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EFFECT OF PROBIOTIC FEED ADDITIVES ON BROILER CHICKENS HEALTH AND PERFORMANCE

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ABSTRACT: *Antibiotics were very important pieces of the puzzle that enabled the poultry production to move from a backyard flock based industry to the large-scale production facilities of today. Public health professionals have suggested that the use of subtherapeutic antibiotics in animal production may be partially responsible for the development of antibiotic resistant bacterial populations. The probiotics may be substituted by antibiotics (growth promoting) in certain cases. Pediococcus acidilactici is a bacterial probiotic used in this experience. 16000 broiler chickens were assigned in two experimental groups: treatment (10^9 cfu/kg of feed of Pediococcus acidilactici MA18/5M) and control. In each group 8000 broiler chickens were allocated in the same batch and divided by a physical barrier. Individual live weight of a sample of 200 birds for each group from day 0 to day 56 was measured weekly. Feed intake, feed efficiency, mortality, carcass quality, serum lipids (cholesterol and triglycerides) and number of white blood cells, were recorded per group. The administration of Pediococcus acidilactici affected positively the growth performance of broilers (2586.43 vs. 2252.79 g, p≤0.01) and feed conversion ratio (2.00 vs. 2.5). There were no significant difference between groups in dressing, breast meat and thigh percent, at the end of day 56. Analysis of variance showed significant difference between treatments for serum lipids (p≤0.01). Mortality was almost similar in both groups (6.56 vs. 6.51). The numbers of white blood cells were significantly affected by dietary treatment (p≤0.01).*

Key words: *Probiotic, Broiler chickens, Health and Performance of production*

ORIGINAL ARTICLE

INTRODUCTION

The development of resistance to certain antibiotics poses real problems to the animal and public health (Barton, 2000; Hofacre et al. 2001). Consequently, many additives (prebiotics, probiotics, symbiotics…) raise a particular interest as products of substitution to antibiotics in order to improve the production performances and the health of animals (Bach, 2001; Revington, 2002).

Pediococcus acidilactici is a probiotic bacterium that presents positive effects on the balance and the role of the intestinal flora; it also reinforces the immune defense and improves the production performances of animals (Jin et al. 2000; Coppola and Turnes, 2004; Stella, 2005).

The objective of this study is to evaluate in field conditions, the effect of probiotic feed additive (*Pediococcus acidilactici*) on the production performances (feed intake, weight gain, feed ratio and carcass yield), and on the blood lipids concentration and the immunity of broiler chickens.

MATERIALS AND METHODES

Place of the study

The trial has been conducted at the Poultry Center of Tazoult (Batna), Algeria. This centre is constituted of 10 buildings having the same technical features (materials of construction, surface area, extractors, pad colling, food and watering chains). Buildings having served to the experimentation have a surface area of 1000 m².

Animals

The trial has been conducted on 16 000 chicks of the strain ISA 15, coming from the same hatchery. They were allocated to two treatment groups of 8000 chicks each (control group and experimental group), raised separately in two identical buildings. Animals have been followed during all the trial period of 56 days of raising. At each weighing, 200 subjects were chosen randomly from both groups for individual weighing.

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Feed

The feed is supplied by the centre of Tazoult that possesses its own unit of feed manufacture. Three types of feed have been distributed according to periods of raising: a starter feed (d0-d21), a grower feed (d22-d42) and a finisher feed (d43-d56) (Table 1).

Two treatments have been compared in this survey:

A control group (Cont.) receiving a classic feed based on maize and soybean meal and an experimental group (Exp.) fed with the same feed than the (Cont.) combined with 10^9 ufc of Pediococcus acidilactici (MY 18/5M) /kg , equivalent to 100 grams of probiotic per ton of feed. Neither antibiotic, nor anticoccidial has been added to the feed.

Measured parameters

During the experimental period, feed intake, individual live weight of 200 birds per group, feed ratio and mortality rate have been measured weekly for both treatment groups.

At the end the experimental period 20 chickens from each group have been sacrificed then weighed in order to determine the carcass yield. Two types of yields have been calculated: weight of fat/weight of the carcass and weight of carcass eviscerated/weight of carcass non-eviscerated. The carcass yield permits to measure the probiotic effect on the quality of the carcass.

The number of white blood cells, the serum cholesterol and triglycerides concentration have been determined by blood withdrawals done on 80 chickens chosen randomly from each treatment group.

Statistical analyses were carried out using ANOVA and the general linear model procedures (GLM) of SPSS version 16.0 (SPSS Inc. Chicago, IL, USA), followed the post-hoc was performed by turkey test to determine the level of significance among mean values. The p-values less than 0.01 were considered to be significant.

RESULTS AND DISCUSSION

Broiler chickens performance

Results of production performances are summarised in Table 2. The evolution of the live weight of the Experimental group is marked, from the sixth week, by a significantly higher live weight than the Control (1703.67±34.4 vs. 1574.11±33.39 g). The average live weight at the end of the experimental period is 2586.48 g and 2252.79 g for the (Exp.) and (Cont.) group respectively, which corresponds to an improvement of 12.89%.

These results agree with the works of Cavazonni et al. (1998) and Stella (2005). Kabir et al. (2004) observed an improvement of the chickens' weights with other probiotics; however Karaoglu and Dardug (2005) did not establish any effect with *Saccharomyces cerevisiae*.

During all raising phases, chickens having received a supplemented diet with *P. acidilactici* presented feed ratios lower than the Control (Table 3). At the eighth week, chickens of the (Cont.) group had a feed ratio slightly higher than that of the (Exp.) group (2.45 vs. 2.37) respectively. Studies done by Pelicano et al. (2004); Silva et al. (2000); Franco et al. (2005) demonstrated an improvement of the feed ratio with chickens fed on probiotics such as *Bacillus subtilis*, *Lactobacillus acidophilus*, *Saccharomyces cerevisiae* and *Enterococcus faecium*. Johri (2004) did not observe any positive effect on the feed ratio of the chickens when *Streptococcus lactis* was incorporated in the feed.

The mortality rate in the two treatment groups is almost identical (6.57 vs. 6.51). Siwicki et al. (2005), Ramirez (2005) proved a reduction of the mortality rate due to the addition of probiotics in feeds of chickens.

Results concerning the carcass yield and the abdominal fat are summarised in Table 4. There was a clear influence of the use of *P. acididilactici* on the final quality of chickens' carcasses, a significant improvement ($p \leq 0.01$) of the carcass yield is noted (60.40 vs. 66.32%) for (Cont.) and (Exp.) respectively. However there was no significant reduction in the abdominal fat yield for the (Exp.) group in relation to the (Cont.) (1.90 vs. 2.27%). Kalavathy et al. (2003, 2006); Miazzo et al. (2005) observed a significant reduction of the abdominal fat content of the chickens, whereas Pelicano et al. (2004) and Arslan (2004) did not observe any effect of probiotics on the carcass yield of the chickens.

White blood-cells count

The number of white blood cells has been influenced by the addition of the probiotic in the diet. A significant difference ($p \leq 0.01$) has been observed between the (Cont.) group (25260 ± 3258 /mm^3) and the (Exp.) group (30365 ± 3210 /mm^3). (Table3). Sharef et al. (2009); Al-Mansour et al, (2011) observed that chicks fed supplemented diets with yeast culture in the rate of 1.5 g/kg had significantly ($p<0.05$) lower white blood cell counts compared to control

Serum lipids concentration

The analysis of serum lipids' concentration of the broiler chickens is summarised in the table 5. The content in lipids of blood that is represented by triglycerides and cholesterol is reduced in a significant manner ($p \leq 0.01$) in the group of chickens receiving *P. acidilactici*, during all raising phases. This could be explained by the fact that probiotics may possess the property of reducing cholesterol in the blood, which is due to the inhibition of the hepatic synthesis of cholesterol, and to their capacity of deconjuguating the biliary salts (Mercenier et al., 2002;

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Pereira et al., 2003; Lim et al., 2004). On the other hand, Kanashiro et al. (2001) and Djouvinov et al. (2005) did not observe any variations of cholesterol and triglycerides content in chickens' blood while using mixture of different strains of probiotics (*lactobacillus sp, bacillus sp, enterococcus faecium, streptococcus thermophilus*) in the diet.

Table 1 - Composition of the broiler chicken feeds (%)

Ingredients	Starting phase (d0-d21)	Growing phase (d22-d42)	Finishing phase (d43-d56)
Maize	58	60	60
Soyameal	30	25	18
Cereals by-products	9	13	18
Premix*	1.5	1	1
Bicalcic phosphate	1.5	1.5	1.5
Chemical composition			
ME kcal /kg	3040	3100	3180
Crude protein	21.500	18.500	17.500
Fiber	3.066	2.770	2.536
Ash	7.50	6.20	6.00

* Provided per kg of diet: vitamin A, 8,800 IU; vitamin D3, 3,300 IU; vitamin E, 40 IU; vitamin K3, 3.3 mg; thiamine, 4.0 mg; riboflavin, 8.0 mg; pantothenic acid, 15 mg; niacin, 50 mg; pyridoxine, 3.3 mg; choline, 600 mg; folic acid, 1 mg; biotin, 220 mg; vitamin B12, 12 mg; antioxidant, 120 mg; manganese, 70 mg; zinc, 70 mg; iron, 60 mg; copper, 10 mg; iodine, 1.0 mg; selenium, 0.3 mg

Table 2 - Evolution of the live weight (g) of broiler chickens in control and experimental groups

Age (days)	Control group (n= 200)	Experimental group (n =200)	P
0	46.11±0.20	44.08± 0.25	NS
14	241.88± 3.33	245.45± 3.61	NS
28	802.36± 15.06	842.97± 21.44	NS
42	1574.11± 33.39	1703.67± 34.4	*
56	2252.79± 24.50	2586.43± 27.6	*

* mean values were significantly different (p≤0.01); NS: not significant

Table 3 - Feed ratio, mortality rate, number of white blood cells of the broiler chickens in control and experimental groups at day 56

Parameters	Control group	Experimental group	P
Feed conversion ratio	2.45	2.37	NS
Mortality rate (%)	6.57	6.51	NS
White blood cells (n/mm^3)	25260±3258	30365±3210	*

* mean values were significantly different (p≤0.01); NS: not significant

Table 4 - Carcass yield of broiler chickens in the control and experimental groups

Parameters	Control group	Experimental group (n=20)	P
Live weight (g)	2285.57± 48.00	2629.90±45.20	*
Carcass weight (g)	1715.56±38.80	2091.84± 44.90	*
Carcass yield (%)	60.40	66.32	*
Fat weight (g)	37.36±5.66	39.92±4.42	NS
Fat Yield (%)	2.27	1.9	NS

* mean values were significantly different (p≤0.01); NS: not significant

Table 5 - Serum lipids concentration in the of broiler chickens in the control and experimental groups

Parameters		Ages (n=80)				P
		d14	d28	d42	d56	
Cholesterol (g/l)	Exp.	1.10± 0.06	0.94± 0.09	0.93± 0.05	0.84± 0.09	*
	Cont.	1.20± 0.01	1.13± 0.01	0.96± 0.12	1.09± 0.11	
Triglycerides (g/l)	Exp.	1.42 ±0.07	1.23± 0.04	0.86± 0.08	0.84 ±0.06	*
	Cont.	1.46± 0.09	1.25± 0.10	1.15 ±0.03	0.86 ±0.06	

* mean values were significantly different (p≤0.01); NS: not significant

REFERENCES

Al-Mansour S, Al-Khalf A, Al-Homidan I and Fathi MM (2011). Feed efficiency and blood hematology of broiler chicks given a diet supplemented with yeast culture. International Journal of Poultry Science 10 (8): 603-607.

Arslan M, Ozcan M, Matur E, Cotelioglu U and Ergul E (2004). The effects of probiotics on leptin level, body, liver, and abdominal fat weights during the rapid growth phase of broilers. Indian Veterinary Journal, 81: 416-420.

Barton M (2000). Antibiotic use in animal feed and its impact on human health. Nutrition Research Reviews, 13: 299-279.
Bach Knudsen KE (2001). Development of antibiotic resistance and options to replace antimicrobials in animal diets. Proceedings of the Nutrition Society, 60: 291-299.
Cavazzoni V, Adami A and Castrovilli C (1998). Performance of broiler chickens supplemented with *Bacillus coagulans* as probiotic. British Poultry Sciences, 39(4): 526-529.
Coppola M and Turnes CG (2004). Probiotics and immune reponse. Ciencia Rural., Santa Maria, 34 (4): 1297-1303.
Djouvinov D, Stefanov M, Boicheva S and Vlaikova T (2005). Effect of diet formulation on basis of digestible amino acids and supplementation of probiotic on performance of broiler chicks. Trakia Journal of Sciences, 3(1): 61-69.
Franco SG, Pedroso CA and Grigoletti CE (2005). Effect of inclusion of yeast (*Saccharomyces cerevisae*) associated or not with antibiotics in broilers. Ciencia Animal Brasileira, 6(2): 79-85.
Hofacre CL, White DG, Maurer J, Morales C, Lobsinger C and Hudson C (2001). Characterization of antibiotic-resistant bacteria in rendered animal products. Avian Diseases, 45(4): 953-961.
Jin IZ, Ho Y, Abdullah N and Jaludin S (2000). Digestive and bacterial enzyme activities in broilers fed diets supplemented with *lactobacillus* cultures. Poultry Science, 79: 886-891.
Johri TS (2004). Dietary additives for enhancing nutritional value of feeds. FAO-Roma
Kabir SML, Rahman MM, Rahman MB and Ahmed SU (2004). The dynamic of probiotics on growth performance and immune reponse in broilers. Poultry Science , 3(5): 361-364.
Kalavathy R, Abdullah N, Jalaludin S and Ho YW (2003). Effects of *lactobacillu*s cultures on growth performance, abdominal fat deposition, serum lipid and weight of organs of broiler chickens. British Poultry Sciences, 44(1): 139-144.
Kalavathy R, Abdullah N, Jalaludin S, Wong M.C and Ho YW (2006). Effects of *lactobacillus* feed supplementation on cholesterol, fat content and fatty acid composition of the liver, muscle, and carcass of broiler chickens. Animal Research., 55: 77-82.
Kanashiro AM, Bottino JA, Ferreira F, De Castro AG and Ferreira AJ (2001). Influence of probiotic continuous administration to broilers on serum enzymes activities and serum cholesterol concentration. Arquivo Instituto Biologia, Sao Paulo, 68(2): 11-17.
Karaoglu M and Durdag H (2005). The influence of dietary probiotic (*saccharomyces cerevisiae*) supplementation and different slaughter age on performance, slaughter and carcass properties of broilers. International Journal of Poultry Science, 4(5): 309-316.
Lim HL, Kim SY and Lee WK (2004). Isolation of cholesterol-lowering lactic acid bacteria from human intestine for probiotic use. Journal Veterinary Science, 5(4): 391-395.
Mercenier A , Pavan S and Pot B (2002). Probiotics as biotherapeutic agents : Present knowledge and future prospects. Current Pharmaceutical Design, 8: 99-110.
Miazzo RD, Peralta MF and Picco M (2005). Productive performance and carcass quality in broilers fed yeast (*S.cerevisae*). Revista Electronica de veterinaria RedVET, 6, 12.
Pelicano ER, De Souzaa PA , Souzaa HB, Leonel FR, Zeola NB and Boiago M (2004). Productive traits of broilers chickens fed diets containing different growth promoters. Revista Brasileiria de Ciencia do Solo, 6(03): 177-182.
Pereira DI, Mc Cartney AL and Gibson GR (2003). An *in vitro* study of the probiotic potential of a bile-salt-hydrolyzing *lactobacillus fermentum* strain and determination of its cholesterol-lowering prperties. Applied and Environmental Microbiology, 69(8): 4743-4752.
Ramirez RB, Zambrano SO, Ramirez PY, Rodriguez VY and Morales M.Y (2005). Evaluacion del efecto probiotico del *lactobacillus spp*. Origen aviar en pollitas de inicio reemplazo de ponedora comercial en los primeros 42 dias de edad. Revista Electronica de veterinaria RedVET, 6: 9.
Revington B (2002). Feeding poultry in the post-antibiotic era. Multi-State Poultry Meeting. http://ag.ansc.purdue.edu/poultry/multistate/multi-state.pdf.
Shareef A M and Al-Dabbagh ASA (2009). Effect of probiotic (Saccharomyces cerevisiae) on performance of broiler chickens. Iraqi Journal of Veterinary Sciences, Vol. 23, Supplement I, 2009 (23-29).
Silva EN, Teixeira AS, Bertechini AG, Ferreira CF and Ventura BG (2000). Performance the broiler for chickens in diets with probiotics, antibiotics, and two different phosphorus sources. Ciencia i Agrotecnologia, Lavras, 24, 225-232.
Siwicki AK, Bielecka M, Wjcik R and Biedrzycka E (2005). Effect of selected probiotics on non-specific cellular and humoral defense mechanisms and protection against salmonellosis-experimental study in broiler chicken. Roadshow 3. Guthealth support. Poland.
Stella Alberto V, Fava M, Bersani C, Del Degan G, Savoini G and Chevaux E (2005). Effets de l'addition de *pediococcus acidilactici* dans la ration de poulet de chair sur les performances zootechniques et la microflore intestinale. 6eme Journées de la Recherche Avicole, St-Malo, 208-211.

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