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Effects of administration of multivitamins and enzymes for broilers either singly or in combination on body weight and haemato-biochemical parameters

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Abstract

The experiment was conducted on "Lohman Meat" broiler chicks to evaluate the effect of exogenous multivitamin and enzyme supplementation on body weight gain, haematological parameters (TEC, Hb content, PCV and ESR) and serum transaminases (AST and ALT). A total of 20, twenty days old broilers were randomly divided into four equal groups (5×4). Group A was considered as control, fed only with commercial ration, group B was treated at a dose rate of 0.5 ml multivitamins per 1 litre of drinking water, group C was treated at a dose rate of 1 ml enzyme per litre of drinking water and group D was treated with multivitamin @ 0.5 ml/L and Enzyme @ 1ml/ L in water from 1 to 21 days of experiment. It was observed that multivitamin and enzyme supplementation significantly ($p<0.01$) increased body weight. TEC, PCV and Hb content increased significantly ($p<0.01$) in the treated groups as compared to that of control group. ESR, AST and ALT values decreased significantly ($p<0.01$) in the treated groups. Therefore, it may be concluded that multivitamin and enzyme may be used with better performances in terms of increase of body weight and blood profiles.

Keywords: Multivitamins and enzymes, Effects, Broiler

Introduction

In Bangladesh, livestock contributes 2.73% of total GDP (Bangladesh Bureau of Statistics, 2009). About 15% of her total population suffers from malnutrition due to deficiency of calorie and protein (Huque, 1999). The availability of animal protein in the country is only 7.6 g (Huque *et al.,* 2001), against the FAO recommendation of 28g. Poultry sub-sector is an important avenue to reduce the gap between demand and supply of animal protein. Animal protein has higher biological value in comparison with plant protein. The broiler industry demands a fast growing chick and good quality feed with high level of energy, protein, vitamin and essential minerals to support maximum growth within a short period of time. For the sustainability of broiler industry, the production cost should be as minimum as possible. On the other hand, deficiency diseases may cause mortality, reduce body growth and disease resistance etc. (Singsen, 1947). Chickens are more susceptible to vitamin deficiency because gut flora can synthesize very little vitamins but complete absence of dietary vitamins in intensively kept chickens undergoes many stresses (Ward, 1996). Vitamin A, riboflavin and B_{12} are usually low in poultry diets. Inclusion of multivitamin and enzyme in the formulated diet has become indispensable practice because blending of feed ingredients do may not ensure all essential vitamins at the right amounts needed for chicken. Some important vitamins like vitamin A, D_3, E, folic acid, pantothenic acid, pyridoxine and riboflavin etc should be checked carefully in the diet. As the ultimate goal of broiler is to produce more meat within a short period of time, additional multivitamin and enzyme supplement with commercial feed may increase meat production more rapidly. Enzyme and multivitamin protect deficiency diseases and stimulate growth rate. Beside this, enzyme supplement along with multivitamin reduces mortality, keep birds healthy, increase feed intake, improve digestion and feed conversion rate. Poultry feeds as many cereals and their by 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 indigestible part, which hinders feed utilization and bird's performance. These adverse effects may be overcome by supplementation of exogenous enzymes which have been shown to lower viscosity of intestinal contents and to improve digestibility of starch, protein, fat and apparent metabolisable energy (AME) in broilers fed on diets containing wheat (Annison and Choct, 1991; Bedford, 1995). The dietary administration of enzyme preparations is capable of partly hydrolyzing pentosans and betaglucans and gave significant improvements in performance of broilers fed on different cereal based diet (Pettersson and Aman, 1988).

Therefore, the study observed that effect of enzymes and multivitamins supplementation on growth performance in broiler, effect of supplementation of enzymes and multivitamins in hematological parameters.

Materials and Methods

The experiment was conducted in “Roton Poultry Farm”, Poultry Mur, Sadar, Mymensingh, to evaluate the effect of multivitamin and enzyme on the body weight and blood biochemical parameters in broilers.

A total of 20, fourteen days old broiler chicks were randomly divided into four (4) equal groups (n=5) and marked them as Group A, B, C and D. Group A was considered as control and was fed with commercial ration (Table 1). In addition to commercial ration, Group B was supplemented with multivitamins (Table 2) (VP 1000® @ 0.5 ml/ L drinking water); Group C with enzymes (Table 3) (Liquid Enzyme® @ 1ml/L drinking water) and Group D was supplemented with multivitamins (VP 1000® @ 0.5ml/ L drinking water) plus enzymes (Liquid Enzyme® @ 1ml/L drinking water). Initial body weight of each bird was recorded prior to segregation. Body weight was recorded at 7 days interval up to the end of the 21 days of experimental period and the birds were sacrificed to collect blood sample for hematological study (TEC, Hb, PCV and ESR), and serum samples for aspertate amino transferase (AST) and alanine amino transferases (ALT).

Table 1. Formulation of commercial ration

Ingredients	Broiler Pre-starter	Broiler starter	Broiler Finisher
Maize	43.00 kg	40.32 kg	43.64 kg
Wheat	10..00 kg	10.00 kg	10.00 kg
Rice polish	4.00 kg	8.00 kg	10.00 kg
Soybean	26.00 kg	29.00 kg	22.50 kg
Meat and Bone meal	9.00 kg	7.00 kg	8.00 kg
Oyster shell	1.00 kg	1.00 kg	1.00 kg
Salt	300 g	300 g	250 g
Methionine	200 g	200 g	180 g
Lysine	30 g	30 g	30 g
Vitamin Premix (broiler)	250 g	250 g	250 g
Feed zyme	-	-	50 g
Soybean oil	6.5 kg	3.5 kg	4.00 kg
DCP	2.50 g	2.50 g	-
Choline chloride	100 g	100 g	100 g
Total	100.00 kg	100.00 kg	100.00 kg

Source: Nourish Poultry and Hatchery Ltd., Bangladesh.

Table 2. Ingredients and proximate analysis of multivitamin (VP 1000 ®)
Each liter contains-

Ingredients	Units
Vitamin A	1000000 IU
Vitamin D_3	250000 IU
Vitamin E	200 mg
Vitamin B_1	120 mg
Vitamin B_2	320 mg
Vitamin B_6	120 mg
Vitamin B_{12}	0.2 mg
Vitamin C	3000 mg
Vitamin K_3	160 mg
Nicotinamide	200 mg
Pantothenic acid	184 mg
d- Biotins	1 mg
Folic Acid	10 mg

Source: Vetpharm Limited

Table 3. Ingredients and proximate analysis of enzyme (Liquid Enzyme®) Each 1000 ml Contains-

Ingredients	Amount
Protease	400,000 IU
Phytase	90,000 FYT
Cellulase	40,000,000 IU
Xylanase	6,500 IU
Pectinase	10,000 Units
Arabirase	7,000 Units
α-glucosidase	10,000 Units
β-galactosidase	10,000 Units

Source: Polymix B.V., Holland.

Preparation of the experimental shed

The experimental shed was washed using clean tap water and disinfected with Iosan® (Novartis (Bangladesh) Ltd.) and Virkon-S® (Dupont, UK). The floor was air dried. All necessary instruments and appliances were set properly. Five birds were allotted for each 76 cm× 61 cm space. Therefore, floor space provided for each bird was 930 sq. cm. Fresh and dried rice husk was used as litter, at a depth of about 5 cm. As per schedule the old litter material was changed in every 15 days using new rice husk to prevent birds from fungal and coccidial attack. One feeder and one round waterer were provided for each 5 birds. The feeder and waterers were fixed in such a way that the birds were able to eat and drink conveniently. Feeders were cleaned once a week and the waterers were washed daily in the morning. Feed and fresh drinking water were supplied twice in a day, once in the morning and again in the afternoon.

The lighting programme

Age of birds	Lighting hours
1-3 day	24 hrs
4-7 days	23 hrs
8-20 days	18 hrs
Rest	16 hrs

Daily room temperature and humidity were recorded three times with a dry and wet bulb thermometer respectively. In order to maintain required temperature and humidity inside the shed, all the curtains of the shed were kept open during day and electric bulbs were provided at night as a source of light and heat.

The vaccination schedule upto 21 days of age of experimental birds

Age of birds (day)	Name and type of vaccine	Preparation of dilution	Dose and route of administration
5	BCRDV (freeze dried live vaccine)	1 ampoule of BCRDV +6 ml of distilled water	One drop in eye
11	Nobilis Gumboro D 78 freeze dried live vaccine	1 ampoule of Nobilis Gumboro D-78 +36 ml of distilled water	One drop in eye
18	BCRDV (Booster dose)	As used in day 5	One drop in eye
21	Nobilis Gumboro D 78 (Booster dose)	As used in day 11	One drop in eye

Source: BCRDV, Livestock Research Institute (LRI), Mohakhali, Dhaka, Nobilis Gumboro D 78, Intervet-International B.V. Boxmeer-Holland.

Different treatment procedure should be taken to identify these parameters below:
Measurement of body weight of birds, blood collection, collection and preparation of serum samples, total erythrocytes count (TEC), estimation of hemoglobin (acid-hematin method), determination of packed cell volume (PCV), determination of erythrocyte sedimentation rate (ESR), determination of serum transaminases biochemical parameters (AST and ALT), determination of serum aspartate aminotransferase (AST), determination of serum alanine transaminase (ALT)

Statistical analysis

A randomized complete block (RCB) design with more than one observation per cell was applied. The data were collected and the Mean ±SE were calculated by using descriptive statistics. The data were subjected to analysis of variance (ANOVA) with the help of MSTAT, a computer package for identifying any statistically significant difference among the groups. The mean difference among the treatments was compared by Ducan's Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

Effect on the body weight

Body weight of different groups of birds is presented in (Table 4). Body weight on 14th day (day 1 of experiment) was more or less similar. On 21st day (day 7 of experiment), the highest body weight was recorded in treated group D and lowest in control group A. On 28th day (day 14 of experiment), the highest body weight was recorded in treated group D and lowest in control group A. On 35th day (day 21 of experiment), the highest body weight was recorded in group D. The body weight gradually increased due to enzymes and vitamins supplementation with water. The average body weight of all treated groups were statistically significant ($p<0.01$) than the control group. The highest body weight was recorded in group D (1639a ±0.59).

The result shows that body weight increased significantly ($p<0.01$) in the treated group but the body weight increased slowly in the control group A. The increased rate of body weight gain in the treated groups might be due to an increased feed absorption, utilization, digestion and metabolism of supplied nutrient specially protein essential for weight gain. Increased live weight after addition of enzymes was similar to some of the previous findings (Meng *et al.*, 2005; Saleh *et al.*, 2005 and Wang *et al.*, 2005) who reported concluded that improved feed utilization by exogenous enzyme is responsible for an increased live weight in broilers.

Table 4. Body weight (M±SE) of different groups (n=5) on different days after treating with multivitamins and Enzymes

Group of chicks	Pre-treatment (gm)	Post-Treatment (gm)			
	Day 1	Day 7	Day 14	Day 21	% increase
A	367d ±0.11	651d ±1.63	1012d ±0.57	1307d ±0.58	71.9
B	369c ±0.57	697c ±0.59	1168c ±1.26	1579c ±0.56	76.6
C	372b ±0.21	732b ±0.59	1252b ±0.58	1626b ±0.57	77.0
D	379a ±1.17	748a ±0.17	1317a ±0.22	1639a ±0.59	76.9
LSD	2.1	3.2	2.3	1.9	-
Level of significance	-	**	**	**	-

Figures with different letter in a column differ significantly ($p<0.01$)

The result contradicts with the report of Preston *et al.* (2000) who found that enzyme inclusion did not improve performance. This work also differed with an earlier report of Richter *et al.* (1994) who reported that live weight did not improved by enzyme supplementation in a triticale based diets. The increased weight in present finding resembles Christmas *et al.* (1995) who reported that weight gain and feed efficiency increased statistically with vitamin supplementation. The result of the present work is also in agreement with the earlier reports of Gavrilona *et al.* (1989).

Effects on hematological parameters

The hematological parameters are presented in Table 5. The highest value of TEC in the group D (3.0a ±0.0 million/mm^3) and lowest in control group A (2.5b ±0.0 million/mm^3). All the values of treated groups were higher than the control group A. The highest value of Hb content was recorded in group D (9.4a ±0.1 gm/dl) and lowest value of Hb was in group A (7.6d ±0.0 gm/dl). All the values of treated groups were significantly (p>0.01) higher than the control group A.

Table 5. Hematological parameters (M±SE) of broilers (n=5) on different days after treating with multivitamin and Enzyme

Treatment/Group of chicks	TEC (millions/mm3)	Hb (gm/dl)	PCV (%)	ESR (mm in 1st hour)
Group A	2.5b ±0.0	7.6d ±0.0	27.2d ±0.1	3.2b ±0.0
Group B	2.6a ±0.0	8.2b ±0.1	29.4c ±0.2	2.8b ±0.0
Group C	2.7a ±0.0	9.3c ±0.1	30.2b ±0.1	2.6b ±0.0
Group D	3.0a ±0.0	9.4a ±0.1	31.8a ±0.0	2.4a ±0.0
LSD	0.0	0.3	0.5	0.1
Level of significance	**	**	**	**

Figures with different letter in a column differ significantly (p<0.01)

The highest value of packed cell volume (PCV) was found in group D (31.8a ±0.0 %) and lowest was in control group A (27.2d ±0.1 %). All the values of treated groups were significantly (p<0.01) higher than the control group A. The lowest value erythrocyte sedimentation rate (ESR) was found in group D (2.4a ±0.0 mm in first hour) and highest was in group A (3.2b ±0.0 mm in first hour). All the values of treated groups were significantly (p<0.01) decreased than the control group A. The increased level of total erythrocyte, hemoglobin and packed cell volume might be due to the effects on hemopoietic organs. Some vitamins such as vitamin B_{12}, pantothenic acid, folic acid, biotin etc which are essential for normal growth of the hemopoietic organs and erythropoiesis.

Effects on serum transaminase amino acid

The AST and ALT concentration presented in Table 6. The ALT concentration decreased in treated group compared to controls. All the values of ALT in groups B, C and D were decreased significantly (p<0.01) than the control group A. Decreased ALT titers in the treated groups resembles Swain and Johri (2000) who detected significantly (p<0.01) lower ALT increasing level of vitamin-E and selenium and significantly higher ALT titer were observed in the chicks that were not given supplemental vitamin E and selenium. Present findings are also consistent with Kumar and Rawat (1976) who showed that the ALT concentration in blood serum decreased with advancement of age. Swain and Johri (2000) observed that an increase in the amount of selenium causes decrease in the level of ALT. Our study also agreed with Huff *et al.* (1992) who reported that extra supplementation of vitamin-mineral premixes causes decreased ALT level.

Table 6. Biochemical parameters (M±SE) of broilers (n=5) on different days after treating with multivitamin and Enzyme

Treatment on grouped chicks	ALT (U/L)	AST (U/L)
Group A	6.4 a ±0.1	242.8 c ±0.1
Group B	4.6 b ±0.1	238.2 b ±0.7
Group C	4.5 b ±0.0	236.2 a ±0.1
Group D	4.3 b ±0.0	227.4 d ±0.2
LSD	0.3	1.2
Level of significance	**	**

Figures with different letter in a column differ significantly (p<0.01)

The highest AST was recorded in group A and lowest in group D. The highest AST was recorded in group A and lowest in group D. Significantly ($p<0.01$) decreased on AST was recorded in the treated groups compared to control group. Kumar and Rawat (1976) and Pravbhakaran *et al.* (1996) found that the AST level decreased with the advancement of age. The results of the present study agreed with Sahin *et al.* (2001) who observed that activity of serum asperate amino transferase (AST) were not influenced by dietary vitamin E, vitamin A nor by a combination of vitamin A and vitamin E ($p<0.01$).

From the findings it could be suggested that supplementation of multivitamin and Enzyme are essential for improving body weight, body resistance capacity. However, elaborate studies are necessary to observe the effects of multivitamin and Enzyme supplementation with more biochemical parameters before making any comment.

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