



Coccidiosis prevalence and intensity in litter-based high stocking density layer rearing system of Benin

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1 SUMMARY

The prevalence and intensity of coccidiosis in litter-based high stocking density exotic layer rearing system was investigated in a cross-sectional observational study in rainy and dry seasons in Benin. A total of 81 farms with 120 flocks (young and adult) were surveyed. The collected data included flock size, season, bird age category, and fecal samples for further laboratory investigation. The results showed a prevalence of 28.2% for young birds and 40.7% for adult birds. The prevalence in rainy season was 39.30% and in dry season 33.8%, giving an overall coccidiosis prevalence of 36.6%. The disease when it occurred was more severe in young birds in a proportion of 66.6% significantly higher ($P < 0.05$) than that observed in adult bird category (9%) which experienced rather, the sub-clinical form of the infection in a proportion of 81.8%. The current study gave the proof of the endemicity of coccidiosis in this rearing system and the higher rate of the subclinical form of the disease in adult birds.

2 INTRODUCTION

Coccidiosis is an important poultry disease caused by a protozoan parasite belonging to the Apicomplexa phylum, the family of the Eimeridae and genus of *Eimeria*. There are 7 species of coccidia of pathological importance in chicken: *Eimeria acervulina*, *Eimeria brunetti*, *Eimeria maxima*, *Eimeria necatrix*, *Eimeria tenella*, *Eimeria praecox* and *Eimeria mitis* (Ovington *et al.*, 1995). In all parts of the world where confinement rearing is practiced, coccidiosis represents a major disease problem that requests attention of poultry producers, feed manufactures and poultry disease experts. The infectious form of the parasite is the oocyst, which sporulates two days following excretion through the feces in natural environment and can be ingested by a susceptible host organism (Williams, 1999). Coccidiosis is a gastrointestinal avian disease characterized by enteritis and diarrhea, which can become bloody

with certain *Eimeria* species. The sporozoites replication in the epithelial cells of the intestinal tract causes tissue damage with resulting interruption of feeding, digestive processes or nutrient absorption, dehydration and blood loss (McDougald, 2003). The macroscopic lesions in the digestive tract are some predisposing factors to many gastrointestinal bacterial poultry diseases such as Clostridiosis, Salmonellosis and Colibacillosis (Bostvironnois and Zadjan, 2011). Certain immunosuppressive viral diseases such as Infectious bursal disease, Marek disease and Chick anemia infectious viral disease (Lanckriert *et al.*, 2010) also exacerbate coccidiosis. The economic importance of the disease is due to its high rate of morbidity and mortality in young and adult birds, reduced feed conversion efficiency and egg production especially in sub-clinical cases. Coccidiosis is a disease of poor



management. Indiscriminate use of anticoccidial drugs in feed and water has led to serious drug resistance problem. In Benin, exotic layer chicken reared intensively for table eggs production is a growing poultry subsector and knowledge about epidemiological parameters of coccidiosis

(prevalence and intensity of the disease) is essential. The current study came up with the prevalence and intensity of coccidiosis and this will help to develop strategies for controlling the disease in Benin litter-based high stocking density exotic layer rearing system.

3 MATERIALS AND METHODS

3.1 Study design and sample size

calculation: The study is an observational cross-sectional design with coccidiosis prevalence and its intensity as the outcome of the investigation. The sample size was obtained by considering the theoretical coccidiosis prevalence in litter-based layer rearing system, which is 31% (Lunden *et al.*, 2010). A minimum of 20% as null proportion and an alternative proportion of 40% were considered, with 90% of power and under 0.05 significance levels. The POWER procedure in SAS (v.o. 9.2) with Z test applied to the above mentioned estimates, gave an optimal sample size of 42 laying hen farms to include in the study. The sampling method used was the weighted technique and the random selection of the surveyed farms with a total of 81 farms consisting of 120 flocks (39 chick flocks and 81 adult flocks) enrolled in the survey.

3.2 Field study: The survey was carried out in the Northern, Central and Southern regions of Benin (6° 28' N 2° 36' E; 114 763 km²), in the rainy and dry seasons. The Northern region is characterized by a sahelo-tropical climate with one rainy season from April to August and one dry season from September to March. The southern region is characterized by a

subequatorial climate with two rainy seasons: the long one, from March to July and the short one, from September to November, and two dry seasons: the long one, from December to February and the short one in August. The Central region is the intermediate form of this two above mentioned main climate features. The collected data include flock size, bird breed and age categories. Feces were collected for further laboratory investigation.

3.3 Laboratory works: The microscopic examination of the feces using the simple floatation technique (Soulsby, 1986) with McMaster counting chamber enabled to quantify the litter infective oocysts in feces. For each coccidia oocyst positive sample, the intensity of the infection was categorized as described by Lawal *et al.* (2008) as follows:

1-10 oocysts per field of McMaster counting chamber = unapparent infection,

11-20 oocysts per field = low grade infection

> 20 oocysts per field = severe infection

3.4 Statistical analysis: The FREQ procedure of SAS (v.o. 9.2) was used to calculate, the coccidiosis prevalence and intensity and also to make the comparison of the proportions with the test of Fisher.

4 RESULTS

The table 1 showed that 11 flocks out of 39 were infected with coccidial parasites, giving a prevalence of 28.2% in young bird category. In adult birds, 33 flocks out of 81 were infected with coccidia, giving a prevalence of 40.7%. The total

prevalence in rainy season was 39.3% statistically similar to the prevalence in dry season (33.8%) as demonstrated on figure 1 ($P > 0.05$). The overall coccidiosis prevalence obtained was 36.6%.

Table 1: Prevalence of coccidiosis in young and adult birds

Type of chicken	Fecal samples	Infected flocks	Uninfected flocks	Prevalence %
Young	39	11	28	28.2
Adult	81	33	48	40.7
Total	120	44	76	36.6

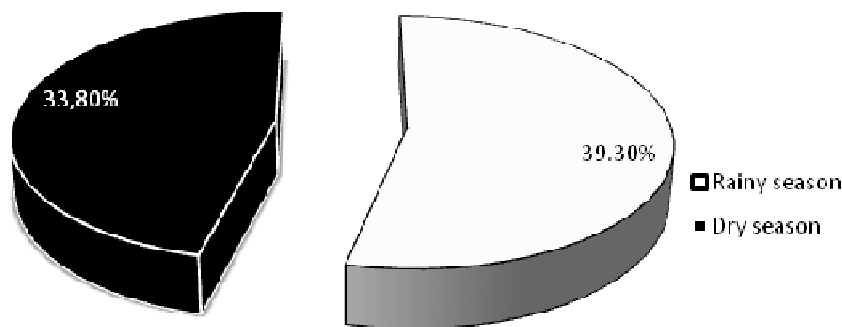


Figure 1: Coccidiosis prevalence in rainy and dry season

The intensity of the disease was not the same in the different age category. Severe coccidiosis in the proportion of 66.6% was recorded in young birds group and was significantly ($P < 0.05$) higher than that observed in adult category (9%) as demonstrated on table 2. Significantly higher

rate of unapparent infection was recorded in layer hen (81%) against only 33% of unapparent infection in young bird ($P < 0.05$). The overall unapparent form of coccidiosis was significantly higher (71.4%) than the severe form of the disease (21.4%).

Table 2: Coccidial infection intensity in young and adult birds

Infection intensity %	Layer chicken		
	Young	Adult	Total
Severe infection	66.6	9	21.4
Low grade infection	0	9	7.1
Unapparent infection	33.3	81.8	71.4

5 DISCUSSION

The overall coccidiosis prevalence recorded in Benin, litter-based high stocking density layer rearing system was 36.6% higher than 27% and 31% observed by Yunus *et al.* (2008) and Lunden *et al.* (2010) respectively and give the proof of the endemicity of coccidiosis in this rearing system. This relatively higher prevalence of coccidiosis

could be ascribed to the confinement and deep litter-based rearing system compared to caged birds, according to Lunden *et al.* (2010). The result corroborates previous reports, indicating that coccidiosis is most common to birds under intensive management, especially those reared on deep litter due to relatively higher oocysts



accumulation in the deep litter (Methusela *et al.*, 2002; Taylor *et al.*, 2007). The fact that the infection is more prevalent in adult layer bird than it is in chick, could be the result of acquired immunity by adult birds through repeatedly several contacts with various coccidia species in the litter, that can enable them to harbor the infection without succumbing. Chicks are not fully immunized and can experience great mortality in coccidiosis outbreak (Chapman *et al.*, 2005). The result is in agreement with the observation of Etuk *et al.*, (2004) who recorded a higher prevalence of coccidiosis in adult layer birds than in other age categories. The higher prevalence in adult hen can also be justified by the bird egg laying activity stress (Lunden *et al.*, 2010). According to McDougald and Reid (1997), Breeder and layer hens are at great risk of coccidiosis outbreak, because they are kept on deep litter for several weeks. The unapparent form of the infection was observed in adult layer birds in a proportion of 81.8% of the infected flocks. This is the visible sign of the subclinical form of coccidiosis with consequently a

disastrous economical incidence on the production outcome, especially egg production reduction and the emergence of gastrointestinal poultry diseases involving bacterial opportunistic agents: *Clostridium perfringens*, *Escherichia coli* and different strains of Salmonella that cause enteritis, wet fecal materials with wet litter and dermatopodosis (Bostvironnois and Zadjian, 2011). According to Sørensen *et al.* (2006), the subclinical coccidiosis considerably depress feed efficiency and egg production and account for 70% of the total coccidiosis disease control cost, since feed cost comprises some 70% of the total production cost in commercial poultry production system (Haug *et al.*, 2008). The higher rate of severe form of coccidiosis recorded in chick flock category confirm the low prevalence of the disease which disables any portage status in this category with the very redoubtable horror-spraying *Eimeria tenella*, the most pathogenic species for young chick. The current study gave the proof of the endemicity of coccidiosis in this rearing system and the higher rate of the subclinical form of the disease in adult birds.

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