Current Research in Agricultural Sciences
2014 Vol. 1, No. 4, pp. 103-109
ISSN(e): 2312-6418
ISSN(p): 2313-3716

THE INFLUENCE OF PROBIOTICS AND ANTIBIOTIC GROWTH PROMOTER ON GROWTH PERFORMANCE AND HEMATO-BIOCHEMICAL PARAMETERS IN BROILERS

MA Miah* --- MMH Sarker --- MR Das --- A Mustari --- MS Islam

[1,2,3,4]*Department of Physiology, Bangladesh Agricultural University, Mymensingh, Bangladesh*

[5]*School of Agriculture and Rural Development, Bangladesh Open University, Gazipur*

ABSTRACT

10 days old "Cobb 500" broiler chicks were used to investigate the influence of probiotics and growth promoter supplementation on growth performance and different hemato-biochemical parameters of broilers. They were randomly divided into three equal groups (n=10). Group A was considered as control, fed only with commercial ration and group B and group C were supplemented with probiotics and growth promoter respectively for the period of 21 days. Body weights were measured at 7 days interval and selective organ weights, total erythrocyte count(TEC), hemoglobin (Hb) concentration, packed cell volume (PCV), AST and ALT values were measured at the end of experiment. Results revealed that body weight was increased significantly ($p < 0.05$) in treated groups and the highest body weight was recorded in group B. Significant ($p > 0.05$) differences were found among groups of A, B, and C in the weight of breast meat, liver, Leg meat and spleen. All weights were increased significantly ($p > 0.05$) both in probiotics and antibiotic growth promoter treated groups as compared to that of control group. TEC and Hb concentration were increased significantly ($p < 0.05$) in birds of group B compared to those of birds in control and treated group C. Highest PCV was also recorded in group B but all the values were more or less similar and statistically insignificant ($p > 0.05$). Biochemical parameters like AST were increased significantly ($p < 0.05$) in treated groups of group B and C. Whereas ALT values decreased significantly ($p < 0.05$) in treated groups in similar pattern in comparison to control group. Based on the results it could be concluded that probiotics supplementation shows better significant effect on growth performance and certain hemato-biochemical parameters in broiler chickens.

Keywords: Hematology, Biochemical profile, Probiotics and broiler.

Contribution/ Originality

The study strengthens the existing literatures and documents that probiotics are better alternative feed supplementation in broiler industry.

1. INTRODUCTION

Feed is necessary for broiler production. The dietary use of probiotic feeding is gaining momentum in broilers to counteract and minimize the stresses [1, 2]. Probiotics are bacteria, fungi or yeasts that have favorable effects on hosts by improving the characteristics of intestinal

† Corresponding author

microflora [3]. Probiotics can be categorized into either colonizing species (*Lactobacillus* sp., *Enterococcus* sp. and *Streptococcus* sp.) or free, non-colonizing species (*Bacillus* and *Saccharomyces cerevisiae*). They display antagonistic action to inhibit the development of pathogenic bacteria by secretion of products such as bacteriocins, organicacids and hydrogen peroxide, or they compete to other bacteria for locations to adhere to the intestinal mucous membranes; or competition for nutrients [4]. Probiotics reduce the risk of disease [5], improve the immune system; [6] and influence morphology and function of intestines [7, 8].

On the other hand, antibiotic growth promoter is used to destroy or inhibits bacteria and is administered at a low, sub therapeutic dose [9]. Lee, et al. [10] stated that antibiotic growth promoter improves body weight by digesting their food more efficiently in growing animals. Growth promoters are now recognized in broiler industry as additives for faster growth and economic meat production. Growth promoters can play a vital role to shorten the time period required for attaining the market weight by stimulating growth. The growth promoters have given positive responses in respect to growth: improve feed efficiency and survivability of broiler [11]. Since probiotics and growth promoters are claimed to improve the performance, information with respect to their effects on the growth performance and hemato-biology in broilers is meager. Therefore, the present study was undertaken to determine the effect of feeding probiotics and antibiotic growth promoter supplementation on growth performance and hemato-biochemical parameters in broilers.

2. MATERIALS AND METHODS

A total of 30, ten days old "Cobb 500" broiler chicks purchased from Alamin poultry farm, Chorkhai, Mymensingh were randomly divided into three equal groups (n=10). Group A was considered as untreated control, fed only with commercial ration Group B was supplemented with 0.5 g probiotics /liter drinking water (Poultry Star® Sol, Renata Animal Health Limited, Bangladesh) and group C was supplemented with 0.5 g growth promoter/liter drinking water (Colistin 80, Veterinary and Agricultural products Mfg. Co. Ltd.) as per manufacturer recommendation respectively . Initial body weight of each bird was recorded and kept them group wise. Fresh water was supplied to the broilers *ad libitum*. Feed supplementations were prepared on daily basis. Rearing of birds was strictly followed according to standard broiler farming system [12]. In order to prevent stress, shock, deficiencies and infections broiler chicks were routinely immunized and antibiotic premixes were used as per recommendation of manufacturer. Proper hygienic and strict sanitary measures were also taken during the experimental periods.

Ten days old chicks were used in this experiment for management advantages and to reduce the mortality rate. The body weight of each bird was measured with the help of electric balance on the day 10 of age (0 day of experiment), at 7 days interval up to the end of experiment. The data were compared with same age of untreated control birds. All birds were sacrificed, processed and then selected organs-liver, spleen, leg meat, breast meat were weighed by electric balance according to the procedure of Jones [13] at the end of the experiment (31 days of age).Blood

from each bird was collected during sacrificing of birds and then was put into a number of sterile test tubes containing anticoagulant (3.8% Tri-sodium citrate solution). The hematological analyses were performed within two hours of blood collection. Sera were prepared for biochemical (AST and ALT) analyses according to standard procedures. Briefly, 2-3 mL of blood was collected in the sterile glass test tube. The blood containing tubes were kept in a slanting position at room temperature (25^0 C) for clotting and then were incubated in the refrigerator at 4°C for overnight. Sera were collected and then centrifuged at 1000 rpm for 15 minutes to have a more clear serum. The serum samples were stored at -20°C until analysis. Serum transaminases were assayed by conventional enzymatic methods by Hitachi 911 automated analyzer from Roche Diagnostics (Laval, QC, Canada) as per manufacturer's specifications. All data were presented as mean ± SE and differences among the groups of birds were compared using one-way ANOVA with post-hoc Duncan's multiple range test. Statistical analysis was performed using XLstat software.

3. RESULTS AND DISCUSSION

3.1. Effects of Probiotics and Growth Promoter on Birds Body Weight

Results on body weight of 3 different groups of birds used in the present study is shown in Table 1. On day 7, comparatively lower body weight gain was recorded in birds of group A compared to group B and C. On day 14, the highest body weight gain was recorded in birds of group B which was significantly ($p < 0.05$) higher than control group ($p < 0.05$) and at the end of experiment, the highest weight gain was recorded in birds of group B. It is found that body weight was increased significantly ($p < 0.05$) in all groups of birds with advancement of age. However in group A, body weight gain was slower compared to others treated group. The increased rate of body weight gain in the treated groups might be due to an increased feed intake, feed consumption, utilization, digestion, absorption and metabolism of supplied feed nutrient essential for their health and body weight gain.

Table-1. Effect of probiotics and growth promoter on body weight in grams (mean±SE) of broilers.

Group (n=10)	Body weight (g)				
	Day 0	Day 7	Day 14	Day 21	Weight gain (%)
Control	379.9±2.30	804.0±8.74^a	1209.36±3.33^a	1625.21±2.80^a	328
Group B	371.8±0.78	849.8±2.96^b	1371.0±5.77^b	1882.0±1.70^b	406
Group C	383.4±1.09	840.5±5.88^b	1348.0±5.04^c	1847.0±1.67^c	382

Figures with different superscript letter in the same column differ significantly ($p < 0.05$).

The results obtained were agreed with the findings of earlier reports of Manickam, et al. [14], and Islam, et al. [15]. Cavazzoni, et al. [16] and Rowghani, et al. [17] who stated that mean body weight and daily live weight gain were higher ($P<0.05$) in the probiotic fed chickens than the control group and similar to growth promoter fed chickens. On the other hand, Gunal, et al. [18] demonstrated that probiotic treatment significantly increased ileum and jejunum villus height ultimately increase body weight gain ($P<0.05$), whereas antibiotic growth promoter treatment significantly decreased muscularis thickness compared to the basal diet. But the present

findings differ from Ergun, et al. [19] who stated that supplementation of probiotic, with or without antibiotic growth promoter; to the rations has no important effect on live weight gain.

3.2. Effects on Weights of Different Selected Organs

The effects of probiotics and growth promoter on weights of different selected organs are presented in Table 2. The liver weight was recorded higher in all treated groups and was the highest in group B which was statistically significant (P<0.05). However, no statistical significant was observed among the treated groups.

Table-2. Effect of probiotics and growth promoter on weight (mean ± SE) of different organs of broiler.

Groups	Weight of different organs (g)			
	Liver	Spleen	Breast meat	Leg meat
Control	30.83±0.327[a]	2.677±0.043[a]	582.6±21.56[a]	260±15.42[a]
Group B	57.95±2.22[b]	3.04±0.043[b]	766.9±47.79[b]	495±13.31[b]
Group C	51.59± 1.36[b]	3.573±0.069[c]	750.4±42.71[b]	402±16.91[c]

Figures with different superscript letter in the same column differ significantly (p < 0.05).

The highest spleen weight was recorded in group C and then group B. Kamruzzaman, et al. [20] found that spleen weight were differed (p<0.05) among different groups after feeding with probiotics and antibiotic whereas Mehdi, et al. [21] observed that dietary inclusion of probiotic supported a superior performance of broiler, can be applied as antibiotic growth promoter substitutions in broilers diet.

The weight of breast meat of control group, B and C were 582.6±21.56 g, 766.9±47.79 g and 750.4±42.71g respectively. The highest breast weight was recorded in group B (0.5 g growth promoter /liter drinking water) and lowest weight was recorded in control group.

The present findings are contradictory with those of Baidya, et al. [22] and Mandal, et al. [23], who observed that feeding of probiotics did not have any influence on the carcass yield. Pelicano, et al. [24] observed that feeding of different probiotics influence on carcass and meat quality of broilers. Brzoska, et al. [25] also demonstrated that supplementation of probiotics, with or without antibiotic, to the rations have no important effect on breast meat yield.

The highest leg weight was recorded in group B (0.5 g probiotic /liter drinking water) and lowest weight was recorded in group A. Leg meat weight in treatment group increased significantly (p< 0.05). The present finding is similar with the earlier experiment of Pelicano, et al. [24] who observed higher leg weight gain in birds after treatment with probiotic supplementation.

3.3. Effects on Haemato-Biochemical Parameters

The effects of feeding probiotics and growth promoter on hemato-biochemical profile are presented in table 3. Increased total erythrocyte count (TEC) was observed in birds of group B which was statistically significant (p<0.05) compared to control group and treated group C.

Similarly, the values of Hb concentration and PCV were only increased significantly in group B. It is noted that birds treated with antibiotic growth promoter have no influence on hematological values rather it reduced the values slightly as the gut micro flora may be reduced under the influence of antibiotic.

The results of the current study on hematological parameters are in agreement with the findings of Kamruzzaman, et al. [20] and Islam, et al. [15] who stated that the mean values of TEC, Hb, and PCV corresponding to the different treatments were differ significantly ($p<0.05$).

Table-3. Effect of probiotics and growth promoter on hemato-biological parameters (mean±SE) of broilers (n=10).

Groups	Haemato-biochemical parameters				
	TEC(millions/mm$^{3)}$	Hb (g/dl)	PCV (%)	AST(U/L)	ALT(U/L)
Control	2.84±0.36^{a}	7.90 ± 0.10^{a}	21.00±0.51^{a}	230.7 ±14.80^{a}	12.57±0.42^{a}
Group B	3.17±0.69^{b}	9.33±0.3^{b}	24.33±1.01^{b}	313.7±23.06^{b}	7.47±0.3^{b}
Group C	2.70 ±0.53^{a}	7.94±0.31^{a}	22.03±1.00^{b}	293.5±13.07^{c}	7.13±0.70^{b}

Figures followed by different superscript letter in the same column differ significantly ($p<0.05$). TEC, Total erythrocyte count; Hb, hemoglobin: PCV, packed cell volume; AST, asparate transaminase and ALT, alanine transaminase.

Among the serum bio-chemical parameters, aspartate aminotransferase (AST) values were found significantly higher in treated groups, group B and C in comparison to control group.The lowest and statistically significant (ALT) alanine transaminase serum concentration was recorded in all treated groups. The present findings are in agreement with the findings of Kamruzzaman, et al. [20] who stated that the values of ALT and AST were differ significantly ($p<0.05$) among the treatment groups.

Under the present experimental condition, it is concluded that feeding of probiotics and growth promoter increases expected body weight gain and improves hemato-biochemical parameters in birds. However, feeding probiotics showed better improvement than growth promoter. Further study with more experimental birds are needed to make final conclusion.

REFERENCES

[1] H. Gunes, H. Cerit, and A. Altinel, "Effect of preprobiotic (Fermacto-500) on the yield characteristicsof broiler chickens," *Veteriner Fakultesi DergisiIstanbul*, vol. 27, pp. 217-228, 2001.

[2] H. Shoeib and A. Madian, "A study on the effectof feeding diets containing probiotics (Pronifer Andbiogen) on growth performance, intestinal flora andhaematological picture of broiler chicks," *Assiut VeterinaryMedicine Journal*, vol. 47, pp. 112-125, 2002.

[3] R. Fuller, "Probiotics in man and animal," *Journal of Applied Bacteriology*, vol. 66, pp. 365-378, 1989.

[4] J. Patterson and M. Burkholder, "Application of prebiotics and probiotics in poultry production," *Poultry Science*, vol. 82, pp. 627-631, 2003.

[5] K. Mountozouris, P. Tsirtsikos, E. Kalamara, S. Nitsch, G. Schatzmayr, and K. Fegeros, "Evaluation of the efficacy of a probiotic containing lactobacillus, bifidobacterium, enterococcus,

and pediococcus strains in promoting broiler performance and modulating cecalmicroflora composition and metabolic activities," *Poultry Science*, vol. 86, pp. 309-317, 2007.

[6] M. Hossain, M. Ali, S. Chowdhury, M. Haque, and S. Kabir, "Effect of yoghurt andprotexin boost on gut microflora and broiler performance," *The Agriculturists*, vol. 3, pp. 24-29, 2005.

[7] G. Uscebrka, D. Zikic, L. Peric, S. Jurcoane, and N. Milosevic, "Effect of probiotic supplementation on the small intestinum morphology of broiler chickens," in *Proceedings of The 34th International Session of Scientific Communications of the Faculty of Animal Science*, Bucharest, Romania, 2005, pp. 67-71.

[8] Y. Yang, P. Iji, and M. Choct, "Dietary modulation of gut microflora in broiler chickens: A review of the role of six kinds of alternatives to in-feed antibiotics," *World's Poultry Science Journal*, vol. 65, pp. 97-114, 2009.

[9] D. Jamroz, J. Skorupinska, J. Orda, W. Wiliczkie, and M. Kirchgessner, "Effect of avilomycin (Maxus) and roxazyme supplementation on broiler performance," *Archivefur Gefluge kunde*, vol. 59, pp. 228-233, 1995.

[10] D. Lee, F. Ching, Shiau-RUL, and W. Hen, "Effect on growth performance immune response and gastrointestinal health of Taiwan red feathered native chickens feed diets supplementation with growth promoting antibiotics," *Journal China Social Animal Science*, vol. 37, pp. 223-224, 2008.

[11] P. Dash, S. Verma, and N. C. Gopal, "Response of broilers to certain performance propertied," *Indian Journal of Poultry Science*, vol. 27, pp. 103-115, 1992.

[12] M. Salahuddin, M. Miah, and N. Ahmad, "Effects of protein and multivitamin ADE on growth performance and hematobiochemical profile in broilers," *Bangladesh Journal of Veterinary Medicine*, vol. 10, pp. 9-14, 2012.

[13] R. Jones, "A standard method of dissection for carcass analysis of poultry." *West of Scotland Agricultural College. Auchincruive Ayr. Technical Note , No.222*, 1984.

[14] R. Manickam, K. Viswanathan, and M. Mohan, "Effect of probiotics in broiler performance," *Indian Veterinary. Journal*, vol. 71, pp. 737-739, 1994.

[15] M. Islam, M. Rahman, S. Kabir, S. Kamruzzaman, and M. Islam, "Effects of probiotics supplementation on growth performance and certain haemato-biochemical parameters in broiler chickens," *Bangladesh Journal of veterinary Medicine*, vol. 2, pp. 39-43, 2004.

[16] V. Cavazzoni, A. Adami, and C. Castrovilli, "Performance of broiler chickens supplemented with bacillus coagulans as probiotic," *British Poultry Science*, vol. 39, pp. 526-529, 1998.

[17] E. Rowghani, M. Arab, and A. Akbarian, "Effects of a probiotic and other feed additives on performance and immune response of broiler chicks," *International Journal of Poultry Science*, vol. 6, pp. 261-265, 2007.

[18] M. Gunal, G. Yayli, O. Kaya, N. Karahan, and O. Sulak, "The effects of antibiotic growth promoter, probiotic or organic acid supplementation on performance, intestinal microflora and tissue of broilers," *International Journal of Poultry Science*, vol. 5, pp. 149-155, 2006.

[19] A. Ergun, S. Yalcin, and P. Sacakli, "The usage of probiotic and zinc bacitracin in broiler rations," *Ankara Universitesi Veteriner Fakultesi Dergisi*, vol. 47, pp. 271-280, 2000.

[20] S. Kamruzzaman, S. Kabir, M. Rahman, M. Isla, and M. Reza, "Effect of probiotics and antibiotic supplementation on body weight and hemato-biochemical parameters in broiler," *Bangladesh Journal of Veterinary Medicine*, vol. 3, pp. 100-104, 2005.

[21] G. Mehdi, R. Vahid, M. M. Mehdi, and D. Naser, "The effect of novel probiotic on blood parameters and performance in broiler chickens," *Journal of Cell and Animal Biology*, vol. 3, pp. 141-144, 2009.

[22] N. Baidya, L. Mandal, S. Sarkar, and G. Banerjee, "Combined feeding of antibiotic and probiotic on the performance of broiler," *Indian Journal of Poultry Science*, vol. 29, pp. 228-231, 1994.

[23] S. Mandal, I. Biswas, and L. Mandal, "Efficiency of different growth promoters on the performance of broilers," *Indian Journal Poultry Science*, vol. 92, pp. 13-17, 1994.

[24] E. Pelicano, P. D. Souza, H. D. Souza, A. Oba, E. Norkus, L. Kodawara, and T. D. Lima, "Effect of different probiotics on broiler carcass and meat quality," *Revista Brasileira de Ciencia Avicola*, vol. 5 pp. 207-214, 2003.

[25] F. Brzoska, R. Grzybowski, K. Stecka, and M. Pieszka, "Nutritive efficiency of selected probiotic microorganisms in chicken broilers," *Roczniki Naukowe Zootechniki*, vol. 26, pp. 291-301, 1999.