Citation: Almeida, G.F.D., Thamsborg, S.M., Campos, D.M.B., Horsted, K., Magalhães, P.M.d., Ferreira, J.F.S., Hermansen, J.E., 2016. The effects of dried leaves of Manihot esculenta and Artemisia annua on coccidiosis in organically reared pullets in Brazil. In: 5th EAAP International Symposium on Energy and Protein Metabolism and Nutrition. Krakow, Poland, 12-15 September 2016. EAAP Publication No. 137, pp. 335-336.

The effects of dried leaves of *Manihot esculenta* and *Artemisia annua* on coccidiosis in organically reared pullets in Brazil

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Abstract

The effects of *Manihot esculenta* and *Artemisia annua* as natural coccidiostats were investigated as compared to a vaccinated group. The inclusion of *Artemisia annua* showed poorer performance compared to the vaccinated group whereas dried leaves of *M. esculenta* presented similar results of a commercial vaccine in performance and smaller oocyst shedding at 21 days of age. *Manihot Esculenta* might be an option as natural coccidiostat for organic and slow input poultry systems and deserves further investigation.

Key words: natural anti-protozoa drug; cassava; organic systems, layers.

Introduction

Coccidiosis in poultry systems has been prevented through the addition of anti-coccidial drugs in feed. However, the risk of drug residues in poultry products has drawn attention to food with minimal drug use. In this respect, new methods to control the disease through food supplements described as "natural" are likely to play an increasing role since they have been well accepted by consumers. The use of live attenuated vaccines is a useful option available in the market, although not always affordable to the small scale farmer. Thus, we investigate possible benefits of *Manihot esculenta* and *Artemisia annua* as potential coccidiostats provided with daily feed on performance and oocyst excretion.

Material and methods

The study was performed in an organic commercial farm located in São Paulo state, Brazil (22°38′ S, 47°00′ W). Eight groups were randomly allocated to pens (4 x 8 m) with concrete floor and access to an outdoor chicken run/corridor (during the experimental period birds did not access outdoor corridors). 1,280 one-day Isa Brown pullets were distributed in a completely randomized design of four treatments with two replicates of 160 birds per pen. Treatment 1 (Vac), birds were vaccinated at 4 days of age with a commercial vaccine (Livacox Merial®). Treatment 2 (Aad1), dried powder of *A. annua* was supplied in a concentration of 3% of the diet since one day old. Treatment 3 (Aad30), *A. annua* was supplied in a concentration 3% of the diet from 30 days of age. Treatment 4 (Cad8), *M. esculenta* dried leaves were supplied in the first 8 days of birds life at 3% through diet. From first week to seven weeks old, 10% of animals per group were weighed and feaces was collected for oocysts counting. An ANOVA test was performed to assess the differences considering time and treatment effects including interactions on body weights (BW) and mean oocyst excretion (OE). Box-Cox transformations were used in order to stabilize variances due to the small number of replicates. The Gompertz equation was also fitted to the means in order to estimate the growth parameters.

Results and discussion

Supplementation of *A annua* at 3% at daily feed influenced negatively BW in the 49 days trial. Gompertz equation presented different parameters for mature body mass, age of inflection point and growth rate for the experimental treatments (Figure 1). The mature body mass of Vac and Cad8 were similar, suggesting that *M. esculenta* dried leaves might not affect growth rate of the Isa Brown pullets.

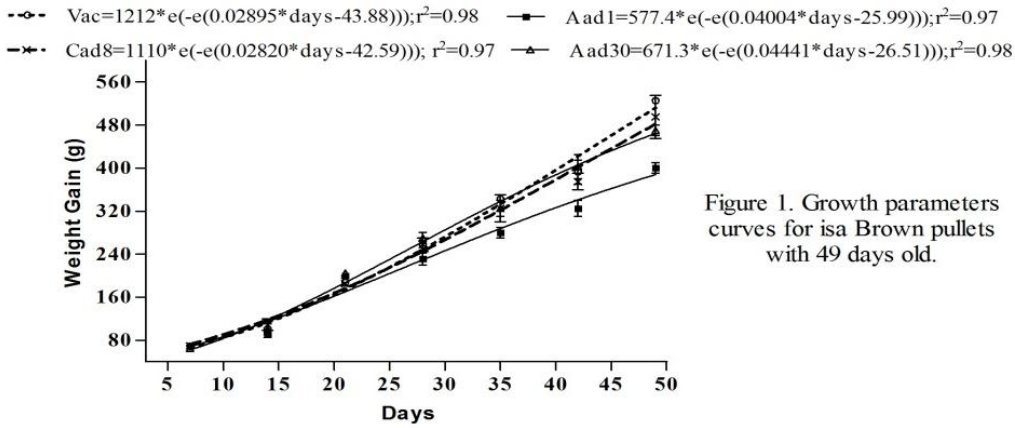

Figure 1. Growth parameters curves for isa Brown pullets with 49 days old.

An interaction among treatment and time was found for OE for the group supplemented with cassava at 21 days (Table 1) suggesting an infection delay attributed to cassava active ingredients.

Table 1. Log transformed means of oocyst excretion of Isa Brow Pullets from 21 to 49 days old.

Treatments	Time (weeks)				
	21	28	35	42	49
Vac	9.32 Aa	11.18 Aa	8.97 Aa	7.20 Aa	6.49 Aa
Aad1	7.49 Aa	7.80 Aa	10.14 Aa	9.23 Aa	10.52 Aa
Aad30	6.68 Aa	9.15 Aa	8.79 Aa	9.14 Aa	11.32 Aa
Cad8	-0.69 Ab	7.50 Aa	9.05 Aa	9.97 Aa	11.63 Aa

Log means followed by the different letters, uppercase in line and lowercase in row, differ statistically from each other (Tukey< 0.05).

A negative effect of Aad1 over bird's growth was observed. Artemisinin, the main bioactive component in *A. annua* leaves is bitter. It influenced negatively feed consumption in agreement with a previous study with broilers in a free range system (Almeida et al., 2012). For Cad8, bioactive components are believed to be condensed tannins (CT). Seng and Rodriguez, (2001) showed its potential coccidiostatic effect in parasitized goats. In our study with pullets, dried leaves of *Manihot esculenta* presented similar results of a commercial vaccine in performance and smaller OE at 21 days of age. It would be a cheap strategy to control coccidiosis in organic slow input poultry systems and the plant deserves further investigation.

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