International Journal of Natural and Social Sciences
ISSN: 2313-4461

Effects of probiotics and enzymes on physical appearance, growth performance and haematobiochemical parameters in broilers

Md. Imam Hossain*, Mohammad Eliusur Rahaman Bhuiyan, Md. Raisul Islam, Yasir Ahammad Arafat, A.F. M Shahidullah

Department of Physiology, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

ARTICLE INFO

Article history

Accepted 11 Nov 2016
Online release 03 Nov 2016

Keyword

Probiotics
Enzyme
Growth
Blood profile
Broiler

***Corresponding Author**

Md. Imam Hossain
✉ roni_5th@yahoo.com

ABSTRACT

The experiment was conducted on "Cobb 500" broiler chicks to evaluate the effects of probiotics and enzymes supplementation on physical appearance, growth performance, hematological (TEC, Hb concentration, PCV and ESR) and biochemical parameters (serum creatinine, triglyceride, cholesterol and HDL). A total of 20, seven days of old broiler chicks were reared throughout the entire period of study. The chicks were divided randomly into four groups with five broiler chicks in each group. Group A was designated as control group was given only normal broiler ration and rest of the groups were fed probiotics and enzymes, [Group B (probiotic preparation Microguard® @ 1gm/L)], [Group C (enzymes preparation Acmezyme® @ 1gm/L)], [Group D (probiotic preparation Microguard® @ 1gm/L and enzymes preparation Acmezyme® @ 1gm/L)], with drinking water respectively from 1st to 28th days of experiment. It was observed that probiotics and enzymes supplementation enhanced the body growth rate with better physical appearance of broilers. At the final day of experiment the body weight was significantly increased ($p<0.01$) in the treated groups in comparison with that of control group.TEC, Hb concentration, PCV values were significantly increased ($p<0.01$) in treated groups than the control group. The biochemical parameters in creatinine was not significant ($P>0.05$) difference among groups and there was a significant ($P<0.05$) difference among the other groups after treating with probiotics and enzymes. So the farmers of Bangladesh can be benefitted by using probiotics and enzymes in broiler ration. Considering all the results of the present experiments, it may be concluded that the probiotics and enzymes supplementation enhanced the better physical appearance and growth rate of broilers.

INTRODUCTION

Poultry production can play an important role by providing a large part of increasing demand for animal protein, side by side it is the source of income and can create employment opportunities for the people in the shortest possible time. Broilers are known to live machinery for quick return of edible meat. Poultry meat contributes approximately 37% of total animal protein supplied in the country (kabir et al., 2005). There is a great possible of growth and expansion of the poultry sector both at domestic and commercial level. In the developing country like Bangladesh, malnutrition and unemployment are two major problems. Broiler production reveals the fact of maximum return of minimum expense. Broiler farming is developed all over the country and recognized as a profitable enterprise. It means of quick return (Hamid et. al., 2001). Its success depends on how rapidly a bird attains a maximum marketable age in a minimum period.

The feed accounts 70% of the total cost of broiler production. Hence it is essential to utilize the most efficiently to have minimum production cost. A number of feed additives like antibiotics, steroids, vitamins, minerals and other growth promoters have been used to improve the performance of broiler growth. The excessive dependency on medications threatens the mankind in antibiotic resistance. However, it is also discouraged to use growth promoters because of their residual effect in broiler meat.

Probiotics are feed additives that contain live microorganisms and promote beneficial effects to the host by favoring the balance of the intestinal microbes (Fuller 1989). The probiotics include live

How to cite this article: Hossain MI, Bhuiyan MER, Islam MR, Arafat YA and Shahidullah AFM (2016). Effects of probiotics and enzymes on physical appearance, growth performance and haematobiochemical parameters in broilers. International Journal of Natural and Social Sciences, 3(4): 28-34.

bacteria, yeast, their metabolites and pH adjusters, which contribute to maintain balance in intestinal microflora (Islam et al., 2004). Probiotic microorganisms are responsible for the production of vitamin B complex and digestive enzymes and stimulation of intestinal immunity, increasing protection against toxins produced by pathogenic organisms. Probiotic act as a mono or mixed culture of living microorganisms which beneficially affect the host by improving the properties of the indigenous microflora.

Probiotic organisms help to improve the environment of the intestinal tract. It may also be defined as living microorganisms which is given to animal assist in the establishment of an intestinal population which is beneficial to the animal and antagonistic to harmful microbes (Sinnons and Sainsbury, 2001). The use of probiotic as a substitute for antibiotics in broiler industry has become an arena of great interest. The probiotic feeding assists in preventing colonization of pathogens in the intestinal tract and in producing certain enzyme like substances (Lee et al., 2007). Probiotics are claimed to exert beneficial effects on live weight gain, feed consumption feed conversation ratio and livability (Mohan et al., 1996).

Various probiotic preparations are available in the market at present and their indiscriminate uses are in practice without much scientific information about it. Microgaurd[@] is a multi-strain probiotic used in poultry production (Prime care). It contains naturally occurring different species of beneficial microflora. However, information on the use of probiotics, their levels in broiler diets and its effect on growth performance is scanty in Bangladesh.

The nutritive value of available feed stuffs such as wheat, maize, rice polish, til oil cake, soyabean meal etc. in Bangladesh contain more indigestible part (Jin et al., 2000). So, the feed digestion utilization is poor. Enzyme should have the ability to break down plant cell wall materials and nutrients such protein and starch. Broiler diet is predominantly composed of plant materials mainly cereals and their bi-products contain non-starch polysaccharides (NPS) such as cellulose, xylose, arabinose, galactonic acid which are not easily digested by poultry.

Most of the feed ingredients contain some anti-nutritional factors and non-digested part which inhibit feed utilization. The anti-nutritive effect is manifested by depressed nutrient utilization accompanied by poor growth. This adverse effect can be overcome by supplementation of exogenous carbohydrate (xylenase) enzymes that is observed by the viscosity of intestinal contents and to improve digestibility of starch, protein, fat and apparent metabolizable energy in broiler feed (Choct at el., 1995).

Considering the above facts the research work was under taken to study the effect of probiotics and enzymes supplementation on physical appearance, growth performance with hematological changes in broiler chicks.

MATERIALS AND METHODS

Experimental birds

Day old chicks (strain Cobb-500) marketed by Nourish Poultry and Hatchery Ltd., Bangladesh were purchased from local market for this experiment. The chickens were allowed to take rest for 6 days for the adaptation. The chicken was supplied with normal diet and water.

Experimental diets

The commercial broiler ration, commercial enzyme (Achmezyme®) and commercial probiotics (Microguard®) were purchased from the local market. Broiler chicks of group – A: fed with commercial broiler ration and fresh drinking water. Broiler chicks of group – B: commercial probiotics (Microguard ®) @ 1gm/L commercial broiler ration and fresh drinking water plus drinking water for 21 days. Broiler chicks of group – C: commercial enzymes (Achmezyme®) @ 1gm/L drinking water commercial broiler ration and fresh drinking water plus for 21 days. Broiler chicks of group–D: commercial probiotics (Microguard ®) @ 1gm/L and enzymes (Achmezyme®) @ 1gm/L drinking water plus commercial broiler ration and fresh drinking water for 21 days.

Broiler (starter, grower and finisher) ration was formulated according to the guideline of Nourish Poultry and Hatchery Ltd., Bangladesh; supplemented enzyme (Achmezyme®) was purchased from the ACME Laboratories Ltd, and probiotics (Microguard®) was purchased from Prime Care, Bangladesh.

Experimental design

A total of 20, seven days old broiler chicks were randomly divided into 4 equal groups (n=5) and marked them as group A, B, C and D for assessing the effect of probiotics and enzymes. Broiler chicks of group – A: was kept as control and was not treated. Broiler chicks of group – B: was treated with probiotics (Microguard ®) @ 1gm/L drinking water for 28 days. Broiler chicks of group – C: was treated with enzymes (Achmezyme®) @ 1gm/L drinking water for 28 days.

Broiler chicks of group – D was treated with probiotics (Microguard ®) @ 1gm/L drinking water plus enzymes (Achmezyme®) @ 1gm/L drinking water for 28 days. Initial body weight of each group was recorded just prior to separation. Body weight was recorded at seven days interval up to the end of 28 days of experimental period and the birds were sacrificed to collect blood sample after 21 days of experiment for hematological (TEC, Hb, PCV and ESR) studies.

Housing and Management

An open sided house made of wire, net, wood and bamboo was used to rear the birds. Each bird was kept in 1 sq. ft. Proper litter management and hygienic condition was maintained. The bird was brooded to 28 days with proper lighting, temperature and humidity feeder and water management.

Feeding and Drinking

Immediately after distribution of chicks in the pens electrolyte and vitamin solutions were provided to drinking water for 4 hours. Then dietary treatment was applied to the chicks. Control (group A); Probiotics 1gm/liter, (group B); Enzyme 1gm/ liter, (group C); Probiotics 1gm/liter and Enzymes 1gm/liter drinking water, (group D) were supplied to the experimental birds.

Feed was supplied four times daily for the first seven days and gradually reduced to three times. Initially feed was given on tray feeder and thereafter through feeder was used to feed the birds. Feed was supplied adlibitum and water was made available all the items.

Biosecurity and Sanitation

The birds were vaccinated against New castle disease at 4^{th} and 21^{th} days and Infectious Bursal Disease at 11^{th} and 18^{th} days of age. Proper hygienic and sanitation programs were followed during the experimental period. To prevent the outbreak of disease strict bio-security was maintained during the experimental period.

Measurement of parameters

Body weight of broiler chicks was measured with the help of balance on the 7^{th} day of age (28thdays of experiment) and sequentially at 7 days interval up to the end of the experiment.

Hemato-biochemical studies

Estimation of Total Erythrocyte Count (TEC), Hemoglobin (gm/dl), packed cell volume (PCV), Erythrocyte Sedimentation Rate (ESR) as per methods indicated by Lamberg and Rothstein (1977).

Biochemical parameters like total serum cholesterol, triglycerides, HDL-cholesterol and serum creatinine were determined by Sood (2006).

Statistical Analysis

All recorded data were calculated and analyzed using statistical SPSS program for one way analysis of variance (ANOVA) followed by student T Test was done to know the differences among the treatment means at 5% level of significance.

RESULTS AND DISCUSSIONS

Effects on physical appearance

Effects on physical appearance and body weight on different group of broilers are presented at table 1. The physical appearance of birds supplied with probiotics and enzymes were better in treated group than the control group. The farmers were more attracted to the treated groups' those who were shown better glossy plumage, good feeder and rapid growing than the control group.

Effects on the body weight

Effects on body weight of different groups of broilers are presented at table 1. Body weight on day 7th of age (1st day of experiment) was observed that the body weight in control group A was 305±1.33 gm, in the treatment group B was 300±0.71 gm, in group C was 309±0.44 gm and in group D was 309±3.47 gm. The data were more or less similar and not statistically significant (P>0.05). The highest body weight was recorded in group D and lowest in group A and B.

Table 1
Effects of probiotics and enzymes on body weight (gm) (Mean ± SE) in broilers on 28th day of experiment.

Groups	Mean ±SE (gm)			
	Pre treatment	Post treatment		
	7th day of experiment	14th day of experiment	21th day of experiment	28th day of experiment
A(Control)	305 ±1.33	480 ±0.74	795 ±0.63	947 ±0.87
B(Probiotic)	300 ±0.71	581 ±1.29**	1124 ±5.27**	1573 ±1.16**
C(Enzymes)	309 ±0.44	555 ±4.39**	1091 ±3.38**	1294 ±2.11**
D(Probiotics+enzymes)	309±3.47	592 ±2.21**	1144 ±0.98**	1601 ±3.23**
Level of significant	NS	**	**	**

** = Significant at 1% (P<0.01) level of probability. NS = Not significant (P>0.05)

Table 2
Hematological parameters (Mean ±SE) in broilers on 28th day of experiment after treating with probiotic and enzymes.

Groups	TEC Millions/mm^3	Hb (gm/dl)	PCV (%)	ESR (mm in 1st hour)
A(Control)	1.75±0.067	5.06±0.013	19.33±0.038	5.33±0.029
B(Probiotic)	2.24±0.011**	6.53±0.026**	22.66±0.047**	3.51±0.033**
C(Enzymes)	2.13±0.014**	5.46±0.049**	23.67±0.292**	3.33±0.026**
D(Probiotics+ Enzymes)	2.42±0.33**	6.81±0.002**	25.34±0.137**	2.67±0.051**
Level of significant	**	**	**	**

**= Significant at 1% (P<0.01) level of probability.

On day 28 (21th day of experiment) was observed that the body weight in control group A was 947 ±0.87 gm, in the treatment group B was 1573 ±1.16gm, in group C was 1294 ±2.11gm and in group D was 1601 ±3.23 gm. All the data was statistically significant at 1% (P<0.01) level. The highest body weight was recorded in treated group D and lowest in control group A.

Data cataloged on 14th, 21th and 28th day of experiment shows that the weight increased significantly at 1% (P<0.01) level of significance. The body weight increased slowly in the control group A in respective days of experiment but rise in body weight was noticed in the treated groups (B, C and D) it is highest in group D in comparison with control group A. Although body weight on 1st day of experiment was more or less similar a distinct fluctuation was observed with the advanced of age (14th, 21th and 28th day of experiment) among different groups and always highest in group D combined probiotics and

enzymes supplemented group. The highest body weight recorded in the present finding in group D indicates synergistic effect of combined treatments of probiotis and enzymes. This finding is indirectly supported by the above mentioned researchers (Kabir et al. 2005; Mohan et al., 1996; Panda et al., 1999; Ahmed et al., 2004). The effect of dietary supplementation of probiotic Lactobacillus significantly enhanced body weight gain in broilers (Panda et al., 2006). Increasing the growth performance of broiler chickens by supplementing their diets with exogenous enzymes can also contribute to positive changes in gut health (Rosin et al., 2007)

Effects on Hematological parameters

Total Erythrocyte Count (TEC million/mm^3)

Total erythrocyte count in different groups of broilers is presented in the Table 2. At 28th day of experiment (35 days of age) the values of TEC in control group was 1.75±0.067 million /mm^3 and in the treated group B was 2.24±0.011 million /mm^3 , Group C was 2.13±0.014 million /mm^3 and Group D was 2.42±0.33 million /mm^3. The highest values of TEC in treated group D was 2.42±0.33 million /mm^3 and lowest values in control group A was 1.75±0.067 million /mm^3. All the values of treated groups were significantly at 1% (P<0.01) level higher than the control group A.

Hemoglobin content (Hb gm/dl)

Hemoglobin content in different groups of broilers is presented in the Table 2. At 28th day of experiment (35 days of age) the values of hemoglobin in control group A was 5.06±0.013 gm/dl and in the treated group B was 6.53±0.026 gm/dl, Group C was 5.46±0.049 gm/dl and Group D was 6.81±0.002 gm/dl. The highest values of Hb in treated group D was 6.81±0.002 gm/dl and lowest values in control group A was 5.06±0.013 gm/dl. All the values of treated groups were significantly at 1% (P<0.01) level higher than the control group A.

Packed Cell Volume (PCV %)

Packed Cell Volume (PCV %) in different groups of broilers is presented in the Table 2. At 28th day of experiment (35 days of age) the values of PCV in control group A was 19.33±0.038 % and in the treated group B was 22.66±0.047 %, Group C was 23.67±0.292 % and Group D was 25.34±0.137 %. The highest values of PCV in treated group D was 25.34±0.137 % and lowest values in control group A was 19.33±0.038 %.All the values of treated groups were significantly at 1% (P<0.01) level higher than the control group A.

Erythrocyte Sedimentation Rate (ESR mm)

Erythrocyte Sedimentation Rate (ESR) in different groups of broilers is presented in the Table 2. At 28th day of experiment (35 days of age) the values of ESR in control group A was 5.33±0.029 mm and in the treated group B was 3.51±0.033 mm, Group C was 3.33±0.026 mm and Group D was 2.67±0.051mm in 1st hour. The highest values of ESR in treated group A was 5.33±0.029 mm and lowest values in control group D was 2.67±0.051 mm in 1st hour. All the values of treated groups were significantly at 1% (P<0.01) level higher than the control group A. The different values of hematological parameters were remain within normal range but statistically significant within the comparison of treated and control group. The increased level of total erythrocyte count, hemoglobin content, packed cell volume and erythrocyte sedimentation rate might be due to the initiative effects on hematopoietic organ. The hematological parameters of presenting finding resembles to that Cowieson et al., (2006), who reported that the number of erythrocyte and other components of blood varied due to the influence of sex, environment, exercise, nutritional status and climate.

Biochemical parameters

The serum creatinine levels in different groups of broilers are presented in Table 3. On the final day (28th) of experiment the serum creatinine level was 0.13±0.07 mg/dl in control group A and treated groups the values were 0.23±0.06mg/dl in group B, 0.20±0.07 mg/dl in group C, 0.15±0.05 mg/dl in group D. The highest value was in treated group B and lowest in control group A.

Table 3
Biochemical parameters (mean ±SE) in broilers on 28th day of experiment after treating with probiotics and enzymes.

		Serum			
	Groups	Creatinine	Triglyceride	Cholesterol	HDL
Probiotic	B	0.23±0.06	144.16b±2.07	94.47b±4.57	49.26d±9.81
Enzyme+Probiotic	D	0.15±0.05	147.70a±3.16	98.19a±1.88	81.86a±3.99
Enzyme	C	0.20±0.07	141.44c±2.01	92.35c±2.11	68.03b±6.47
Control	A	0.13±0.07	104.05d±5.47	91.17d±2.52	66.43c±4.71
	LSD	0.063	3.471	2.963	6.631
	Level of sig.	NS	**	**	**

** = Significant at 1% (P<0.01) level of probability. NS = Not significant (P>0.01)

Serum creatinine level was decreased in control group A but all of the treated groups the values were more or less similar and the titer values were statistically significant (P<0.01) increased than the control group A. Pravhakaran et al. (1996) found that the serum creatinine level increased with the advanced age. The present study also agreed with Huff et al. (1992). The triglyceride levels in different groups of broilers are presented in Table 3. On the final day (28th) of experiment the triglyceride level was 104.05±5.47mg/dl in control group A and treated groups the values were 144.16±2.07mg/dl in group B, 141.44±2.01 mg/dl in group C, 147.70±3.16 mg/dl in group D. The highest value was in treated group D and lowest in control group A. Triglyceride level was decreased in control group A but all of the treated groups the values were more or less similar and the titer values were statistically significant (P<0.01) increased than the control group A. The cholesterol levels in different groups of broilers are presented in Table 3. On the final day (28th) of experiment the cholesterol level was 91.17±2.5mg/dl in control group A and treated groups the values were 94.47±4.57mg/dl in group B, 98.19±1.88 mg/dl in group C, 147.70±3.16 mg/dl in group D. The highest value was in treated group D and lowest in control group A. Triglyceride level was decreased in control group A but all of the treated groups the values were more or less similar and the titer values were statistically significant (P<0.01) increased than the control group A. The HDL (High density lioprotien) levels in different groups of broilers are presented in Table 3. On the final day (28th) of experiment the HDL (High density lioprotien) level was 66.43±4.71mg/dl in control group A and treated groups the values were 49.26±9.81mg/dl in group B, 68.03±6.47 mg/dl in group C, 81.86±3.99 mg/dl in group D. The highest value was in treated group D and lowest in group B. HDL (High density lioprotien) level was decreased in control group A but all of the treated groups the values were more or less similar and the titer values were statistically significant (P<0.01) increased than the control group A.

CONCLUSION

From the present experiment it can be concluded that the combined supplementation of probiotics and enzymes are highly beneficial for broilers without making any potential hazards to the physiology of the birds. However these are very preliminary findings in a small population of broiler chicks. So, further studies will be required to mark final conclusion involving more birds.

REFERENCES

Ahmed K and Taghi G (2006): Effect of probiotic on performance and immunocompetence in broiler. The Journal of poultry science, 43: 296-300.

Choct M, Hughes RJ, Trimble RP, Angkanaporn K and Annison G (1995). Non-starch polysaccharide degrading enzymes increase the performance of broiler chickens fed wheat of low apparent metabolizable energy. Journal of Nutrition, 125(3): 458-492.

Cowieson AJ, Singh DN and Adeola O (2006). Prediction of ingredient quality and the effect of a combination of xylanase, amylase, protease and phytase in the diets of broilers chicks. Energy and

Nutrient Utilization. British Poultry Science, 47 (4):490-500.

Hamid MS and Aijazuddin Q (2001): Trial study on the efficiency of proteccin (water soluble) on the performance of broiler. Pakistan Veterinary Journal, 21: 224-250.

Huff ML, Nakual and Mirosh (1992): Effect of probiotic on performance and biochemical parameters in pullets. Journal of Poultry Science, 43, 296-300.

Islam MW, Rahman MM, Kabir SML, Kamruzzaman, SM, Islam MN (2004). Effects of probiotics supplementation on growth performance and certain hemato-biochemical parameters in broiler chickens. Bangladesh Journal of Veterinary Medicine, 2: 39-43.

Jin LZ, Ho YWN, Abdullah S and Jalaluddin S (2000). Digestive and bacterial enzyme activities in broilers fed diets containing Lactobacillus cultures. International Journal of Poultry Science, 79: 886-891.

Kabir SML (2005): Effect of yoghurt and protexin boost on gut microflora and broiler perform. The Agriculturists, 3: 24-29.

Lamberg SL and Rothstein R (1977). Laboratory manual of Hematotogy and urinalysis. Avi Publishing Company, Inc. Westport connecticut, U. S. A.

Lee R, Abdullah N, Jalaluddin S, and Ho YW (2007). Effects of Lactobacillus cultures on growth performance, abdominal gut deposition, serum lipids and weight of organs of broiler chickens. British Poultry Science, 44: 139-144.

Mohan S, Haker D, Pfeifer A and Schiffrin EJ (1996). Probiotics and immune response. Clinical review and allergy immunology, 22:287-309.

Panda SJC, Sahu BJC and Rao (1995): Urea tolerance in broiler chicken. Indian Journal of Poultry Science, 63 (5) 54-68.

Prabhakaran V, Chihravel V, Prabhakaran SK and Saravanan CS (1996). Haematological and biochemical profile of white leghorn chickens. Indian Journal of Animal Health, 35:11-15.

Rosin EA, Blank G, Slominski BA and Holley RA (2007). Enzyme supplements in broiler chicken diets: in vitro and in vivo effects on bacterial growth; Journal of the Science of Food and Agriculture, 87 (6): 1009-1020.

Sinnos and Sainbury, (2001): Potential organisms to prevent diarrhea and promote digestion in farm animals. Journal of Food and Agricultural Science, 49: 1-13.

Sood R (2006) Textbook of medical laboratory technology. Jaypee Brothers Medical Publishers Ltd., New Delhi.