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Effect of supplementation of vitamin E and selenium on growth and haemato-biochemical parameters of broiler

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ABSTRACT

The research work was conducted on "Saver Star Boro" broilers fed with vitamin E and selenium from "Eskavit E" at different doses with normal broiler ration to observe the effect on body weight gain and organ weight, some haematological (TEC, Hb, PCV, ESR, MCV, MCH and MCHC) and some biochemical (SGOT and SGPT) parameters. Twenty, 20 days old broilers were randomly assigned into one of four equal groups (n=5) as A, B, C and D. Group A was considered as control, fed with normal broiler ration and other groups B, C and D were fed with vitamin E and selenium at the dose 40 mg vitamin E and 0.04 mg selenium in group B, 80 mg vitamin E and 0.08 mg selenium in group C and 120 mg vitamin E and 0.12 mg selenium per Kg diet in group D with normal broiler ration from 0 to 21 days of experiment. It was observed that vitamin E and selenium supplementation significantly ($p<0.01$) increased body weight of broilers with better physical appearance. The organs weight did not differ significantly ($p>0.05$) among the treated groups in comparison to control. Haematological parameters such as TEC, Hb, PCV, ESR, MCV, MCH and MCHC increased mathematically but not significantly ($p>0.05$) in comparison to control group. SGOT and SGPT values decreased significantly ($p<0.01$) in the treated groups. It is revealed that vitamin E and selenium supplementation with normal ration is beneficial for broiler productions.

Keywords: Vitamin E, selenium, broiler, performance.

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INTRODUCTION

Vitamin and mineral plays an important role in efficient production of broiler. Among the vitamins and mineral elements vitamin E and selenium have an important relationship. Vitamin E has been shown to be essential for integrity and optimum function of the reproductive, muscular, circulatory, nervous and immune system (Sheffy and Williams, 1979 and McDowell et al. 1996). It is well established that some functions of vitamin E, however can be fulfilled in part or entirely by traces of selenium or by certain synthetic antioxidants.

The important roles of selenium in nutrition of broiler are: it acts as nonspecific antioxidants, protect against per oxidation in tissues and membranes, participates in the biosynthesis of ubiquionone, participates in hydrogen transport along the respiratory chain, prevents degeneration and fibrosis of the pancrease in chicks, influences the absorption and retention of vitamin E. Vitamin E and selenium recognized as an essential nutrient for poultry. Both vitamin E and selenium are needed for adequate immune responses by poultry (NRC, 1983). Vitamin E and selenium may help immune cells to survive on the toxic products that are produced to effectively kill ingested bacteria (Badwey and Karnousky, 1980 and Leassard et al. 1991).

Vitamin E requirement of broiler chicks recommended by National Research Council (NRC-1994) is 10 IU/kg of diet, but Comb and Scott (1974) reported that at least 30 IU/kg diet

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was needed to minimize susceptibility of hepatic microsomes to per oxidation and selenium requirement of broiler chick recommended by NRC (1994) 0.15 mg/kg diet. Grains are the major feed for broilers but many reports have illustrated that the limitation of grain in meeting the mineral needs of poultry. Ullrey (1974) reported that selenium concentrations in grain are highly variable (0.40 to 0.05 ppm). Many of the vitamins are oxidized with coming into contact with oxygen. So birds cannot fill up their requirement from natural diet.

So, it is clear that vitamin E and selenium is very important in poultry production. Various synthetic vitamin E and selenium preparations are available in the market at present and their indiscriminate uses are practice without much scientific information about it. Since vitamin E and selenium appeared as a performance enhancer in broiler in the market, it would be interesting to conduct an experiment with this product to investigate its beneficial effects. Therefore, the present study has been undertaken to study the effects of supplementation of vitamin E and selenium on broiler performance. The experiment was conducted with the following objectives:

To determine the effect of different levels of dietary supplemental vitamin E and selenium on growth of broiler.
To determine the effect of different levels of dietary supplemental vitamin E and selenium on some organs weight (such as liver, heart, gizzard and proventiculus) of broiler.
To study the effects of different doses of vitamin E and selenium on some haematological parameters (such as TEC, Hb, PCV, ESR, MCV, MCH and MCHC).
To study the effects of different doses of vitamin E and selenium on some biochemical parameters (SGOT and SGPT).

MATERIALS AND METHODS

The experiment was performed in the Sumaia Poultry Farm, Bangladesh Agricultural University Sheshmur, Mymensingh and Department of Physiology, Bangladesh Agricultural University, Mymensingh.

Experimental design

A total of 20 (twenty) days old "Savar Star Boro" broilers were randomly divided into four (4) equal groups (4×5) and numbered them as group A, B, C and D. Group A was considered as control and other groups (B, C and D) were treated with supplementation of vitamin E and selenium preparation (Eskvit E contain 400mg vitE and 0.40mg/1gm), with ordinary feed (Kuality Feed Ltd) at a dose rate 100 mg with 40 mg vitamin E and 0.04 mg selenium, 200 mg with 80 mg vitamin E and 0.08 mg selenium and 300 mg with 120 mg vitamin E and 0.12 mg selenium per kg feed.

Initial body weight of each bird was recorded just prior to segregation and kept them into separated cages. Body weight was recorded at 7 days interval up to the end of the 21 days of experimental period. The physical appearances were observed during the experimental period and at the end of the experimental days the birds were sacrificed to collect blood sample for haematological (TEC, Hb, PCV, ESR and MCV, MCH, MCHC) and biochemical (SGOT, SGPT) study. Every day these commercial ration, experimental ration and fresh water were made available to the growing broiler of each group for entire period of experiment.

Bird management

The farm was cleaned, washed using clean tap water and disinfected using Iosan®. Then the farm was kept empty for 3 day before placing the experimental birds. All necessary equipments were set properly to care the broiler chicks successfully. The floor space for each bird was 1 ft^2. Feeder and water spaces were provided to the birds according to the recommendation of Panda et al. (1987). Fresh, clean and cool drinking water was made available for all times.

Fresh and dry rice husk was used as litter at a depth of about 4 cm. As per need the old litter material was changed using new rice husk to prevent birds from fungal coccidial attack.

Table 1
Vaccination schedule for experimental birds.

Age of experimental birds (day)	Name and type of vaccine	Preparation of dilution	Route of administration and dose
5	BCRDV inactivated	1 ampoule of BCRDV was diluated with 6 ml of distilled water	One drop in each eye
11	D-78 Gumboro vaccine inactivated	1 ampoule of Gumboro D-78 was diluted with 36 ml of distilled water	One drop in each eye
18	BCRDV (Booster dose) inactivated	As used in 5 day	One drop in each eye
21	D-78 Gumboro vaccine (Booster dose) inactivated	As used in 11 day	One drop in each eye

Source: BCRDV, Animal Vaccine Research Center (AVRC), Mohakhali, Dhaka, Gamboro D-78 vaccine (Intervet-International B.V, Boxmeer-Holland).

Vaccination was done to control the influence of disease might attack the birds (Table 1).

The birds were always exposed to a continuous lighting of 12 hours, a day. During night electric bulbs were used to provide necessary light. Sufficient light and ventilation was provided in the farm. Proper sanitation was done.

Measurement of parameters

Body weight of birds

The body weight of each bird was measured with the help of balance on the day twenty-one and sequentially at 7 days interval up to the end of the experiment.

Hemato-biochemical profile

The hematological studies were performed within two hours of the blood collection. Hemoglobin, Packed Cell Volume (PCV), Erythrocyte Count (TEC) and Erythrocyte Sedimentation Rate were determined according to the procedure describe by Islam et al. (2004). Serum SGPT and SGOT were performed according to the procedure described by (Denek et al.1985).

Statistical analysis

The recorded data were compiled and tabulated for statistical analysis. The mean differences among the treatments were determined as per Duncan's Multiple Range Test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Effects on the bodyweight

Body weight (Table 2) showed that the weight in 21st day (1st day of experiment) was more or less similar but not statistically significant ($p>0.05$). Highest body weight was recorded in group C and lowest in group D. The recorded body weight were 470.00 ± 3.54 gm in group A, 478.00 ± 8.60 gm in group B, 503.00 ± 14.28 gm in group C and 468.00 ±12.51 gm in group D.

On 7th day of experiment it was observed that the average body weight was 759.00 ± 4.30 gm in group A (control group), 775.00±11.04 gm in group B, 823.00 ± 11.36 gm in group C and 788.00 ± 3.39 gm in group D. All the data were statistically significant ($p<0.01$). The highest body weight was recorded in treated group C and lowest in control group A.

On 14th day of experiment it was observed that the average body weight was 1227.00 ± 4.64 gm in group A, 1247.00 ± 12.61 gm in group B, 1275.00 ± 9.74 gm in group C and 1224.00 ± 7.32 gm in group D. The increased rates were statistically

significant ($p<0.01$). The highest value was recorded in group C and lowest in group D.

On 21st day of experiment it was observed that the average body weight was 1715.00 ± 8.21 gm in group A, 1722.00 ± 12.51 gm in group B, 1765.00 ± 7.07 gm in group C and 1730.00 ± 7.58 gm in group D. The increased rates were statistically significant ($p<0.01$). The highest value was recorded in group C and lowest in group A (control group).

Data cataloged on 7th, 14th and 21st day of experiment shows that body weight increased significantly ($p<0.01$). The body weight increased slowly in the control group A in respective days of experiment but rise of body weight was noticed in the treated groups (B, C, D) in comparison with control group A.

The increased rate of body weight might be due to the increased feed intake, feed consumption, efficiencies of feed utilization, enhancement the digestion, absorption and metabolism of supplied feed nutrient specially protein essential for their health and body weight gain. The increased weight recorded in present findings resembles to that Kennedy et al. (1992) who found improvement of growth rate in broilers fed vitamin E, Yuming et al. (2000) who reported that vitamin E tended to improve growth and feed utilization, Thompson and Scott (1970) who reported deficiency of selenium resulted in poor growth, Bhat et al. (1999) who reported supplementation of vitamin E numerically improve body weights and growth rates in compare with control group.

Table 2
Effect of supplementation of different doses of vitamin E and selenium on body weight (gm) of broiler on 7th, 14th and 21st day of experiment.

Groups	No. of birds	Pre-treatment	Post-treatment		
		Body-weight (gm) on 21st day (1st day of experiment)	Body weight (gm) on 7th day of experiment	Body weight (gm) on 14th day of experiment	Body weight (gm) on 21st day of experiment
A	5	470.00±3.54	759.00 ±4.30	1227.00±4.64	1715.00±8.21
B	5	478.00±8.60	775.00 ±11.04**	1247.00±12.61**	1722.00±12.51**
C	5	503.00±14.28	823.00±11.36**	1275.00±9.74**	1765.00±7.07**
D	5	468.00±12.51	788.00±3.39**	1224.00±7.32**	1730.00±7.58**

Note: Values indicated the Mean ± SE
** Indicate significant ($p<0.01$) difference from control

Table 3
Effects of supplementation of different doses of vitamin E and selenium on different organ weight of broiler.

Groups	No. of birds	Liver weight	Heart weight	Gizzard weight	Proventiculus weight
A	5	43.40 ±1.78	8.20 ±0.58	31.80 ±1.69	5.22 ±0.24
B	5	42.00 ±1.14	9.00 ±0.71	30.20 ±1.77	4.80 ±0.47
C	5	46.80 ±0.92	10.0 0 ±0.71	32.20 ±0.38	5.70 ±0.25
D	5	43.00 ±1.14	9.4 0 ±1.03	34.20 ±1.11	5.60 ±0.53
Level of significance		NS	NS	NS	NS

Note: Values indicated the Mean ± SE; NS indicate not significant ($p>0.05$).

Effects on organs weight

Data on organ weight in presented in Table 3. The results indicated that there were no significant differences among group A, B, C and D for liver weight, heart weight, gizzard weight and proventiculus weight. This result resembles to that of Swain and Johri (2000), who found that dietary

supplementation of vitamin E and selenium did not affect the relative weight of some organs such as spleen, thymus and liver.

Effect on haematological parameters

Total erythrocyte count (TEC) in different groups is presented in Table 4. At final day of experiment, the highest value of TEC was in group B which was 2.94 ± 0.018 millions/mm^3 and lowest in control group A which was 2.86 ± 0.018 millions/mm^3. At the final day of experiment, among the treated groups, the values of total erythrocyte count were more or less similar. At the final day of experiment the values of TEC in al treated birds were non-significantly ($p>0.05$) higher than the values of control group.

Haemoglobin content in different groups of bird is presented in Table 4. In all treated and control groups these values were not affected and this values gradually increased with increased doses of vitamin E and selenium but this values were not statistically significant ($p >0.5$). On an average values of haemoglobin was highest in group D (7.90 ± 0.19 gm/dl) and lowest at control group A (7.68±0.13 gm/dl).

Packed cell volume (PCV) in different groups of bird is presented in Table 4. At final day of experiment the values of group A, B, C and D were 32.40 ± 0.75 %, 32.60 ± 0.87 %, 32.80 ± 0.49 % and 33.00±0.89 % respectively. The highest value was found in group D but all of them were more or less similar and statistically non significant ($p>0.05$).

Erythrocyte sedimentation rate (ESR) is presented in Table 4. At final day of experimental the value of groups A, B, C and D were 1.80 ± 0.12, 1.80 ± 0.12, 1.70 ± 0.12 and 1.70 ± 0.12 mm in first hour respectively. The highest value was observed in group A and B and lowest in group C and D. But all the data was statistically non significant.

MCV in different groups of birds is presented in Table 4. The highest value was recorded in group A (control group) which was 113.30 ± 2.70 cuμ and lowest in group C which was 110.34 ± 0.90 cuμ. But values were more or less similar and statistically non significant ($p>0.05$).

MCH in different groups of birds is presented in Table 4. The highest value was recorded in group A (control group) which was 26.86±0.45 pg and lowest in group C which was 26.06±0.53. But values were more or less similar and statistically non significant ($p>0.05$).

MCHC in different groups of birds is presented in Table 4. The highest value was recorded in group D which was 24.06±1.19 and lowest in group B which was 23.65±0.70. But values were more or less similar and statistically non significant ($p>0.05$).

Table 4
Effects of supplementation of different doses of vitamin E and selenium on haematological parameters in broiler.

Groups	No. of birds	TEC (millions/mm^3)	Hb content (gm/dl)	PCV (%)	ESR (mm in 1^{st}hr)	MCV (Cuμ)	MCH (pg)	MCHC (%)
A	5	2.86±0.018	7.68±0.13	32.40 ±0.75	1.80 ±0.12	113.30±2.70	26.86±0.45	23.72±0.24
B	5	2.94±0.018	7.70 ±0.26	32.60±0.87	1.80±0.12	110.82±3.11	26.19± 1.01	23.65±0.70
C	5	2.90 ±0.02	7.80 ±0.12	32.80±0.49	1.70±0.12	110.34±0.90	26.06±0.53	23.80±0.55
D	5	2.91±0.04	7.90±0.19	33.00±0.89	1.70±0.12	110.38±3.47	26.41±0.45	24.06±1.19
Significance		NS	NS	NS	NS	NS	NS	NS

Note: Values indicated the Mean ± SE; NS indicate not significant ($p>0.05$).

The different values haematological parameters were remain within normal range but statistically non significant in comparison of treated and control group. The increased level of total erythrocyte count, haemoglobin content and packed cell volume might be due to the

initiative effects on haemopoietic organ. The haematological parameters of present findings resembles to that of Tras et al. (2000) who reported that vitamin E and selenium supplementations has no significant effect on any of the haematological parameters (red blood cell, haemoglobin, haematocrit, mean corpuscular volume, mean corpuscular haemoglobin concentration and mean corpuscular haemoglobin) in broiler.

Effect on biochemical parameters

Effect on SGOT level (U/L)

Effect of different doses of vitamin E and selenium supplementation on SGOT level are presented in Table 5. At the final day of experiment the SGOT titer was 391.80 ± 4.32 U/L in group A (control group), 349.20 ± 2.58 U/L in group B, 315.20 ± 3.26 U/L in group C and 297.40 ± 17.45 U/L in group D. Data available in the treated group were more or less similar but lower than control group A and all the data were statistically significant ($p<0.01$).

Data available in table impresses that there were decreased SGOT titer in the all 3 treated groups where the titer level of control group (group A) was higher. This is supported by Swain and Johri (2000) who detected that SGOT level decreased significantly ($p<0.05$) with the increase level of vitamin E and selenium and significantly higher SGOT values were observed in chicks that were not given supplemented vitamin E and selenium.

Effect on SGPT level (U/L)

The effect of different doses of vitamin E and selenium on SGPT level are present in Table 5. At final day of experiment the titer of SGPT was 6.33 ± 0.05 U/L, 4.59 ± 0.04 U/L, 4.41 ±0.02 U/L and 4.22 ± 0.02 U/L in group A, B, C and D respectively. The highest value was recorded in control group A and lowest in group D. Data available in the treated group were more or less similar but lower than control group A and all the data were statistically significant ($p<0.01$).

Table 5

Effects of supplementation of different doses of vitamin E and selenium on biochemical parameters in broiler.

Groups	No. of Birds	SGOT (U/L)	SGPT (U/L)
A	5	391.80±4.32	6.33±0.05
B	5	349.20±2.58**	4.59±0.04**
C	5	315.20±3.26**	4.41±0.02**
D	5	297.40±17.45**	4.22±0.02**

Note: Values indicated the Mean ± SE
** Indicate significant ($p<0.01$) difference from control

Based on the findings, the results suggest that supplementation of 80 mg vitamin E and 0.08 mg selenium per Kg diet from "Eskavit E" as a source of vitamin E and selenium may be used in broiler rations for better performance. Further studies are needed to recommend the supplementation of vitamin E and selenium in broiler ration for increasing significant performance.

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