PERFORMANCE OF BROILER CHICKEN FED PROBIOTICS SUPPLEMENTED DIET

DESEMPENHO DE FRANGOS DE CORTE SUPLEMENTADAS COM PROBIÓTICO*

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SUMMARY

The use of probiotics as an alternative strategy to substitute growth promoters added to the diet fed to broilers was evaluated. Three hundred and sixty Cobb 500 broiler chicks were distributed among three groups, each one with 40 broilers and three repetitions. Groups were fed three diets as follows: Group I, 7.75 ppm of virginiamycin was added to the diet; Group II, 2 kg of probiotics/ton of food and Group III, the broilers were fed the same food without any supplementation. At the end of 42 days, weight gain of the control group and the two groups fed supplemented diets was significantly different. Mean weight gain of the group fed diet supplemented with virginiamycin was higher compared to others. Food intake was also statistically different among treatments and probiotic supplemented treatment had the lowest feed intake. Therefore, the treatment supplemented with probiotics displayed the best ratio feed intake per weight gain. This result suggests that probiotics may be used as an alternative strategy to growth promoters added in the diet fed to broilers.

KEY-WORDS: *Bifidumbacterium bifidum.* Broiler chicken. *Lactobacillus acidophilus. Streptococcus faecium.* Virginiamicin.

RESUMO

Para avaliar o uso de um probiótico como alternativa estratégica para substituição de promotores de crescimento nas dietas de frango de corte, foi avaliado o desempenho de 360 pintos de um dia da linhagem Cobb 500, distribuídos em três tratamentos com 40 aves cada e três repetições. No tratamento I os frangos receberam (7,5 ppm de virginiamicina na dietas), no tratamento II os frangos receberam (2 kg de probiótico/ton de dietas) e no tratamento III (os frangos receberam a mesma dieta dos tratamentos anteriores sem aditivos). Ao final do experimento (42 dias), para o ganho de peso (GP), houve diferença significativa entre os tratamentos controle, com probiótico e com virginiamicina, sendo que os animais que receberam virginiamicina tiveram um maior ganho médio de peso. O consumo de ração (CR), também apresentou diferença significativa entre os tratamentos. No entanto, o tratamento com probiótico apresentou menor consumo de ração. Com relação à conversão alimentar (CA), houve diferença significativa entre todos os tratamentos, sendo que o tratamento com o probiótico apresentou a melhor conversão alimentar. Esse experimento permitiu verificar significativamente que o probiótico utilizado no experimento pode ser usado como uma alternativa estratégia para a substituição dos promotores de crescimento em aves de corte.

PALAVRAS-CHAVE: *Bifidumbacterium bifidum,* frangos de corte, *Lactobacillus acidophilus*, *Streptococcus faecium*, virginiamicina,

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INTRODUCTION

Several aspects of supplementing diets fed to broiler chicken with probiotics are being investigated, among them, the effect on productivity rates. Although, there are several studies showing its benefits as additives in animal feed, there is still resistance from the poultry industry regarding its use (DE LOS SANTOS & GIL-TURNES, 2005).

The concept of probiotics has changed over time. According to Fuller (1989) and Kaur *et al*. (2002), they are food supplements made of living organisms that benefit the host health by balancing the intestinal flora. Salminen *et al*. (1999) define them as prepared microorganisms or their components that have a beneficial effect on both, the well being and health of the host. Schrezenmeir & De Vrese (2001) consider that the term probiotics should be used to designate preparations or products containing defined amounts of microorganisms that are capable of changing the microbiota specific to the mucosa by colonization of a host system, thus producing beneficial effects on their health. Regardless of the concept used, probiotics do bring health benefits to the host, among them, they do not leave residues on the products of animal origin and do not contribute to drug resistance (NEPOMUCENO & ANDREATTI, 2000), which makes them ideal to replace antibiotics as feed additives.

Panda et al. (2000) used a commercial product containing probiotic at concentration of 100 $mg.Kg^{-1}$ which improved chicken weight gain during the first four weeks, but did not improve feed conversion rate. Likewise, Balevi et al. (2001) found that the product containing 4 genera of bacteria and 2 of fungi did not change feed intake. Similar observations were made by Lodder et al. (2000), who reported that probiotics did not change weight gain and feed conversion rates. However, several studies in recent years have shown extremely promising results regarding the addition of probiotics to the diet of broiler chicken. Supplementation of the diets with *Bacillus cereus,* var. tovoii (CUEVAS *et al*., 2000) and *Bacillus subtilis* (SANTOSO *et al*., 1995; FRITTS *et al*., 2000) increased weight gain and improved feed conversion rate of broiler chicken. Cavazzoni *et al*. (1998) reported similar results using virginiamycin in diets fed to broilers compared to probiotics that contained *B. coagulans*. Kalavathy *et al*. (2003) added bacteria of the genus *Lactobacillus* to the diet and observed improved weight gain and feed conversion rate, while Özcan *et al*. (2003) confirmed improved efficiency of feed conversion rate and increased carcass weight of chicken fed diet supplemented with *Enterococcus faecium.*

This study proposed to evaluate the performance of broiler chicken fed a diet supplemented with probiotics as an alternative strategy to replace growth promoters.

MATERIAL AND METHODS

The experiment was conducted at Faculdade de Ciências Agrárias e Veterinárias, UNESP, Jaboticabal/SP, during the period from March 24 to May 4, 2005.

The 360 Cobb 500 one-day old broilers were floor-raised inside a brick shed divided into 4.25 m^2 boxes. Light exposure was almost continuous, 23 L to 23 L: 1E from 0 to 42 days (CLASSEN & RIDDELL, 1989). Broilers were divided into three groups, each group with 20 chicks (20 males and 20 females) and three repetitions, the treatments were as follows: I) diet supplemented with virginiamycin; II) diet supplemented with 2 kg of probiotics per ton of feed, and III) control treatment.

Treatments were distributed in a completely randomized design (CRD). Broilers were vaccinated against Gumboro disease (two intermediates and one strong dose) and also against coccidiosis. To meet broilers nutritional requirements, the experiment was divided into two phases: initial (1 to 7 days and 8 to 21 days) and late (22 to 42 days). Water and feed were supplied freely. Diets contained 20.2% crude protein (CP) and 2,930 kcal of metabolizable energy per kilogram of feed in the initial phase and 18.5% crude protein and 2,990 kcal of metabolizable energy per kilogram of feed as recommended by Rostagno (2005). The probiotics used contained *Lactobacillus acidophilus* 3.5 x 10^{11} UFC/kg; *Streptococcus faecium* 3.5 x 10^{11} UFC/kg and *Bifidumbacterium bifidum* 3,5 x 10^{11} UFC/kg.

At 1, 7, 21 and 42 days old, the birds as well as leftover diets were weighted to assess weight gain (WG). Performance was evaluated by weight gain (WG), feed intake (FI) and feed conversion rate (FCR). All these results were corrected for mortality.

Means were compared by Tukey test ($P<0.05$) using the Statistical Analysis System (SAS, 2001).

RESULTS AND DISCUSSION

During the first seven days of the trial, the parameters weight gain, feed intake and feed conversion rate were not significantly different between diets supplemented with virginiamycin and probiotics compared to control as shown in Table 1.

Between days 8 and 21, weight gain was significantly different for broilers fed diet supplemented with probiotics compared to virginiamycin and control. During the same period, feed intake was also significantly different. The highest feed intake was observed for control treatment followed by diet supplemented with probiotics and virginiamycin (Table 1). This result has also been reported by Zulkifli *et al*. (2000), who observed higher weight gain in broilers fed probiotics during the period from 1 to 21 days, compared to control and antibiotics. Boratto *et al*. (2004) as well as Zulkifli *et al*.(2000), also observed higher weight gain in the group fed diet supplemented with probiotics compared to control group; however, compared to antibiotics this difference was observed only in the beginning of the experiment.

Table 1 – Mean values of weight (W), weight gain (WG), feed intake (FI), feed conversion rate (FCR) in Cobb 500 broilers fed virginiamycin, probiotics and control at 7, 21 and 42 days.

TREATMENT		MEANS		
1 a 7 days	**W**	**WG**	**FI**	**FCR**
Virginiamycin	168	127[a]	152[a]	0,905[a]
Probiotic	170	128[a]	150[a]	0,882[a]
Control	166	124[a]	154[a]	0,928[a]
TREATMENT 8 a 21 days				
Virginiamycin	842	800[b]	1119[a]	1,328[b]
Probiotic	852	810[a]	1130[b]	1,326[b]
Control	841	801[b]	1147[c]	1,364[a]
TREATMENT 22 a 42 days				
Virginiamycin	2334	2308[a]	4064[b]	1,741[b]
Probiotic	2334	2281[b]	4029[a]	1,726[a]
Control	2321	2268[c]	4081[c]	1,758[c]

W (g); WG (g); FI (g); FCR (Kg/Kg)
Values followed by the same letters do not differ statistically.

From 22 to 42 days, weight gain among treatments was significantly different. The highest weight gain was observed in the broilers fed diet supplemented with virginiamycin followed by probiotics and control diets. Jin *et al.* (1998) reported higher weight gain for animals fed probiotics compared to control treatment in the period from 1 to 42 days. In the present study, the lowest feed intake was observed for broilers fed probiotics supplemented diet compared to virginiamycin, while the highest was observed in the control group.

Correa et al. (2003) while testing different probiotics in the diet fed to broilers, observed lower feed intake in the treatment with probiotics compared to control group, from 1 to 21 days, this result was also observed by Zulkifli *et al*, (2000). On the other hand, Boratto *et al*. (2004) reported for the same period, higher feed intake of the group fed probiotics compared to control group.

Feed conversion rate was not significantly different between probiotics and virginiamycin supplemented diets, from 1 to 21 days (Table 1). However, from 1 to 42 days the best feed conversion rate was observed in the group treated with probiotics (Table 1). This result disagrees with the ones reported by Maiorka *et al*. (2001), Corrêa *et al*. (2003), and Pelicano *et al*. (2004), who observed statistically different results in the period from 1 to 21 days, with the best feed conversion rate observed for probiotics supplemented diet.

Salarmoini & Fooladi (2011) observed higher weight gain in laying hens fed a diet supplemented with *Lactobacillus acidophilus* during 42 days compared to control group. Similar results were reported by Taheri et al., (2010) while studying *Pediococcus acidlactice*. Faria Filho et al. (2006) after reviewing several studies reporting on the use of probiotics as a supplement and further performance analysis, concluded that probiotics are a viable alternative to replace growth promoters in diets fed to broilers.

Rearing conditions may affect directly the efficiency of growth promoters (TAKAHASHI *et al.*, 1997; BORATTO, 2004). Sanitary conditions, stress situations and the relationship between the number and type of microorganisms present in the probiotics may be related to the efficiency of the product (LIMA *et al*., 2003). Every action that contributes to reduce infection and/or colonization of pathogenic organisms in the animals will certainly contribute to improve performance, and probably this is probiotics contribution. Probiotic bacteria may stimulate the immune system on the cell surface by means of receptor recognition or by direct activation of lymphoid cells. The practical application of probiotics based on this feature include its use in anti-tumor, anti-allergic and immunotherapy treatments, but there is growing evidence that some probiotics alone can stimulate a protective immune response to increase resistance to microbial pathogens (CROSS, 2002).

Probiotics effectiveness dependence on these aforementioned factors, as well as the great diversity among types of probiotics, administration route and experimental conditions adopted in different works (BORATTO, 2004) make this comparison difficult (LODDI *et al*., 2000; BORATTO, 2004).

CONCLUSIONS

The performance results of broilers fed diets supplemented with probiotics suggest that it is a viable strategic alternative to replace growth promoters, in view of the increasing demand of the export market of poultry, especially with respect to determination of antibiotic residues present in the meat.

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