EFFECT OF EXOGENOUS ENZYMES ON PERFORMANCE OF BROILER CHICKEN IN ALGERIA

Sahraoui Naima[1)*], M Hider[1)], M. Doudah[1)], M. Brahim Errahmani[1)], J. L. Hornick[2)]
*[1]Institut des Sciences Vétérinaires, Université de Blida, 9400 Blida, Algérie; [2]Service de Nutrition, Liège, Belgique; *Corresponding author: nasahraoui@gmail.com*

Abstract. The aim of this study is to evaluate zootechnical and biochemical parameters in poultry farm after using dietary exogenous enzymes. This study was conducted on a total of 7.400 chicks from Arbor Acres strain. They were divided into two groups, one received a basic diet (standard) not supplemented with enzymes as control throughout the rearing period and the other a diet supplemented with enzymes. Growth performance, feed efficiency and mortality were recorded at the end of each week. Results showed that the addition of the enzymes does not significantly improve body weight and feed conversion during the breeding period. However, the mortality rate was higher in the control group compared to the one supplemented with the enzymes. The group exposed to exogenous enzymes had lower level of serum glucose (1.75 g.L-1vs 2,60 g.L-1), respectively for the control and experimental group) and not significantly higher levels of triglycerides (0,87 vs 0,53 g.L-1), HDL (0,79 vs 0,75 g.L-1) and LDL (0,28 vs 0,16 g.L-1). Exogenous enzymes proved some positive effects on zootechnical parameters and serum glucose in Algerian broiler chicks.

Keywords: broiler, exogenous enzymes, animal performance, plasma parameters.

INTRODUCTION

Since the 1940's antibiotic growth promoters (AGPs) are an integral part of livestock production. However, the excessive use of antibiotics led to the development of antibiotic resistance, a serious risk for animal and human health. Resistance is developed as a reaction of the bacteria to defendit self and offer resistance to antibiotics through mutation.There has been a lot of research activity looking at possible alternative compounds. Public pressure and concerns about food and environmental safety (antibiotic residues, antibiotic-resistant pathogens) have driven researchers to actively look for alternatives to antibiotics. Some of the alternatives include pre- and probiotics, organic acids and essential oils (Diarra and Malouin, 2014). Feed additives based on plant extracts aim at improving the animal health and the qualities of its feed: added in small quantities to the raw materials, they preserve the animal health, improve the rations efficiency, reduce the production costs, and enhance the product features.

Many alternatives to AGP, such as pre- and probiotics, symbiotics, hormones, organic and inorganic acids, ionophores, herbs and ethereal oils, methane inhibitors and other additives including enzymes in animal diets, have been explored for a decade. These practices not only impose an extra financial burden on animal producers but they also leave residues in animal products, which may cause health concerns (Sharma *et al.*, 2008). With the restricted use or outright ban on certain feed additives, new strategies of improving and protecting the health of farm animals must be explored. Additionally, useful additives should ensure optimum animal performance and increase nutrient availability. Among these products, enzymes have a great interest. They act as catalysts, improve the digestibility of food components and reduce wet droppings and odours. This is the context of this study in

which it is evaluated the nutritional efficiency of enzymes in broiler chickens as well as their impact on some biochemical parameters.

MATERIALS AND METHODS

Place and duration of the study. This study was carried out on seven thousand four hundred arbour-acre stalk chicks, distributed in two groups, exposed to similar ambient conditions, a control group (n = 3700) and an experimental group (n = 3700). The birds were placed in the battery cages, and the temperature was controlled and gradually reduced from 30◦C to 20◦C on day 42. The birds were vaccinated against New Castle and Gumboro's diseases. Fresh feed and water were provided daily on an ad libitum basis. The birds in the control group were given a diet without additives (T_1). The ingredient of the control diet were maize, soya bean meal, salt, vitamin and trace element mixture. The experimental group was given the same diet as fed to the control group but was supplemented with 350 g/toe enzymatic complex (cellulose, xylanase, alpha-amylase, beta-glucanase, phytase, protease).

Measurements. The body weight of 12 birds randomly chosen was recorded on at weekly intervals. The cumulative feed consumption was also recorded on aweekly basis. Feed conversion ratio (FCR) was worked out at weekly intervals by taking intoconsideration the weekly body weight gain and the feed consumption. The mortality in the two groups was recorded daily. Blood samples were collected on 15 animals in each group at 56 days of age from the slaughtered birds in non heparinised tubes. The samples were centrifuged at 3000 rpm for 15 minutes, and the serum obtained was stored at −20∘C until analysis. Serum glucose, cholesterol, triglycerides, creatinine, urea, HDL, LDL were determined by auto analyzer using commercially available kits.

Statistical analysis. The evolution of the zootechnical parameters was compared with the "separate-slopes model" of the Statistica General Linear Model (GLM) test. After verifying the homogeneity of the variances of the biochemical parameters, the means of the control and experimental groups were compared by Student tests and the differences considered significant for $p < 0.05$.

RESULTS AND DISCUSSION

Animal performance

The chickens in the experimental batch showed a numerical higher growth than that of the control group. The mean weights at the end of the experiment (d56) were 3040g for the experimental batch and 2713 g for the control group, respectively (P = 0.83, Figure 1). Our results are close to those reported by Mathlouthi *et al.* (2011), on 52-day old chiks (1953 vs 2017 g). Khan *et al.* (2006) and Abudabos *et al.* (2010) also found significant improvements in growth when broiler chickens were fed with corn based diets supplemented with enzymes.

There were no significant difference between the groups for the FCR (p = 0.75) but the animals from the experimental group showed higher numerical values (Figure 2).

According to Abudabos *et al.* (2010), a diet based on exogenous enzymes results in a decrease in FCR.

The mortality rate recorded in the control group was higher than those observed in the experimental group (P = 0.03), throughout the trial period (Figure 3) and increased with

the age (P = 0.03). It must be noted that two pathological episodes of coccidiosis and colibacillosis occured during the experiment.

A lower mortality rate in the experimental group could be explained by the effectiveness of the enzymes in improving the digestibility of the diet. Moreover, according to Bedford [6], use of exogenous enzymes affects positively populations of intestinal microbial flora in the small intestines and caeca. Rosen [7], as for him, reported a positive effect of enzymes on chick survival.

The biochemical parameters of the control and supplemented groups are presented in Table 1.

The glucose concentration was higher in the experimental batch than in the control one (2.6 vs 1.75) but not significantly although close to (p = 0.11). Fontaine obtained similar values for experimental group to our control group (1.50 to 1.80 g.L-1). This observation can be explained by the effect of enzymes that clived some non-digestible carbohydrates, which induces an increase in glucose availability in intestine or propionate available for neoglucogeneis in caeca.

The results obtained showed a reduction in plasma triglyceridemia levels in the experimental group when compared to the control group (0.53 vs 0.87 g L -1). This difference was close to a trend (P = 0.11).

Alower value of plasma cholesterol was observed in the control group. This couldbe due to higher cleavage of non-digestible carbohydrates, reducing the amount of acetate available for fatty acids and cholesterol synthesis at hepatic level. Other effects could be associated with some changes in gutmicrobiota of the chickens (Abdullah *et al.*, 2006), The results did not show any significant difference in HDL between the experimental and control groups (0.75 vs 0.79 g.L-1).

Finally, exogenous enzymes neither affect serum creatinine in broiler chickens nor urea level. To some extent, this was expected since the protein quality and level of the experimental diet was insignificantly changed.

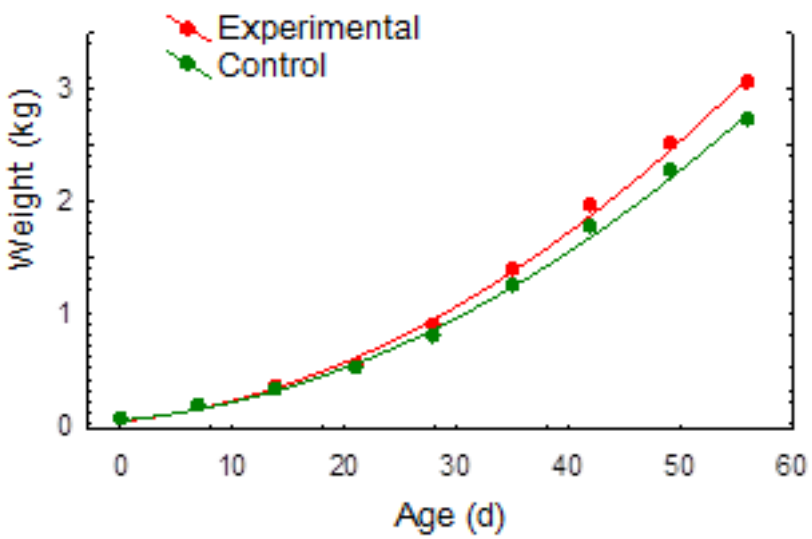

Fig 1. Evolution of the mean weight according to age in poultry fed a diet supplemented or not with enzymes

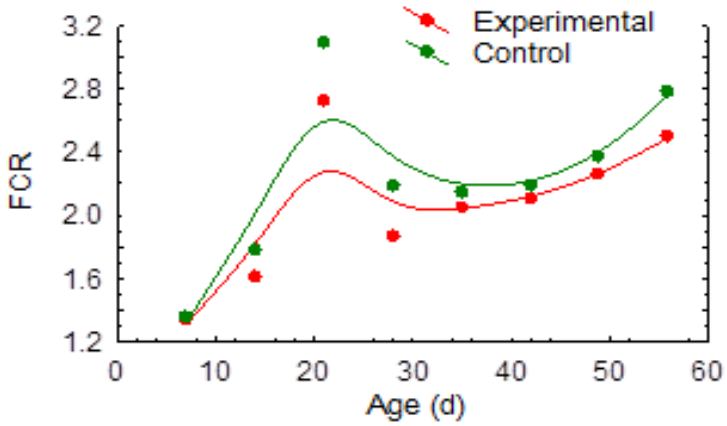

Fig 2. Weekly change in the feed conversion ration in poultry fed a diet supplemented or not with enzymes

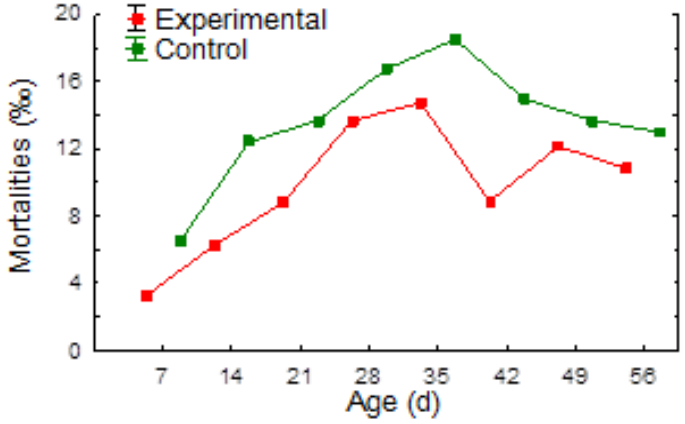

Fig 3. Evolution of weekly mortality rate in poultry fed a diet supplemented or not with enzymes

Table 1

Biochemical parameters in poultry fed a diet supplemented or not with enzymes (mean±SD)

Parameters ($g.L^{-1}$)	Group		P>F
	Experimental (15)	Control (15)	
Glycemia	2,60	1,75	0,11
Triglycerides	0,53	0,87	0,11
Cholesterol	1,01	0,91	0,50
HDL	0,75	0,79	0,81
LDL	0,16	0,28	0,31
Creatinine	3,40	3,00	0,35
Urea	0.02	0,03	0,38

CONCLUSION

This experiment made it possible to demonstrate, in algerian conditions, some effect of enzyme in diet on animal performance and biochemical parameters of the broiler chicken.

They tend to improve animal performance, but also seems to modify interestingly some digestive and fermentative processes in the gut.

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