2014) in their studies found *E. acervulina* to be the most predominant species, Jatau *et al.*, (2012) recorded *E. maxima* to be the most prevalent species, while Molla and Ali (2015) observed *E. brunetti* to be the most common species in Ethiopia. The possible reason behind this difference could be the variability in virulence of *Eimeria* species in the birds housed under different management system and problem of drug resistance (Dinka and Tolassa, 2012) (Table 1–3).

**Table.1** Month-wise prevalence of poultry coccidiosis

Month	Type of bird		Age		Infection	
	Broiler	Layer	Broiler	Layer	Broiler	Layer
<b>June-July</b>	1	1	21d	36d	<i>E. tenella</i>	<i>E. tenella</i>
<b>June-July</b>	1	-	19d	-	<i>E. necatrix</i> <i>E. tenella</i>	-
<b>Aug- Sep</b>	1	1	40d	42d	<i>E. maxima</i> <i>E. tenella</i>	<i>E. acervulina</i> <i>E. maxima</i>
<b>Aug- Sep</b>	1	-	13d	-	<i>E. maxima</i>	-
<b>Aug- Sep</b>	1	-	22d	-	<i>E. tenella</i>	-
<b>Oct-Nov</b>	-	1	-	24 weeks	-	<i>E. acervulina</i>
<b>Dec- Jan</b>	1	-	37d	-	-	<i>E. tenella</i> <i>E. maxima</i>

**Table.2** Mortality due to coccidiosis at affected broiler farms

Farm Code	Mortality (%)
<b>Farm B1 (Shantipuri, U.S. Nagar)</b>	18.8%
<b>Farm B2 (Haldwani)</b>	1.5%
<b>Farm B3(Almora)</b>	1.8%
<b>Farm B4 (Bareilly)</b>	1.26%
<b>Farm B5 (Khatima)</b>	1.8%
<b>Farm B6 (Moradabad)</b>	4%

**Table.3** Mortality due to coccidiosis at affected layer farms

Farm Code	Mortality (%)
<b>Farm L1(Uttarkashi)</b>	9.16%
<b>Farm L2(Pantnagar)</b>	14%
<b>Farm L3(Khatima)</b>	1.7%

The overall mortality rate in the coccidiosis affected farms during the study period was about 3.56%. In broilers, it was around 3.1% whereas; in layers it was about 4.4%. In one of the farm there was higher mortality due to concurrent infection with Infectious Bursal Disease (IBD). Banfield *et al.*, (1999) estimated the total mortality rate of 6-10%, Islam and Samad (2004) recorded 13.28% mortality rate, Kinung'hi *et al.*, (2004) observed 14.5% and 13.3% mortality rate in small and large farms, respectively, while Amer *et al.*, (2010) found 3-12% mortality rate and Yohannes *et al.*, (2014) reported 5% mortality rate in birds suffering from the clinical form of the disease. This variation in the mortality rates may be due to the amount of oocysts ingested, stock density, chemo prophylactic and chemotherapeutic drugs used and control measures adopted.

In conclusion, The epidemiological investigation revealed that the overall prevalence of coccidiosis was 56.25% with 60% (6 farms) in broiler flocks and 50% in layer farms (3 farms) with maximum prevalence during the month of Aug-Sep in broiler farms with 50% followed by June-July and Dec-Jan with 33.3% and 16.6% respectively, while in layer farms there was an equal prevalence during June-July, Aug-Sep and Oct-Nov with 33.3% each.

The management followed consisted mainly of deep litter system with 87.50%, while 12.50% were reared under cage system. Among the different *Eimeria* species identified the most prevalent was *E. tenella* in broiler as well as in layer farms with 66.6% followed by *E. maxima* and *E. necatrix* in broiler farms with 50% and 33.3%, while in layer birds *E. maxima* and *E. acervulina* with 33.3%, respectively. The mortality rates were 3.1% and 4.4% for broilers and layers, respectively.

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