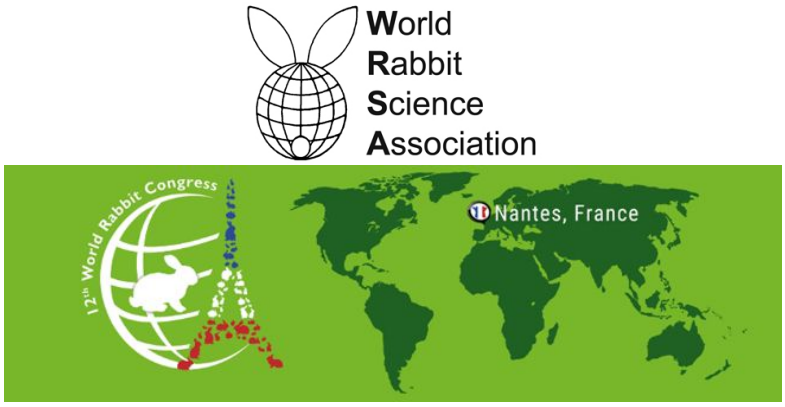

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SEASONAL EVOLUTION OF COCCIDIAL INFECTION IN DOMESTIC RABBITS IN ABIDJAN DISTRICT, COTE D'IVOIRE

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ABSTRACT

A detailed study on rabbit *Eimeriidosis* in a humid tropical region of Côte d'Ivoire relating to prevalence, intensity of infection, species involved and risk factors associated to climate data, was undertaken from January 2017 to July 2019 in Abidjan District. A total of 146 rabbit's farms were visited. Coccidiosis was present in all the farms in this survey (100%). Oocyst per gram of faeces (OPG) were counted using the McMaster method. *Eimeria* species were identified by microscope using morphological criteria. The older rabbits showed mild infections (94.52%) while 76,03% of younger ones were affected by moderate coccidial load. Eleven species were of *Eimeria* were identified. The infection with oocyst of *Eimeria media* species display the highest prevalence rate (100%) followed by the E. *perforans, E. magna, E. exigua, E. coecicola, E. irresidua, E. piriformis, Eimeria stiedae, E. flavescens, E. intestinalis*, and *E. vejdovskyi* with an prevalence rate of (90.41, 84.25, 78.08, 76.03, 58.90, 45.21, 36.99, 21.92, 14.38%, and 8.9%) respectively. Mixed infections with two to eight *Eimeria spp* especially those concerning 3 species were common. Rainy seasons and the month of July were the most susceptible for coccidian infection. The results highlight the major impact of age group in the level of coccidial load.

Keywords: *Eimeria*, seasonal, prevalence, rabbits, Côte d'Ivoire.

INTRODUCTION

Rabbit coccidiosis is a common and ubiquitous infection which is of major economic importance. Although mortality can result from heavy infection by these parasites, the majority of infections result in morbidity due to lower weight gain and diarrhoea (Renaux *et al*. 2003). This pathology mainly affects young rabbits after weaning (Qiao *et al*., 2012).

In Côte d'Ivoire, very few studies deal with coccidiosis in rabbit; nevertheless, previous study concluded that *Eimeria* was ubiquitous in rabbit farms in Bingerville with a presence of 11 species. In addition, environmental conditions appear to be favourable for the emergence of this pathology (Kimse *et al*, 2016). To the best of our knowledge there is no published report of seasonal evolution and risk factors of rabbit *Eimeria* infection relating to the meteorological parameters in Côte d'Ivoire which has unique climatic and geographic conditions different from other West African countries.

As epidemiological data are essential to the development of an effective coccidia control strategy, this study was conducted throughout Abidjan district to identify *Eimeria* species, determine prevalence and then establish the seasonal evolution of the coccidial load as well as the correlation available between coccidia infections and meteorological parameters.

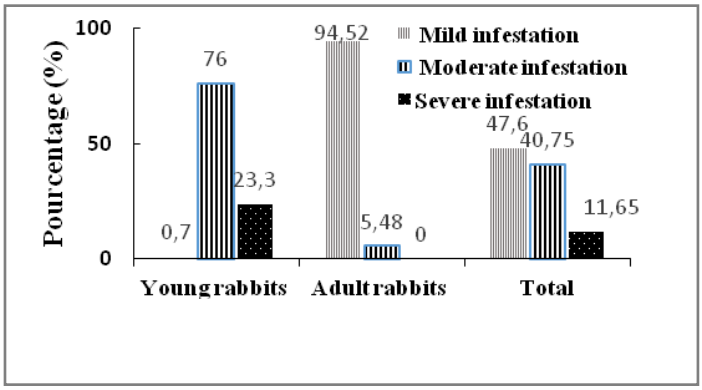
MATERIAL AND METHODS

Study area and rabbit populations

This study took place in 146 rabbit farms in the 10 communes of the city of Abidjan and the 4 sub-prefectures surrounding it. A population of 2000 rabbits (*Oryctolagus cuniculus*) was tested during the period ranging from January 2017 to July 2019. They were randomly selected and classified without gender distinction into two age classes: adult rabbit (age ≥5 months) and young rabbit (40 ~ 60 days).

Sampling

A total of 512 aliquot samples were collected. Sampling was carried out early in the morning between 6 and 10 am once in a mouth. Under each cage, fine-mesh nets were placed 24 hours before droppings were collected. Then 300 g of fresh faeces were collected and stored in sterile plastic faecal canvas before being transferred to the Central Veterinary Laboratory of Bingerville (CVLB).



For each farm visited, 2 aliquots samples were taken 2 days apart in each age class, that is to say 292 samples were taken to identify the different species encountered and to calculate the OPG and prevalence in the farms. In addition, 2 individual samples were taken in each age group on 100 farms out of the 146 surveyed in order to determine the prevalence in the rabbit population and the type of infestation (single or mixed infestation). For the study of seasonal evolution of oocyst excretion in particular, samples were taken once a month on 5 farms according to their location (North, South, East, West and Centre) among those that had a high parasite load, i.e. a set of 120 pooled samples.

Chemical analysis

In order to diagnose the presence and to determine the number of *Eimeria* oocysts per gram of faeces (OPG), a concentration McMaster technique as described by Coudert *et al*. (1995) was conducted. The coccidial load was estimated according to Raunier (2016) and expressed in oocyst per gram of excreta used (OPG). The results obtained were classified into three levels according to Yang *et al* (2016).

For the purpose of distinguishing the different *Eimeria* species and the type of infestation, the non-sporulated oocysts obtained from each sample were purified by the flotation method using a saturated solution of NaCl (d = 1,2). The oocysts were cultured in 2.5% potassium dichromate solution (K2Cr2O7) for sporulation at laboratory temperature (26-28°C) for 7 days. Later, the diagnose of the species encountered was basis on identification keys such as shape, size, colour, presence or absence of micropyle and its cap (Coudert *et al*. 1995; Kvicerova *et al*. 2008).

Data analysis

Statistical analyses were performed using the statistical software R. Comparison and association measurements were based on Chi-square and Fisher tests. Means were tested by analysis of variance (ANOVA) at the 5% significance level.

RESULTS AND DISCUSSION

With regard to the housing, about 82.14% (23 farms) of the 28 exploitations visited used wooden tiered hutches. Feeding racks and drinkers were basic manufacturing or traditional equipment in 26 rabbit husbandry (92.86%). These observations are in line with that made by Tayeb *et al*. (2006) in Morocco and Guindjoumbi, (2007) in Senegal. This kind of equipment is very difficult to remove, to dry, to disinfect and to keep clean while, good farm hygiene is sufficient to maintain low coccidian load on a farm (Gonzalez-Redondo *et al*., 2008; Pakandl *et al*., 2008).The coccidial load ranged from 250 to 265500 OPG with an average of 41068 ± 49232 OPG in Abidjan District. All the farms visited and all rabbits examined were infected as it was previously reported by Farougou *et al*. (2004) in Benin. The coccidial load and the prevalence of coccidiosis were not influenced by the geographical location of the farms (P>0,05). Significant difference (p <0,05) was observed between the old (age ≥5 months) and the young rabbits (40 ~ 60 days). This study revealed the presence of 11 species of *Eimeria* like Kimse *et al*. (2017) in a previous study in Bingerville. The infection with oocyst of *Eimeria media* species display the highest prevalence rate (100%) followed by the E. *perforans*, *E. magna*, *E. exigua*, *E. coecicola*, *E. irresidua*, *E. piriformis*, *Eimeria stiedae*, *E. flavescens*, *E. intestinalis*, and *E. vejdovskyi* with a prevalence rate of (90.41, 84.25, 78.08, 76.03, 58.90, 45.21, 36.99, 21.92, 14.38%, and 8.9%). Mixed infection (2 to 8 species) with three species was most

common than single infestation in the present study like in all previous studies (Yang *et al*., 2016; Kimse *et al*., 2017). The infestation was mild (OPG $\leq 1\times10^4$) in adult rabbits (94.52%) and moderate ($1\times10^4<$ OPG $\leq 10\times104$) in young rabbits (76.03%) which is in contrast with the mild infestation reported by Yang *et al*. (2016) in young as in adult rabbits. This difference could be attributed to the variations in agro-ecology, meteorology, and environmental conditions prevailing in each region (Ravazy *et al*., 2010). There was a significant difference between the highest average coccidial load (53193±14598 OPG) observed during the short dry season (August-September) that is the coldest period of the year and the lowest (30944±6422 OPG) recorded during the long dry season (December-March). Lowest (30944±6422 OPG) recorded during the long dry season (December-March). Similar findings had been picked-up by Zouh Bi et al. (2013) on grass-cutter in Côte d'Ivoire. The high load observed during the short dry season would be explained by the impact of the favourable weather conditions observed during the month of July over August. Indeed, the development cycle of *Eimeria* extends from 7 to 13 days depending on the species in rabbits. Putting together, oocyst excretion was greater during rainy seasons of the year. However, this influence was not significant (P>0,05). This result is similarly to the finding of Laha *et al* . (2015) in India and could be explain by the suitable environmental conditions existing in the study areas. Coccidia were present throughout the year at top prevalence (100%). On the contrary, Elshahawy and Elgoniemy (2018) showed a significant effect of season on the prevalence with highest prevalence in summer. The dynamic of excretion (Figure 2) was characterized by two parasitic explosion in the end of each rainy season in July (79910 OPG) and November (55 695OPG) while coccidial excretion was at its lowest in January (2 545 OPG). Two climatic parameters out of the three studied presented a strong correlation with coccidial load (Table 4). These are mean temperature (r = -0, 80), humidity (r = 0, 77). Rainfall (r = 0, 23) was the less correlated. In fact, the increase in temperature resulted in a reduction of the coccidian load while any rise in relative humidity leaded to an intensification of the oocystale excretion. These observations are similar to those of Laha *et al* (2015) and confirm the fact that sporulation and rainfall depend on temperature and relative humidity of the air (Renaux, 2001; Kouassi et al., 2010).

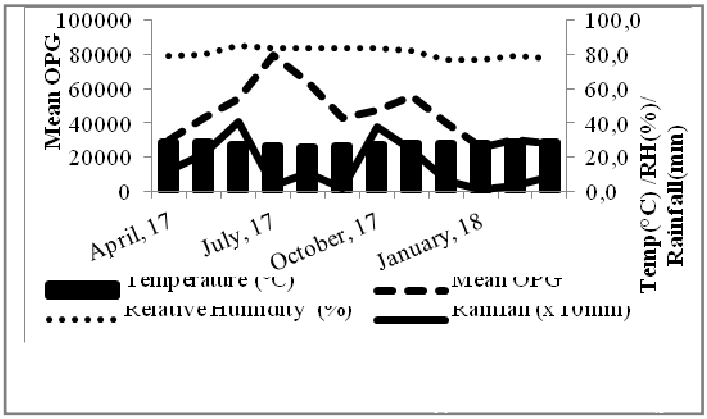
Table 1: Seasonal variation of coccidial load in Abidjan District

Seasons	Coccidial load (OPG)	
Great rainy season (April-July)	51793±21254a	50469±15577a
Short rainy season (September-November)	48705±6490a	
Great dry season (December-March)	30944±6422b	38360±14120b
Small dry season (August September)	53193±14598a	

Values marked with the different letter are statistically different in a column.

CONCLUSION

Results of the present investigation indicated that the prevalence of coccidial infection is high among the rabbit population in the District of Abidjan. Both young and adult rabbits were at the same risk of coccidial infection. However, fattening rabbits were more susceptible to coccidiosis than adults ones. The evolution of the coccidial load of the eleven species of *Eimeria* identified was under the influence of climatic data namely temperature and relative humidity. This impact resulted in an increase of the coccidial load during both rainy seasons of the year, particularly in the end of these periods. This study provided a large number of epidemiological data for development of effective prevention and control strategies against rabbit coccidiosis in Abidjan.



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SEASONAL EVOLUTION OF COCCIDIAL INFECTION IN DOMESTIC RABBITS IN ABIDJAN DISTRICT, COTE D'IVOIRE

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1 Context and objectives

Rabbit coccidiosis is a common and ubiquitous infection which is considered as a major obstacle in rabbits health and production because of mortality and morbidity due to lower weight gain and diarrhoea (Renaux *et al*. 2003). According to Kimse *et al.* (2016), environmental conditions appear to be favorable for the emergence of this pathology in the District of Abidjan (Figure 1). This study was conducted to identify *Eimeria* species, determine prevalence and then establish the impact of seasons and meteorological parameters on coccidial load evolution.

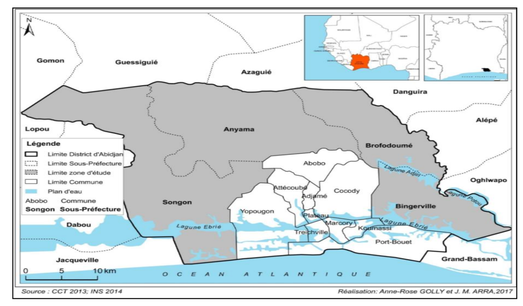


Figure 1: Presentation of the District of Abidjan (Côte d'Ivoire)

Fig.2

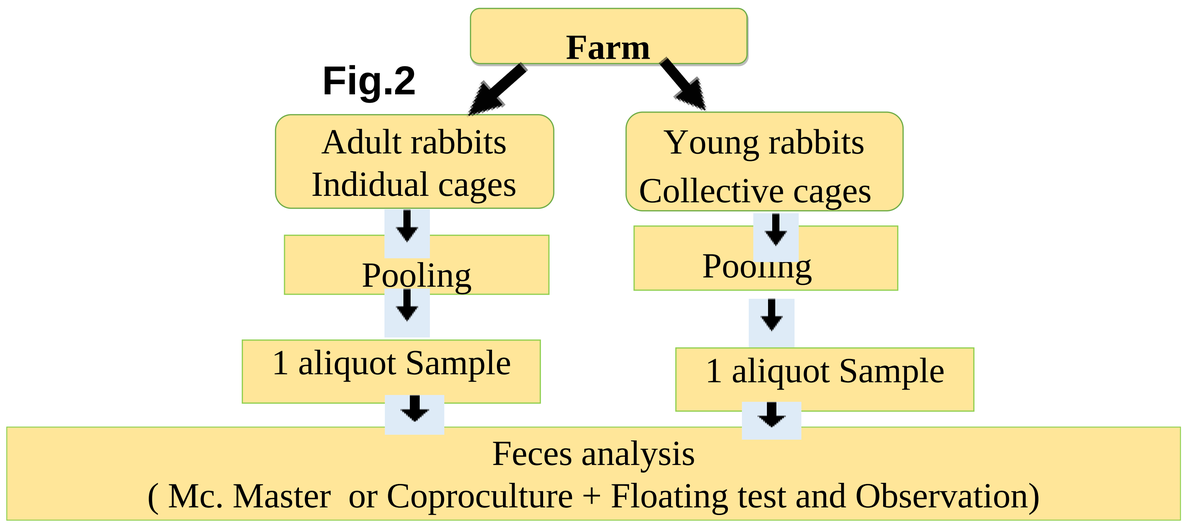


Figure 2: Sampling design

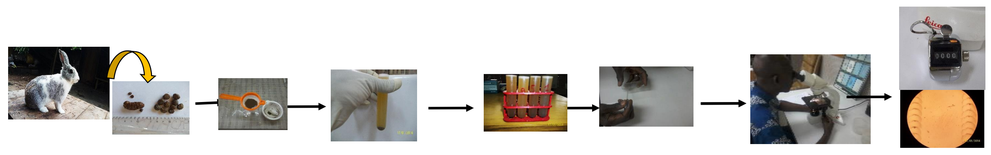
2 Material and Methods

2.1 Animal
- 2000 rabbits *Oryctolagus cuniculus* from 146 husbandries
- Age :adult (age ≥5 months) and young (40-60 days)
- Fed with diet without anticoccidial product

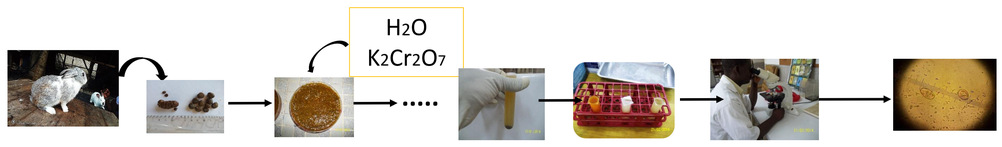
2.2 Cage
- Adult rabbits: individual cages
- Young rabbits (growers): collective cages

2.3 Sampling:512 aliquot samples (fig 2)
- Prevalence and identification : 292+100 aliquot samples
- Seasonal evolution of coccidial load**:** 120 pooled samples

2.4 Oocysts diagnosis and counting (OPG): Mc. Master method



2.5 Identification and infestation types : Culture + Floating test



2.6 Statistical analysis (statistical software R)
- Means tested by analysis of variance (ANOVA) at the 5% significance level
-measurements were based on Chi-square and Fisher tests

3 Results

3.1 Coccidian load and prevalence (Fig 3)
- The coccidial load ranged from 250 to 265500 OPG.
-Overall mean OPG = 41068±49232 OPG (Table 1).
-Overall prevalence = 100%
-Mild infestation in adult rabbits, moderate infestation in young rabbits

3.2 *Eimeria* species identification and types of infestation
-11 species
-*E. media* was the most prevalent specie (100%)
-Mixed infections (2 to 8 species) were most common
-Concurrent infections with 3 species was the most prevalent (33,35%)

3.3 Effects of seasons and meteorological data on OPG (Fig4; Table I)
-High OPG during rainy seasons, no significance (P>0,05)
-Strong correlation between coccidial load T° (r = -0, 80) and RH (r = 0, 77)

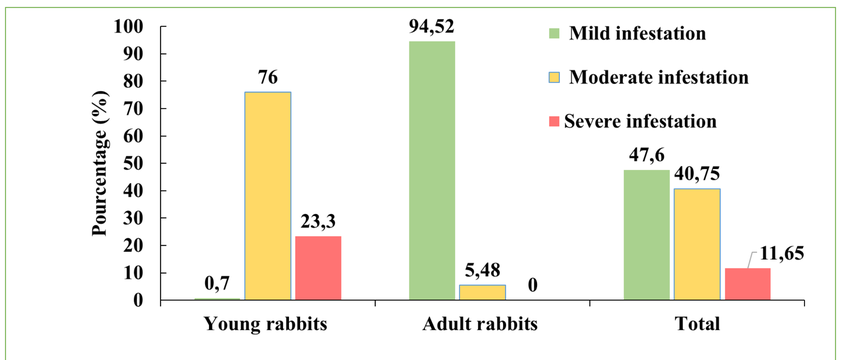


Figure 3: Effect of age on the severity of coccidial infection in domestic rabbits

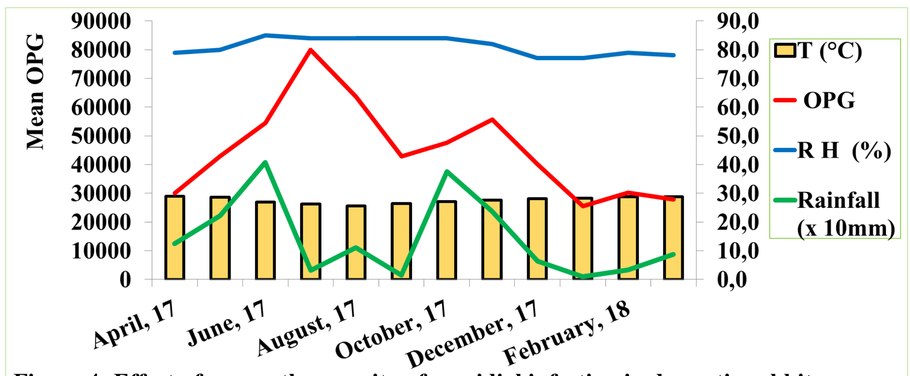


Figure 4: Effect of age on the severity of coccidial infection in domestic rabbits

Table I: Seasonal variation of coccidial load in Abidjan District

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Small dry season (August September)	53193±14598a	

Conclusion

Dakouri S. A

Prevalence of coccidial infection is high in the rabbit farms of the District of Abidjan (100%). Fattening rabbits were more susceptible to coccidiosis than adult ones. The evolution of the coccidial load of the eleven species of *Eimeria* identified was under the influence of temperature and relative humidity. This impact resulted in an increase of OPG during both rainy seasons of the year, particularly in the end of these periods.

KIMSE M

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