Global Journal of Science Frontier Research: D
Agriculture and Veterinary
Volume 21 Issue 3 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

# Effect of Dietary Zinc Supplementation on the Productive Performances, Carcass Traits and Blood Profile of Broiler

By Md. Firojul Islam, Md. Ahsan Habib, Ummay Salma & Sabuj Kanti Nath
*Hajee Mohammad Danesh Science and Technology University*

*Abstract-* This study was conducted to determine the effect of zinc on the productive performances, carcass yield and blood profiles of broilers. Experiment was done for a period of 35 days with a number of 60 day old broiler chicks. Birds were divided into four dietary treatment groups with 3 replications each having 5 birds per replication. The dietary treatment groups were; $T_0$ (basal diet; no zinc), $T_1$ (basal diet + 50 mg zinc/kg feed), $T_2$ (basal diet + 100 mg zinc/kg feed), $T_3$ (basal diet + 150 mg zinc/kg feed). Results indicated that body weight and body weight gain were increased significantly ($P<0.05$) in the zinc supplemented group compared to the control group. Higher ($P<0.05$) feed intake and better ($P<0.05$) FE were also observed in the zinc supplemented group than control group and best performance was observed in the group fed 150mg zinc/kg feed ($T_3$). Carcass yield was significantly higher ($P<0.05$) in the groups fed dietary zinc. Net profit was slightly higher in the $T_3$ group but not significantly (P.0.05) differed with the control group. However, $T_1$ and $T_2$ showed less profit even than the control group. Blood profile of the experimental birds including Hb, PCV and ESR did not significantly differed ($P>0.05$) among the groups. The results indicate that addition of zinc in the broiler diet improves productive performances, carcass yield and increases net profit without affecting health status of broiler. So, zinc can be used as an effective and useful micronutrient to improve the performances of broiler.

*Keywords:* *zinc, productive performances, carcass yield, blood profile, net profit and broiler.*

*GJSFR-D Classification:* *FOR Code: 079999*


*Strictly as per the compliance and regulations of:*

# Effect of Dietary Zinc Supplementation on the Productive Performances, Carcass Traits and Blood Profile of Broiler

Md. Firojul Islam [α], Md. Ahsan Habib [σ], Ummay Salma [ρ] & Sabuj Kanti Nath [ω]

*Abstract-* This study was conducted to determine the effect of zinc on the productive performances, carcass yield and blood profiles of broilers. Experiment was done for a period of 35 days with a number of 60 day old broiler chicks. Birds were divided into four dietary treatment groups with 3 replications each having 5 birds per replication. The dietary treatment groups were; $T_0$ (basal diet; no zinc), $T_1$ (basal diet + 50 mg zinc/kg feed), $T_2$ (basal diet + 100 mg zinc/kg feed), $T_3$ (basal diet + 150 mg zinc/kg feed). Results indicated that body weight and body weight gain were increased significantly ($P<0.05$) in the zinc supplemented group compared to the control group. Higher ($P<0.05$) feed intake and better ($P<0.05$) FE were also observed in the zinc supplemented group than control group and best performance was observed in the group fed 150mg zinc/kg feed ($T_3$). Carcass yield was significantly higher ($P<0.05$) in the groups fed dietary zinc. Net profit was slightly higher in the $T_3$ group but not significantly (P.0.05) differed with the control group. However, $T_1$ and $T_2$ showed less profit even than the control group. Blood profile of the experimental birds including Hb, PCV and ESR did not significantly differed ($P>0.05$) among the groups. The results indicate that addition of zinc in the broiler diet improves productive performances, carcass yield and increases net profit without affecting health status of broiler. So, zinc can be used as an effective and useful micronutrient to improve the performances of broiler.

*Keywords: zinc, productive performances, carcass yield, blood profile, net profit and broiler.*

## I. Introduction

Poultry sector is one of the most emerging and feasible sector for Bangladesh. Poultry industry can contribute to the GDP growth rate by managing food security as well as ensuring employment and reducing poverty at a large scale. Large proportion of daily human intake of animal protein comes from livestock products. Poultry industry provides quality protein to the people of Bangladesh at the lowest price. Poultry meat especially chicken meat is the most desirable animal protein and is acceptable to most of the people belonging to all castes and religions. Per capita requirement for meat in Bangladesh is 120 g meat/day but per capita consumption is only 16.5 day with a deficiency of 50.15% (Amin, 2015). The availability is quite inadequate for normal growth and development of the body. Whereas, world per capita consumption of poultry meat is 30.14 g /day, which is 95.89 g/day for USA (Farrell et al., 2003). Per capita meat consumption in Bangladesh was 5.1, 5.2 and 5.3 kg for the years 2008-2009, 2010-2011 and 2011-2012 respectively (BBS, 2012).

Broiler is one of the most important poultry used for fulfilling the protein demand. The broiler industry in Bangladesh is developing rapidly and its success depends on how rapidly a chick attains maximum marketable weight. Broiler raisers are always interested to different approaches for attaining better growth and economic production. Unfortunately, farmers are using antibiotics with broiler feed to improve growth and feed efficiency, which adversely affects on human health. Antibiotics used as growth promoters tend to be given in feed at sub-therapeutic levels over extended periods to entire herds and flocks. Until recently, the major concerns about incorporation of antibiotics in animal feeds related to antibiotic residues in products from treated animals. Now there is mounting evidence that the antibiotics are widely used on farm animals are also diminishing the power of important antibiotics to help people. As a result, each and every chicken is becoming a depot of antibiotics and other inorganic substances. When these chickens are consumed by human these antibiotic and other inorganic residue enters into human body and causes serious human health hazards with drug resistance (Kibria *et al.,* 2009). For this reason European Union has banned regulation the use of antibiotics in animal production from 2006 and its use has become limited in other developed countries. Due to the ban of antibiotic growth promoters in poultry diets in different countries, it is of high interest to investigate potential alternatives to maintain good growth performance of broilers.

Zinc (Zn) is the essential trace element for growth, enzyme structure and function, appetite, normal immune function, maintenance and with particular

*Author α: MS, Department of General Animal Science and Nutrition, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh.*
*Author σ: Lecturer, Department of Livestock Production and Management, Khulna Agricultural University, Khulna, Bangladesh.*
*e-mail: ahhelal313@gmail.com*
*Author ρ: Professor, Department of General Animal Science and Nutrition, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh.*
*Author ω: Lecturer, Department of Animal Nutrition, Khulna Agricultural University, Khulna, Bangladesh. e-mail: sabuj.vet@gmail.com*

importance for fast-growing of poultry. Trace mineral, such as Zn is essential for broiler growth and are involved in many digestive, physiological, and biosynthetic processes within the body .It function primarily as catalysts in enzyme systems within cells or as parts of enzymes. It is the also constituents of hundreds of proteins involved in intermediary metabolism, hormone secretion pathways, and immune defense systems (Dozier *et al.*, 2003). Traditionally, these trace minerals are supplemented in the form of inorganic salts; such as sulfates, oxides, and carbonates, to provide levels of minerals that prevent clinical deficiencies, allow the bird to reach its genetic growth potential, or both.

Zinc plays multiple roles in poultry metabolism. At low concentrations, it serves as an essential nutrient and functions as a metal cofactor for several enzymes. Zinc also appears to be directly involved in immune cellular functions and zinc deficiencies might also have indirect consequences on the immune system by failure to limit bacterial infections. Zinc can be taken up by biological systems, and bacterial transport and efflux systems have been identified that are energy dependent and highly regulated. Intestinal uptake is carrier-mediated facilitated diffusion and the mechanism is not well understood.

A few researches showed that supplemental Zn could improve carcass traits of animal. Organic Zn could increase carcass quality grade, marbling, and the fat of pelvis and heart in animals (Greene *et al*., 1988). Zinc consumption also increase body weight of chicken and increase in abdominal fat deposit in female chickens (Butler and Curtis, 1973). Zinc has numerous biological roles including protein metabolism (Blamberg *et al*., 1984), DNA synthesis (Lieberman *et al*., 2001), cell division and multiplication (Rubin, 1972 and Rubin and Koide, 1973) and performance (Sadoval *et al*., 1999), carbohydrate metabolism, and basic functions in growth performance (Mohanna, 1999). Zinc boost immune system (Luecke *et al*., 2001) and it is the only metal essential for at least one enzyme in all six enzyme classes; Oxidoreductase (4 enzymes), transferase (3 enzymes), hydrolase (3 enzymes), ligase (one enzyme), isomerase (one enzyme) as well as ligase (one enzyme) (Kidd *et al*., 1996). As zinc has a direct effect on improving body condition of broiler present study was conducted by using Zis-Vet® that contains zinc sulphate monohydrate.

Despite enormous advances in poultry production and technology, research into trace mineral nutrition has lagged behind than other areas of nutrition. Although zinc has a lot of feasibility to be used as a harmless trace mineral as well as growth promoter for broiler a very few number of researches have been conducted to see the effect of different level of zinc on the broiler diet and there has not been any definite conclusion was drawn regarding its effect on broiler productive performances as well as on their carcass traits. Therefore was conducted with the following objectives-to know the effect of dietary zinc on the productive performances of broiler and to know the effect of dietary zinc on the carcass traits and blood profile of broiler.

## II. Materials and Methods

This experiment was conducted with 60 day old (Cobb 500) broilers for a period of 35 days (from 7th May to 10th June, 2016) at the commercial poultry farm of Mr. Mostakim, Karnai, Baserhat, Dinajpur. The aim was to investigate the effect of supplying different level of zinc with the feed to improve the production performances of broilers.

Zinc solution used in this experiment was purchased from local market named Zinc-Vet® (1ml solution contain 2mg zinc sulphate monohydrate USP) which was manufactured and marketed by Navana Bangladesh, Animal health division (a reputed veterinary drugs company), Bangladesh. For the free of cost support, experimental solution was collected from Navana Bangladesh, Anmal health division.

The day old broilers were randomly assigned into 4 dietary treatment groups having 3 replications in each treatment. The treatments were 0, 50, 100 and 150 mg zinc in each kg of feed. There were 5 broilers in each replication. The layout of the experiment is presented in Table 1.

*Table 1:* Layout showing the distribution of broilers to treatments and replications

| Replication | Zinc level (mg/kg feed) | | | | Total |
|---|---|---|---|---|---|
| | 0 ($T_0$) | 50 ($T_1$) | 100 ($T_2$) | 150 ($T_3$) | |
| 1 | 5 | 5 | 5 | 5 | 20 |
| 2 | 5 | 5 | 5 | 5 | 20 |
| 3 | 5 | 5 | 5 | 5 | 20 |
| Total | 15 | 15 | 15 | 15 | 60 |

Experimental house was divided into 4 parts for four dietary treatment group and each part was subdivided with three parts to facilitate the accommodation of 5 birds in each sub group. Afterr15 days the room was disinfected with PPM solution. The experimental room was thoroughly brushed, swiped and properly washed by water after that bleaching powder @ 1kg/500sq.ft was spread over the floor and it was kept 24 hours without any further attention. The bleaching powder was cleaned by using forced tap water. After that the room was disinfected by TH4+ solution (Manufactured by Sogeval, France, Marketed by-Century Agro Ltd, Bangladesh). Feeders, waterers, buckets and all other necessary equipments were also

properly, washed and disinfected by TH4+ solution. Subsequently dried them and left empty for a week before arrival of chicks. Fresh dried sow dust was used as litter at a depth of 2 cm. All birds were reared under same care and management.

For the first seven days the feed was given in paper and then in small trays. After that feed was supplied in the round feeder. Zinc solution was at first taken by the measuring syringe than mixed with the pellet feed. After mixing the experimental zinc solution to the feed in required amount, feed was supplied to the different group of birds according to their age. Feed was purchased from the Nourish feed company.

Blood was collected from the wing vein of the experimental birds and kept in sterile test tubes containing anticoagulant (EDTA). Then the hematological tests were performed.

The birds were assigned to different experimental groups under Completely Randomized Design (CRD). The data were analyzed by the Statistical Package for Social Science (SPSS) program. The data were expressed as the mean±SEM and significance level were calculated under 5 % level of significance.

## III. Results and Discussion

*a) Live weight*

Live weight of birds during the experimental period is presented in Table 2.Present experiment was started with day old chicks with the average live weight of45±0.19 g. At the 7$^{th}$ day live weight of birds were not significantly differed (P>0.05) among the groups but it was significantly (P<0.05) differed at the 14$^{th}$, 21$^{st}$ and 28$^{th}$ day of experimental period where higher live weight was observed in the bird fed 150 mg zinc/ kg of feed than the birds of control group (0 mg Zinc/kg feed). Although birds fed 50 and 100 mg Zinc/kg feed showed higher live weight gain but not significantly differed with the control group. At the end of the experiment significantly higher live weight was observed in the birds fed 100 and 150 mg Zinc/kg feed (1494.3 and 1758.53 g, respectively) than the control group (1376.8 g).

It was nay be due to the critical importance of Zinc in maintaining the structure of metallo proteins such as insulin and growth hormone. Results from the growth performance of this study showed that supplemental Zn promoted growth of broilers. Present findings supports the findings of the Ezzati *et al*. (2013) in which they found supplementation of 125 ppm zinc had a significantly higher live weight (2734 g) than the un-supplemented group (2680 g). Liu *et al.* (2012) also found a significant effect in live weight of broiler birds by supplying different level of zinc. Midilli *et al.* (2014) found increasing live weight, while they supplied inorganic and organic form of zinc alone or combination with microbial phytase. Abhishek *et al.* (2016) reported with a significant effect on increase in live weight in groups fed with 80 mg/ kg of zinc from 21-45 days of age, the author found the lowest live weight of birds in control group then the other 4 treatment groups which prove that zinc was essential for growth. Bartlett and Smith (1998) found that a significant increase in live weight of zinc fed broiler occurs than the control group (1576 g vs 1387 g avg. live weight in birds fed adequate and no zinc). Another author Mohanna and Nys (1999) reported that up to 25 mg/kg of zinc supplementation on diet has the effect to increase the live weight.

*Table 2:* Live weight of birds fed different level of Zinc

| Live weight (g) in different time period | Dietary Treatments* | | | | Level of Significance |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ | |
| 0 day (day old) | 45±0.12 | 44.8±0.18 | 45.1±0.21 | 45.3±0.16 | NS |
| 7$^{th}$ day | 203$^{a}$±1.42 | 202.5±1.91$^{a}$ | 202±2.31$^{a}$ | 204±2.57$^{a}$ | NS |
| 14$^{th}$ day | 385.8±4.54$^{a}$ | 467.4±3.48$^{b}$ | 442.7±2.21$^{ab}$ | 489.4±2.89$^{b}$ | * |
| 21$^{st}$ day | 667.8±6.87$^{a}$ | 646.8±4.21$^{a}$ | 691.7±4.15$^{a}$ | 901.13±0.4$^{b}$ | * |
| 28$^{th}$ day | 1078.3±6.18$^{a}$ | 1163.6±7.4$^{a}$ | 1176.5±1.63$^{a}$ | 1439.3±5.35$^{b}$ | * |
| 35$^{th}$ day | 1376.8±11.42$^{a}$ | 1320.3±7.23$^{ab}$ | 1494.3±9.14$^{b}$ | 1758.53±6.16$^{c}$ | ** |

The above values represent the mean ± standard error (SE) of the live weight of broiler in different weeks of the experimental period. Mean values with the same superscripts within the same row are statistically non-significant (P>0.05) and Mean values with the different superscripts within the same row are statistically significant (P<0.05)

*Here, $T_0$= 0 mg Zinc/ kg of feed (Control group), $T_1$=5 0 mg Zinc/ kg of feed, $T_2$ = 100 mg Zinc/ kg of feed and $T_3$= 150 mg Zinc/ kg of feed.

*b) Live weight gain*

Weight gain of the experimental birds at the day of 35 is shown in Figure 1. It was observed that weight gain at the day of 35 was significantly ($P<0.05$) higher in the birds fed 100 and 150 mg Zinc/kg feed (1249.3g and 1513.53 g, respectively) than the control group $T_0$ (1131.8 g). However, higher weight gain was also observed in the birds fed 50 g zinc/ kg feed (1175.3 g ) but was not significantly different ($P>0.05$) than the control group (1131.8 g). This significant difference in total weight gain is might be due to the association of zinc in protein metabolism of broiler birds. Present findings supports the findings of the Ezzati *et al.* (2013), Liu *et al*. (2012) and Bartlett and Smith (1998), they also found significantly higher live weight gain in the zinc supplemented birds but does not support the findings of the Sahin *et al*. (2005) who had not found any significant differences in the live weight gain of broiler birds by supplying 20 ppm, 40 ppm and 80 ppm dietary zinc to the broiler birds. Midilli *et al.* (2014) found improved live weight gain when they added zinc at the level of 90 mg/kg of diet. Ao *et al.* (2007) also reported that chicks fed as the inorganic form had lower ($P<0.01$) live weight gain.

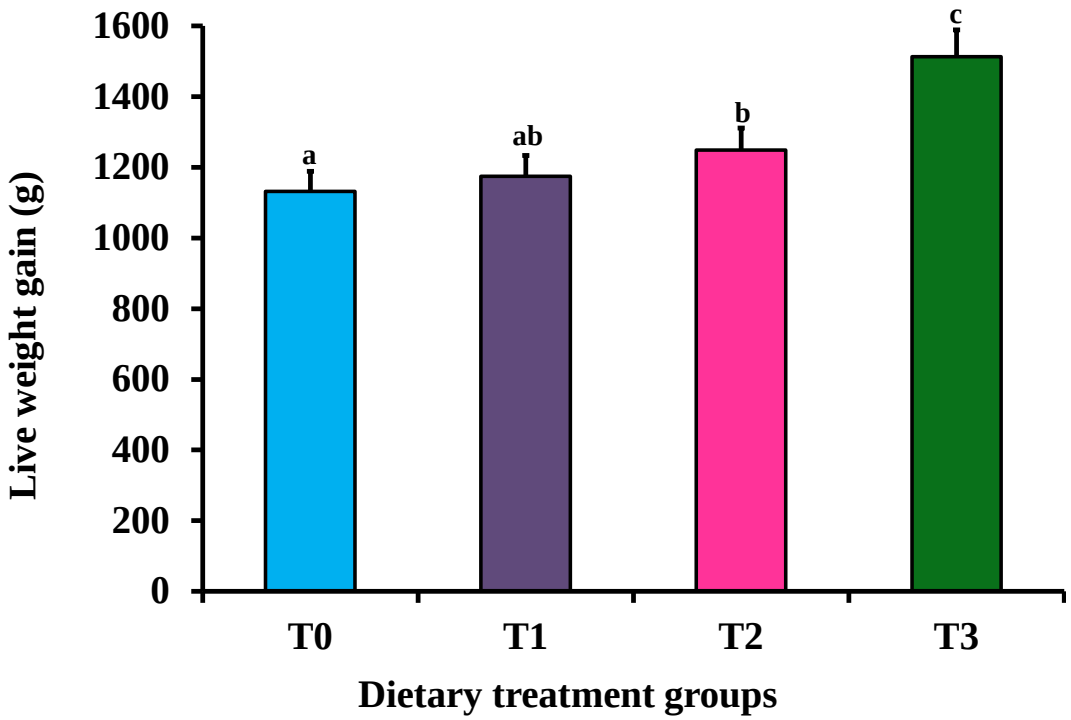


*Figure 1:* Live weight gain (g) of broiler birds fed different levels of Zinc ($T_0$= 0 mg Zinc/ kg of feed (Control group), $T_1$=50 mg Zinc/ kg of feed, $T_2$ = 100 mg Zinc/ kg of feed and $T_3$= 150 mg Zinc/ kg of feed). Each bar with error bar represents Mean ± SEM value. Differences were significant ($P<0.01$) among the groups.

*c) Feed consumption*

Feed consumption of birds during the experimental period is shown in Figure 2. It was observed that feed consumption was significantly ($P<0.05$) higher in the birds fed 100 mg Zinc/kg feed (2717 g/broiler) and 150 mg Zinc/kg feed (2816 g/broiler) than the control group $T_0$ (2512g). However, higher feed consumption was also observed in the birds fed 50g zinc/ kg feed (2634 g/broiler) but was not significantly differed ($P>0.05$) than the control group (2512 g/broiler). Present findings supports the findings of the Ezzati *et al.* (2013) in which they found supplementation of 125ppm zinc had a significantly higher feed intake (6030 g) than the un-supplemented group (5878 g).

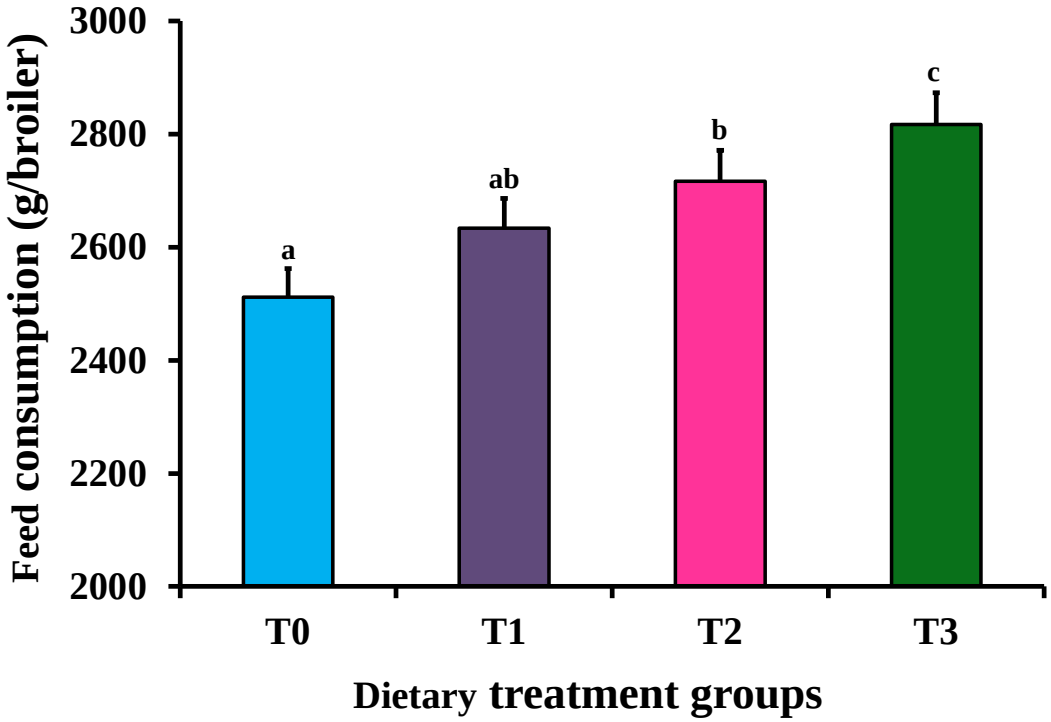


*Figure 2:* Feed consumption (g/bird) of broiler fed different levels of Zinc ($T_0$= 0 mg Zinc/ kg of feed (Control group), $T_1$=50 mg Zinc/ kg of feed, $T_2$ = 100 mg Zinc/ kg of feed and $T_3$= 150 mg Zinc/ kg of feed). Each bar with error bar represents Mean ± SEM value. Differences were significant (P<0.01) among the groups.

*d) Feed efficiency (FE)*

Feed efficiency (FE) of birds during the experimental period is presented in Figure 3. It was observed that FE was significantly (P<0.05) differed between the birds fed 150 mg Zinc/ kg feed (1.79) and control group $T_0$ (2.13). Birds fed, 50 mg Zinc/kg feed showed slightly higher FE (2.15) than the control group (2.13) but this difference is not statistically significant (P>0.05) . However, birds fed150 mg Zinc/kg feed also showed lower FE (2.09) but was not significantly (P>0.05) differed that of the control group (2.15). Present findings supports the findings of the Hosseini-Mansoub *et al.* (2010) in which they found zinc supplemented bird had a lower FE than the un-supplemented zinc group. Present findings does not supports the findings of the Ezzati *et al*. (2013) in which they found supplementation of 125ppm zinc had a FE 2.15 which was not significantly lower than the un-supplemented zinc group FE (2.15). Huang *et al*. (2007) also found highest FE when zinc was added at the level of 20 mg/kg in diet. Another form of zinc is reported to beneficial for broilers that is zinc-methionine which improves the feed efficiency significantly rather than zinc oxide (Sanford and Kawchumnong, 1972).

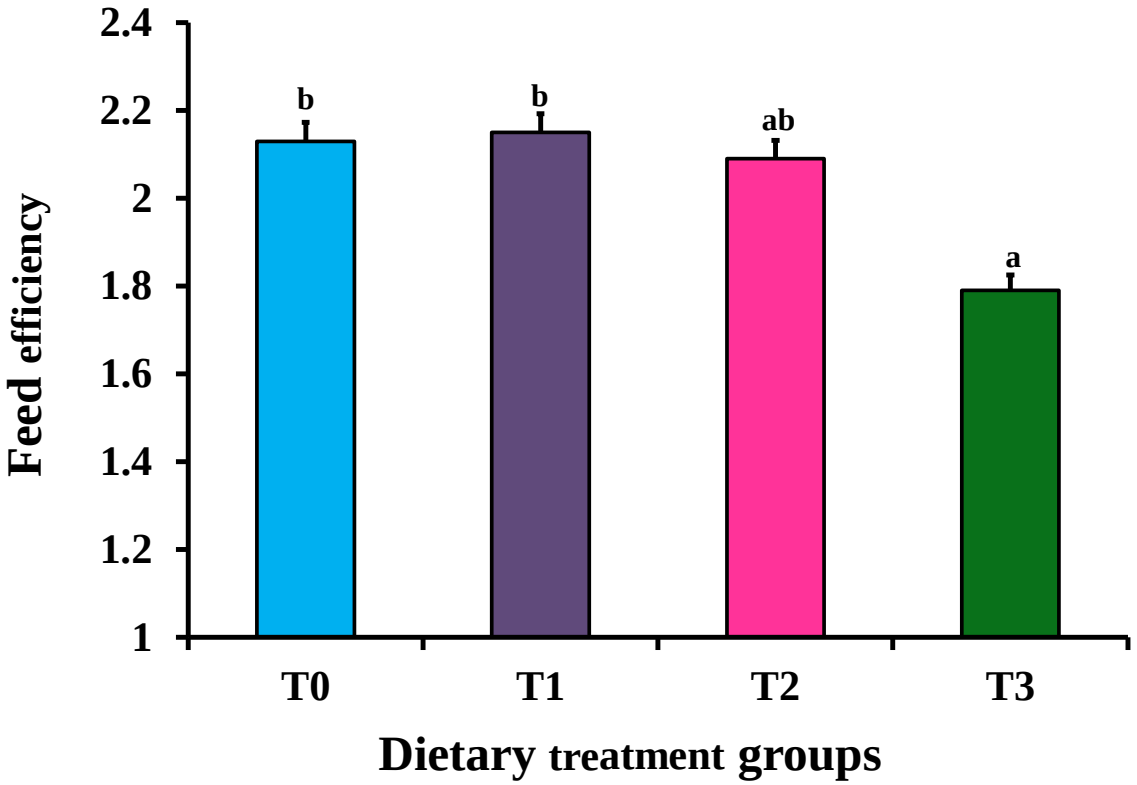


*Figure 3:* Feed efficiency of broiler birds fed different levels of ($T_0$= 0 mg Zinc/ kg of feed (Control group), $T_1$=50 mg Zinc/ kg of feed, $T_2$ = 100 mg Zinc/ kg of feed and $T_3$= 150 mg Zinc/ kg of feed). Each bar with error bar represents Mean ± SEM value. Differences were significant (P<0.05) among the groups.

*e) Carcass yield*

Weight of different internal organs such as heart, gizzard, liver, spleen, pancreas of the birds of $T_0$, $T_1$ and $T_2$ are shown in the Table 3. Statistical analysis of the data did not show any difference between the relative organs weight of the birds of different feeding groups using feed with or without supplementation of Zinc.

*Table 3:* Carcass characteristics of broiler birds fed different level of Zinc

| Parameter (%) | Control | Dietary treatment groups | | | Level of Significance |
|---|---|---|---|---|---|
| | $T_0$ (n=5) Mean±SE | $T_1$ (n=5) Mean±SE | $T_2$ (n=5) Mean±SE | $T_3$ (n=5) | |
| Dressing yield | $55.90^{a}$±1.73 | $57.45^{ab}$±1.35 | $58.10^{ab}$±1.19 | $61.75^{b}$±1.41 | * |
| Breast meat | 14.62±1.73 | 14.81±1.73 | 14.67±1.73 | 14.03±1.73 | NS |
| Thigh meat | $8.15^{\pm}0.73^{a}$ | $8.25\pm0.13^{a}$ | $8.85\pm0.81^{ab}$ | $9.33\pm0.95^{b}$ | * |
| Drumstick meat | $5.27\pm0.31^{a}$ | $5.78^{ab}$±0.41 | $5.91^{ab}$±0.38 | $6.43^{b}$±0.41 | * |
| Drumstick bone | 1.81±1.05 | 1.93±0.10 | 1.87±0.12 | 1.91±0.09 | NS |
| Wing meat | 3.22±0.21 | 3.24±0.38 | 3.72±0.37 | 3.79±0.12 | NS |
| Abdominal fat | 1.21±0.11 | 1.19±0.05 | 1.75±0.03 | 1.82±0.02 | NS |
| Gizzard | 1.44±0.02 | 1.46±0.05 | 1.46±0.11 | 1.51±0.15 | NS |

| | | | | | |
|---|---|---|---|---|---|
| Head | 2.49±0.16 | 2.43±0.21 | 2.48±0.15 | 2.46±0.17 | NS |
| Heart | 0.47±0.005 | 0.46±0.02 | 0.47±0.04 | 0.49±0.09 | NS |
| Liver | 2.20±0.12 | 2.24±0.15 | 2.18±0.13 | 2.19±0.08 | NS |
| Neck wt. | 1.74±0.03 | 1.51±0.05 | 1.86±0.07 | 1.82±0.07 | NS |
| Wing bone | 2.09±0.11 | 2.25±0.16 | 2.16±0.12 | 2.31±0.17 | NS |
| Blood | 4.07±0.09 | 4.09±0.17 | 4.36±0.12 | 4.65±0.18 | NS |
| Thigh bone | 1.27±0.11 | 1.24±0.07 | 1.38±0.09 | 1.42±0.11 | NS |
| Spleen | 0.15±0.002 | 0.14±0.004 | 0.12±0.007 | 0.15±0.002 | NS |
| Skin | 8.21±0.53 | 8.19±0.36 | 7.96±0.75 | 8.39±0.81 | NS |

The above values represent the mean ± standard error (SE) of the live weight of broiler in different weeks of the experimental period. Mean values with the same superscripts within the same row are statistically non-significant (P>0.05) and Mean values with the different superscripts within the same row are statistically significant (P<0.05).
*Here, $T_0$= 0 mg Zinc/ kg of feed (Control group), $T_1$=50 mg Zinc/ kg of feed, $T_2$ = 100 mg Zinc/ kg of feed and $T_3$= 150 mg Zinc/ kg of feed.

For evaluating carcass yield characteristics dressing yield, breast meat, thigh meat, drumstick meat, drumstick bone, wing meat, abdominal fat, gizzard, head, heart, liver, neck wt., wing bone, blood, thigh bone, spleen and skin were taken as variables. It was observed that except dressing yield, thigh meat and drumstick meat all other variables are not significantly differed among the groups. Dressing yield was highest at birds fed 150 mg zinc/ kg feed while it was 55.90, 57.45 and 58.10 g in $T_0$, $T_1$ and $T_3$ group, respectively. Thigh meat weight was also significantly higher in the birds fed 150 mg zinc/ kg feed while it was 8.15, 8.25and 8.85 g in $T_0$, $T_1$ and $T_2$ group, respectively. Drumstick meat was also significantly higher in weight in the birds fed 150 mg zinc/ kg feed (6.43 g). Thigh meat contains more protein less fat, has less tendon, ligaments, myoglobin and blood vessels than that of dark meat. As a result, digestibility of thigh meat is higher than other meat. The demand is higher for thigh meat than the dark meat.

Thus, thigh meat is the one of the valuable part of broiler. So, difference in thigh and drumstick meat yield is manically important. It is very difficult to explain the mechanism of increasing trend of thigh and drumstick meat yield for groups receiving zinc in feed. Most probably this effect was due to the comparative increase in the live weight of broiler birds fed zinc. Present findings support the findings of the Ezzati *et al.* (2013) in which they also found a significantly higher carcass yield in zinc supplemented birds than the un-supplemented group. But Liu *et al.* (2012) had not found any significant effect in carcass yield characteristics of broiler birds by supplying different level of zinc

*f) Blood profile*

Hematological parameters of the experimental birds were shown in Table-4. It was found that hemoglobin (g/dl) was not significantly differed (P>0.05) among the different groups of broiler birds (6.50, 6.65, 6.80 and 6.91g/dl respectively in $T_0$, $T_1$, $T_2$ and $T_3$ group, respectively). Packed cell volume (PCV) was 16.80, 17.10, 17.40 and 17.38 % in $T_0$, $T_1$, $T_2$ and $T_3$ group, respectively which was not significantly (P>0.05) differed among the groups. Erythrocyte sedimentation rate (ESR) was not significantly differed (P>0.05) among the treatment and control groups and it was 6.67, 6.45, 6.45, 6.65 and 6.67 mm in $T_0$, $T_1$ and $T_2$ group, respectively.

Hb, PCV and ESR value of the birds of different groups does not differ significantly among the groups and it was within the normal range. That indicates that supplementation of zinc has no negative effect on the blood profile of broiler birds that means broiler birds was physically sound and healthy during the experimental period and experimented zinc supplementation was safe for the broiler birds.

*Table 4:* Hematological parameters of broiler fed different level of dietary zinc

| Blood Parameters | Dietary treatment groups* | | | | Level of Significance |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ | |
| Hemoglobin (g/dl) | 6.50±0.12 | 6.65±0.06 | 6.80±0.07 | 6.91±0.07 | NS |
| PCV (%) | 16.80±0.67 | 17.10±0.49 | 17.40±0.50 | 17.38±0.30 | NS |
| ESR (mm in 1st hour) | 6.67±0.76 | 6.45±0.68 | 6.65±0.63 | 6.73±0.87 | NS |

The above values represent the mean ± standard error (SE) of the live weight of broiler in different weeks of the experimental period. Mean values with the same superscripts within the same heading are statistically non-significant (P>0.05) and Mean values with the different superscripts within the same headings are statistically significant (P<0.05)
Here, $T_0$= 0 mg Zinc/ kg of feed (Control group), $T_1$=50 mg Zinc/ kg of feed, $T_2$ = 100 mg Zinc/ kg of feed and $T_3$= 150 mg Zinc/ kg of feed.



## IV. Conclusion

At the end it can be sum up that, zinc can be safely and beneficially used in the broiler diets to improve their productive performances, carcass yield and economic benefit. Present research findings may be useful for the small and large scale poultry farmers to earn more profit through improving broiler performances by using zinc and can contribute in the minimization of national protein need and health hazards by supplying tasty, healthy and antibiotic free broiler meat.

## References Références Referencias


1. Abhishek B., Rajeev V. R., Vincent B.-P., Xin T., Chenchen Li, Keji Li, Caroline A. R., Zhanyan Fu, Rudolf J. and Mriganka S. 2016. Jointly reduced inhibition and excitation underlies circuit-wide changes in cortical processing in Rett syndrome. Proceedings of the National Academy of Sciences of the United States of America. 113(46): E7287–E7296.
2. Amin. 2015. Methods for estimation of mineral bioavailability. *Br. Poult. Sci*., 47: 150- 159.
3. Ao, T., Pierce, J. L., Pescatore, A. J., Cantor, A. H., Dawson, K. A., Ford, M. J. and Shafer, B. L. 2007. Effects of organic zinc and phytase supplementation in a maize-soybean meal diet on the performance and tissue zinc content of broiler chicks. *Br. Poult. Sci.* 48: 690–695.
4. Bartlett, J. R., and M. O. Smith. 1998. Effects of different levels of zinc on the performance and immune competence of broilers under heat stress. *Poult. Sci*., 82: 1580-1588.
5. BBS. 2012. Statistical Pocket book of Bangladesh Bureau of Statistics. Ministry of Planning government of the People's Republic of Bangladesh, Dhaka.
6. Bertuzzi, S., G. Manfreda and A. Franchini. 1998. Influence of dietary inorganic zinc and vitamin E on broiler immune response. *Selezione Vet.,* 8(9): 627–636.
7. Blamberg, D. L., U. B. Blackwood, W. C. Supplee, and G. F. Combs. 1984. Effect of zinc deficiency in broiler on body weight and survivability development. *Proc. Soc. Exp. Biol. Med.,* 104: 217–220.
8. Butler, E. and M. Curtis.1973. The effects of Escherichia coli endotoxin and ACTH on the plasma zinc concentration in the domestic fowl. *Research in Veterinary Science,* 15(3): 363-367.
9. Dozier, W. A., A. J. Davis, M. E. Freeman and T. L. Ward. 2003. Early growth and environmental implications of dietary zinc and copper concentrations and sources of broiler chicks. *Br. Poult. Sci.,* 44: 726-731.
10. Ezzati, M., Elio Riboli, M. D. and Lopez, A. D. 2013. Behavioral and Dietary Risk Factors for Noncommunicable Diseases. *N Engl J Med.* 369: 954-964.
11. Farrell, P. R., L. Nicholson, K. D. Roberson, and C.K. Yoong. 2003. Effect of level of inorganic an organic zinc and manganese on the performance and leg abnormalities of turkey toms. *Poult. Sci.,* 71: 18-23.
12. Greene, L. W., D. K. Lunt, and F. M. Byers. 1988. Performance and carcass quality of steers supplemented with zinc oxide or zinc methionine. *J. Anim. Sci.,* 66: 1818–1823.
13. Hosseini-Mansoub, N., Chekani-Azar, S., Tehrani, A.A., Lotfi, A. and Khosravi, M. M. 2010. Influence of dietary vitamin E and zinc on performance, oxidative stability and some blood measures of broiler chickens reared under heat stress (35 °C). *J. Agron*. 2: 103-110.
14. Huang, Y.L., L. Lu, X. G. Luo and B. Liu. 2007. An optimal dietary zinc level of broiler chicks fed a corn-soybean meal diet. *Poult. Sci.,* 86(12): 2582–2589.
15. Kibria ASMG, MA Awal, M Mostofa, AKM Saifuddin, MR Alam and Asgar MA. 2009. Detection of ciprofloxacin and enrofloxacin residues in broilers of

Chittagong. *International Journal of Biological Research,* 2: 33-35.
16. Kidd, M. T., P. R. Ferket, and M. A. Qureshi. 1996. Zinc metabolism with special reference to its role in immunity, *World's Poult. Sci. J.,* 52: 309–324.
17. Lieberman, J. B., S. F. Bilgili, A. M. Parson and K. M. Downs. 2001. Influence of complexed zinc products on live performance and carcass grade of broilers. *J. Appl. Animal Res.,* 19: 49-60.
18. Liu D, SS Guo and YM Guo. 2012. Xylanase supplementation to a wheat-based diet alleviated the intestinal mucosal barrier impairment of broiler chickens challenged by *Clostridium perfringens*. *Avian Pathol.,* 41:291–298.
19. Luecke, Hess, I. B., S. F. Bilgili, A. M. Parson, and K. M. Downs. 2001. Influence of complexed zinc products on live performance and carcass grade of broilers. 3. *Appi. Anim. Res.,* 19:49-60.
20. Midilli, M., Salman, M., Muglali, O. H., Ogretmen, T., Cenesiz, S. and Ormanci. N. 2014. The Effects of Organic or Inorganic Zinc and Microbial Phytase, Alone or in Combination, on the Performance, Biochemical Parameters and Nutrient Utilization of Broilers Fed a Diet Low in Available Phosphorus. World Academy of Science, Engineering and Technology. *Int. J. Bio., Biomol., Agril., Food and Biotech. Engi*. 8(5): 469-475.
21. Mohanna, C. 1999. Effect of dietary zinc content and sources on the growth, body zinc deposition and retention, zinc excretion and immune response in chickens. *Br. Poult. Sci.,* 40: 108-114.
22. Mohanna, C. and Y. Nys. 1999. British Poultry Science, 40(1): 108-114.
23. Rubin, 1972 and Rubin and Koide. 1973. The availability to the chicks of zinc as the sulfate, oxide or carbonate. *Poult. Sci.,* 39: 835-837.
24. Sadoval, Collins and Moran. 1999. Relative bioavailability of supplemental inorganic zinc sources for chicks. *J. Anim. Sci.,* 75: 3195-3205.
25. Sahin, K., M. O. Smith, M. Onderci, N. Sahin, M. F. Garsu and O. Kucuk. 2005. Supplementation of zinc from organic and inorganic source improves performance. *Poult. Sci.,* 84: 882-887.
26. Sanford, P.E. and Kawchumnong, R. 1972. Organic chromium and zinc supplementation of broiler rations. *Poult. Sci.,* 51(suppl. 1): 1856.