

1ST INTERNATIONAL SCIENTIFIC
CONGRESS
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Veterinary Medicine Sessions

Program and Abstract Booklet



Iași, 23-25 October 2014

chickens aged between 19 and 50 weeks and from three areas in the uterus: anterior, medium and posterior. The samples were fixed in 4% buffered formalin, embedded in paraffin, sectioned at the size of 5 µm and stained H-E, PAS, van Gieson, Masson, von Kossa, Novelli and Gomori. The uterus is structured from a mucous tunic with an epithelium and lamina propria; a submucous tunic with connective tissue and blood vessels; a muscular tunic with two layers of smooth muscle tissue and a serous tunic on the outside that is a fasciculated mesothelium. The epithelium consists of secreting goblet cells and prismatic cells with cilia. These two types of cells alternate in the epithelium but before the egg passage the goblet cells seem to dominate because they are filled with secretion and after the egg passage the prismatic cells apparently dominate because once the goblet cells release their secretion they become very thin and are overlaid by the other cells. These secreting cells from the epithelium have an important role in the mineralisation of the eggshell, the von Kossa stain highlighting the mineralisation sites in the epithelium. The mucosa presents leaf-shaped primary folds with secondary and tertiary folding that enlarge the secreting surface of the epithelium detrimental to the development of the tubular glands in the lamina propria. The muscle tunic is very well developed, having the main role of keeping the egg in this segment and rotating it for about 19 hours in order for the elaborated material to be deposited on the egg mass. As this role is realised in particular using the inner circular group of smooth muscle tissue, this layer is much more developed.

Key words: anatomy, chicken, histology, SEM

P(12) EFFICACY OF *ARTEMISIA ANNUA* AGAINST *EIMERIA* SPP. INFECTION IN BROILER CHICKENS IN A BATTERY TRIAL

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Abstract

The goal of this study was to evaluate the efficacy of *A. annua* as essential oil in preventing *Eimeria* infection in broilers. Sixty broilers of fourteen days were randomly divided in 3 groups of 20 chickens as follows: negative control (NC) (uninfected, unmedicated), positive control (PC) (infected, unmedicated) and experimental group (EG) (infected, medicated). Experimental infection was done with 1×10^4 oocysts of *Eimeria* spp. and treatment with 0.15 ml essential oil of *A. annua*/l water for 27 days. The chickens were kept in batteries, fed and watered ad libitum, and were exposed to continuous light. Essential oil of *A. annua* was obtained from a Romanian variety through a hydro-distillation process of plants vegetative parts, blooms and flowers. Efficacy of *A. annua* against *Eimeria* spp. infection was evaluated by: (i) oocysts shed per gram of feces; (ii) lesion score; (iii) body weight gain; (iv) feed conversion ratio; and (v) mortality rate. The inoculum used for experimental infection consisted in *E. tenella* 35.0%, *E. acervulina* 32.5%, *E. mitis* 25.0%, and *E. maxima* 7.5%. All chicks survived in NC and EG, in PC 2 chickens died, at 7 and 10 days after challenge. Chickens treated with essential oil of *A. annua* produced with 97.1% less oocysts than chickens from PC, while the mean lesion score was lower only with 35.3% (EG = 0.86, PC = 1.33). Following the intestinal segment the highest reduction of lesion score in EG was registered in duodenum (1 and 2 in PC) and caeca (0.4, and 1 in PC), while in the jejunum was higher than in PC (1.2, and 1 in PC). Body weight gain and feed conversion ratio were higher in chickens medicated with *A. annua* and in chickens from NC at 7 days post-infection, but at 27 days post-infection chickens from PC presented a higher body weight gain and a lower feed conversion ratio. According to our results, *A. annua* Romanian variety as essential oil can be used with good results to treat coccidiosis mainly caused by *E. tenella* and *E. acervulina* in chickens, and not for prevention. Further analysis must be done.

Keywords: coccidiosis, *Eimeria*, poultry, *Artemisia*.

EFFICACY OF *ARTEMISIA ANNUA* AGAINST *EIMERIA* SPP. INFECTION IN BROILER CHICKENS IN A BATTERY TRIAL

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INTRODUCTION

Coccidiosis is one of the most important diseases of the poultry industry, caused by intracellular protozoan parasites of the genus *Eimeria*. It produces severe economic losses worldwide due to expensive and ineficient control measures leading to increased mortality, growth depression and poor feed conversion in broiler chickens. Combined, this losses exceed 3 billion US\$ annually in the entire world (Dalloul and Lillehoj, 2006).

Control of coccidiosis is based on the use of in-feed anticoccidial drugs and rarely of live vaccines (Peek and Landman, 2011). The extensive use of prophylactic anticoccidial drugs has led to the development of drug resistant strains of *Eimeria* against all products introduced (Chapman, 1997). Live vaccines can restore drug sensitivity and proved to be efficient in controlling the disease, but they are expensive and have adverse effects on early chick growth (Williams, 2002).

Therefore, there is an increasing need in discovering new alternatives for coccidiosis control. In the last decade, many different natural products such as mushrooms, and plant extracts have been tested for anticoccidial activity (Tewari and Maharana, 2011). Amongst them, *Artemisia annua*, a traditional Chinese medicine used for malaria treatment, was found to be effective against *E. tenella* and *E. acervulina* (Allen et. al, 1997). It is believed that acts by inducing oxidative stress (Allen et al., 1998). There are studies showing that artemisinin, a sesquiterpene lactone from *A. annua*, can significant decrease the number of oocysts shedded by chickens infected with *Eimeria* spp. (Arab et al., 2006; Naidoo et al., 2008).

In this study, we investigated the anticoccidial effects of *A. annua* as essential oil in broilers kept in batteries.

MATERIALS AND METHODS

Animals, parasites and *Artemisia* product

- One day-old 60 broilers Ross 308 hybrid
- A suspension of mixed *Eimeria* species (field isolate)
- Essential oil of *A. annua* obtained from a Romanian variety (Fig.1)



Experimental design

- Chickens were kept in batteries, feed and water were provided *ad libitum* and were exposed to continuous light
- Fed with starter feed without anticoccidials until the date of the experiment
- At 13-days-old chickens were divided into 3 groups of 20 birds each (Table 1)

Experimental groups	1X10 ⁴ oocysts of <i>Eimeria</i> spp.	<i>A. annua</i> essential oil
NC (negative control)	-	-
PC (positive control)	+	-
EG (experimental group)	+	+

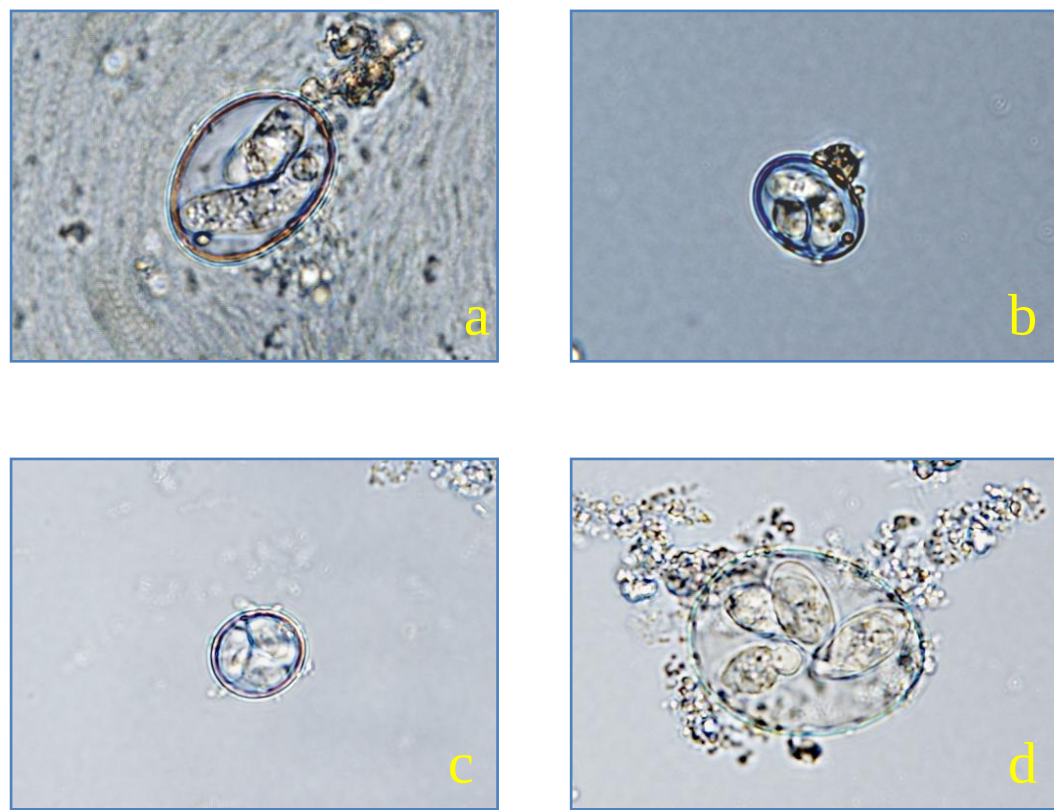
- *A. annua* essential oil - 0.15 ml/l water – administered the entire period of the experiment (27 days p.i.)

Efficacy of *A. annua* (essential oil) against *Eimeria* spp. was assesed by recording:

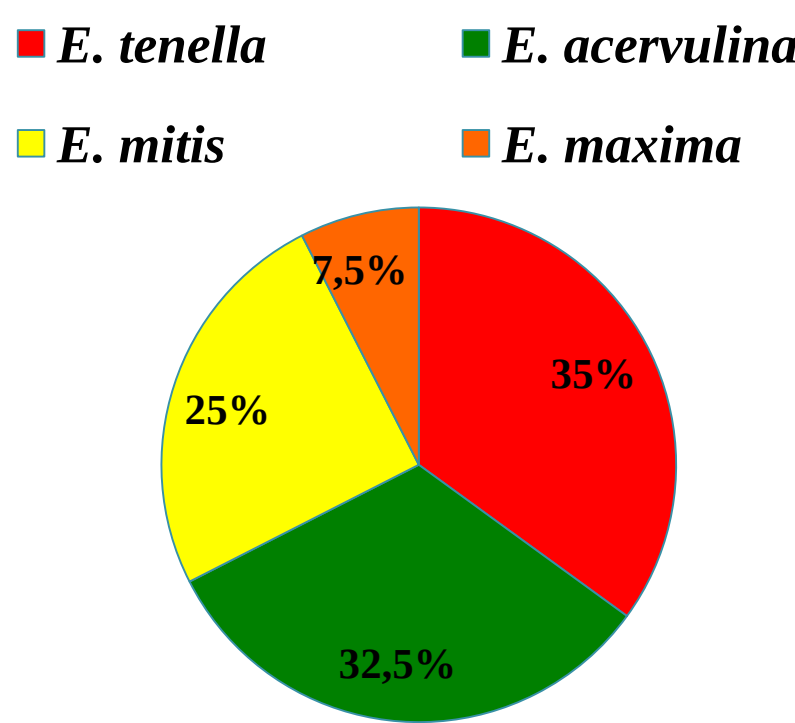
- (i) clinical signs;
- (ii) mortality percentage;
- (iii) number of oocysts shedded/g of faeces (OPG – days 5-18 p.i.)
- (iv) lesion score at 7 and 27 days post infection
- (v) body weight gain (BWG) at 7 and 27 days p.i.;
- (vi) feed conversion ratio (FCR) at 27 days p.i.

RESULTS

Eimeria species

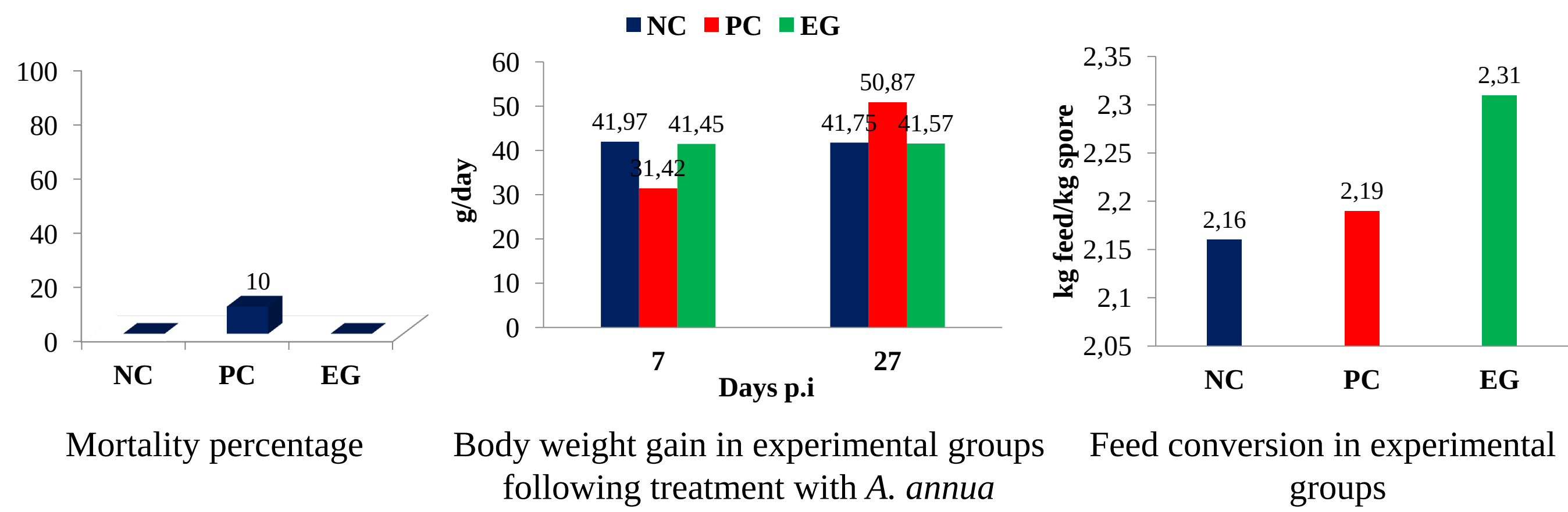


Species of *Eimeria* in the inoculum based on morphology of the sporulated oocysts. *E. tenella* (a), *E. acervulina* (b), *E. mitis* (c) and *E. maxima* (d).

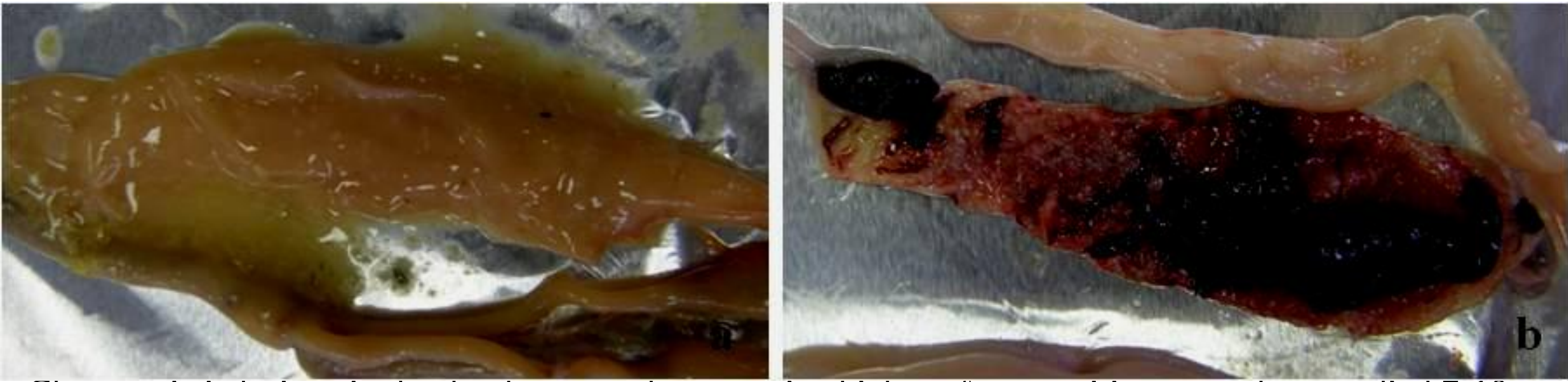
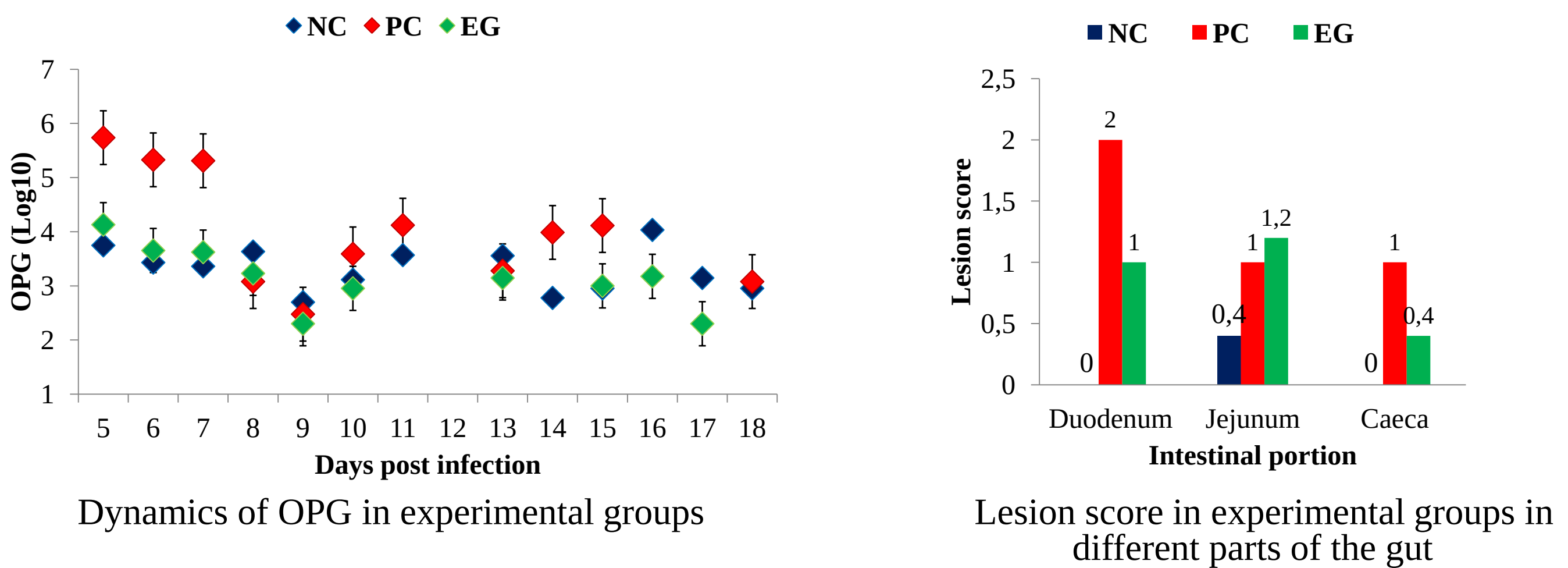


The structure of eimerian population used for experimental infection

Mortality, body weight gain (BWG) and feed conversion (FCR)



OPG and lesion score



Characteristic lesions in the duodenum and caecum in chickens from positive control group died 7-10 days postinfection. (a) White streaks oriented transversely across the intestine , lesion score 2. (b) Hemorrhagic typhlitis, lesion score 4.

CONCLUSIONS

A. annua Romanian variety as essential oil can be used with good results to treat coccidiosis mainly caused by *E. tenella* and *E. acervulina* in chickens, and not for prevention. Essential oil of *A. annua* Romanian variety had no effect against *E. maxima*, according to lesion score in the jejunum. Further analysis must be done.

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AKNOWLEDGEMENTS

This work was partially supported by UEFISCDI, project number PN II-PCCA Tip 2 110/2012 and was published under the frame of European Social Found, Human Resources Development Operational Programme 2007-2013, project POSDRU/159/1.5/S/136893.