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# Growth performance, serum biochemistry and carcass characteristics of broiler birds fed high fibre diet supplemented with exogenous enzyme

**Mithu Dutta, Robin Bhuyan, DN Sarma, Arundhati Bora and TK Amonge**

**Abstract**
The study was carried out to see the effect of enzyme supplementation of high fibre diet on body weight and serum biochemical of broiler chicken in 6 weeks experiment. Six experimental diets ie. $T_1$- Control, $T_2$-8% CF without enzyme, $T_3$-8% CF with enzyme, $T_4$-10% CF without enzyme, $T_5$-10%CF without enzyme was formulated to be isonitrogenous and isocaloric. Two hundred twenty five day old broiler chicks of uniform body weight were divided into five groups of three replicates each with 15 chicks per replicates. The final body weight recorded were 1825.02 ± 9.01, 1625.52± 15.20, 1795.62± 13.51, 1500.29±22.43 and 1575.05± 11.34g for $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ groups, respectively at 6 weeks of age. The final body weight which were recorded at 6$^{th}$ week of age, showed that the birds of $T_1$ and $T_3$ attained significantly ($P$<0.05) higher growth than the groups $T_2$, $T_4$ and $T_5$. But, when the data of $T_1$ and $T_3$ were analyzed, no significant difference ($P$>0.05) was observed between $T_1$ and $T_3$. The Blood glucose and Alkaline Phosphatase level were found to be normal. The average dressing percentage were 88.11, 85.88, 87.27, 84.35 and 85.73, giblet weight percentages were 6.32, 6.04, 6.21, 5.84 and 5.90, eviscerated weight percentage were 67.91, 66.76, 67.37, 65.14 and 65.54 for $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ groups respectively. On the basis of findings of the present study it can be concluded that though the crude fiber level in broiler diet should be maintained at 6% level but it could be increased upto 8% level provided the diet is supplemented with mixture of enzyme.

**Keywords:** Broiler birds, body weight, enzyme supplementation, blood parameters, carcass characteristics

## 1. Introduction
Poultry production presents an efficient alternative to meet the animal protein needs of the nation because of its rapid growth and short generation interval. In one hand when we are witnessing such a tremendous growth rate in broiler production, on the other hand we are forced to face a continuously decreasing trend in profit margin. The reason is high production cost and low price that the farmers get for their birds. Feed cost is the major expense constituting about 70% of total production cost incurred in poultry industry and any attempt to reduce this feed cost would ultimately help the producer to reduce the cost of production. Therefore unconventional feed resource like fibrous feed should be exploited. But the use of unconventional and agro industrial by-products in broiler diets are restricted due to high level of crude fibre or presence of some deleterious factors. The main component of dietary fibre is Non Starch Polysaccharide (NSP) which includes cellulose, hemi cellulose, pectins, ß-glucans and arabinoxylans which are poorly digested. Poultry produce number of enzymes including amylase to digest starch, protease to digest protein, lipase to digest fat. The NSP are known to increase the gut viscosity, reduce nutrient absorption in the intestine and affect indirectly the growth performance of birds [1]. Subsequently water intake increases and undesirable illeal microbial fermentation starts results in increasing moisture in the excreta and resulting in potential diarrhoea [2-3]. There are logical reasons why enzyme supplementation should be beneficial to birds both young and old. In the young chicks, production of endogenous digestive enzyme is scarce and may limit feed digestion [4-5]. Thus the addition of exogenous enzyme can enhance the digestive capacity of young birds by complementing its repertoire of intestinal enzyme. As the birds grow in their digestive ability and microbiota capacity increases, and micro flora route becomes more important in mediating the beneficial effect of exogenous enzyme [6].

Therefore, the present study was undertaken on the effect of enzyme supplementation on blood biochemical of broiler chicken.

## 2. Materials and Methods

**2.1 Study Area:** The experiment was conducted at the experimental poultry shed of the Department of Animal Nutrition, College of Veterinary Science, AAU, Khanapara Campus.

### 2.2 Description and preparation of experimental diets for Broiler Birds

Two hundred twenty five day old broiler chicks of uniform body weight were divided into five groups of three replicates each with 15 chicks per replicates. One group was considered as controlled group *i.e.* $T_1$ and the rest group as treatment groups *viz.* $T_2$, $T_3$, $T_4$ and $T_5$. All the chicks were reared in deep litter system. The composition and nutrient level of the diets used in the two consecutive experiments were shown in Table 1, which were prepared according to the recommended standard [7] The commercial enzyme Poultase was incorporated in the starter and the finisher diets at four different levels @ 50gm/100kg feed. Thus, the groups with their dietary treatment were as follows: $T_1$- 6% CF without enzyme, $T_2$-8% CF without enzyme, $T_3$-8% CF with enzyme, $T_4$-10% CF without enzyme, $T_5$-10%CF without enzyme. Feed and water were given ad libitum. Feed intake and body weight in each group were recorded once a week.

### 2.3 Body weight gain

After weighed and wing-banded, birds were allotted to different groups. The live weight of birds were recorded at weekly intervals on monopan balance, weight of the individual birds were taken from early morning before offering any feed and water. From this record, weekly and total body weight gain of individual bird was calculated.

### 2.4 Estimation of blood constituents

About 2ml of blood from each bird was collected at 0 day and at the end of the experiment from the wing vein. The blood was transferred to the dry clean test tube for serum separation. Serum was separated at 4 ˚C. Different biochemical constituents were estimated from collected serum within 24-48hrs. Blood glucose and Alkaline Phosphatase were estimated by following the methods described in commercial kits manufactured by Merks using UV-2100 Spectrophotometer.

### 2.5 Carcass yield

At the end of trial, five birds from each group were picked up for evaluation of carcass characteristics.

### 2.6 Dressed yield

The average dressing percentage were 88.11, 85.88, 87.27, 84.35 and 85.73, giblet weight percentages were 6.32, 6.04, 6.21, 5.84 and 5.90, eviscerated weight percentage were 67.91, 66.76, 67.37, 65.14 and 65.54 for $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ groups respectively After recording the body weight, the birds were starved overnight, but water was provided adlibitum. All the birds were reweighed next day and slaughtered as per improved Kosher's method. The birds were killed by severing the jugular vein at the atlanto-occipital joint and bled for 3 minutes, scalded at 58 ˚C for 90 seconds and mechanically plucked to determine the blood and the feather losses. The head, shank, tip of the wings and all glands were separated from the main carcass. The dressed weight was expressed on the basis of pre-slaughter live weight percentage.

### 2.7 Eviscerated weight

Evisceration was done by the method described by Panda [8]. It was done by making a cut below the keel bone to remove the viscera. The trachea and lungs were pulled out manually and scrapped liver was made free from gall bladder, heart was freed of internal blood and gizzard was cleaned by removing the internal lining. After dressing, the giblet (heart, liver and gizzard) was retained along with carcass and the weight of carcass with giblet was expressed as eviscerated weight, which was expressed in percentage of pre-slaughter live weight. Gizzard, heart and liver, which constituted giblet were cleaned and weighed. The eviscerated carcass along with giblet formed the total meat yield, while feathers, blood, head, shanks and viscera formed the inedible component of the carcass.

**2.8 Statistical analysis:** The statistical analyses of the experimental data were carried out according to the method described by Snedecor and Cochran [9].

## 3. Results and Discussion

### 3.1 Growth rate of the broiler birds

The average weekly growth in different treatments *i.e.* $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ at different CF level with or without enzyme supplementation showed significant difference in the body weight. The difference was more prominent from 3rd week onward. At the end of 6th week the body weight of broiler bird were found to be 1825.02, 1625.52, 1795.62, 1500.29 and 1575.05 g respectively from $T_1$ to $T_5$ group. It was observed that highest growth was observed in $T_1$ followed by $T_3$, $T_2$, $T_5$ and $T_4$ group. The final growth at 6th week between $T_1$ and $T_3$ was almost similar and statistically no significant difference ($P$>0.05) between the group. However, the final growth in $T_2$, $T_4$ and $T_5$ was significantly lower than $T_1$ and $T_3$ group. It was also observed that $T_2$, $T_4$ and $T_5$ groups had similar growth rate at 6th week of age. Thus it was found that the use of enzyme at higher CF level *i.e.*8% than the permissible level of 6% has some beneficial effects. This might be due to better utilization of non-starch polysaccharide (NSP) component of the feedstuff due to enzyme supplementation in addition to better utilization of other feed nutrients. However present level of enzyme inclusion do not shows improvement at higher CF level (*i.e.*10%). Significantly higher body weight gain was found in birds fed diets containing 8% CF level supplemented with enzyme compared to the birds fed higher level of CF level *i.e.*10% supplemented with enzyme [10]. Supplementation of enzyme at 8% CF significantly ($P$<0.05) increased CF digestibility than other dietary treatments *i.e...*10%, 12% CF [11]. Broiler chicks grew faster and more efficiently on a diet containing fibre degrading enzyme than on a diet without enzyme [12]. The group of birds fed diet containing 10% CF level supplemented with enzyme had significantly ($P$<0.05) lower body weight gain compared with the groups fed lower level of CF. This was probably due to fact that the enzyme preparation incorporating in the diet did not contain sufficient enzyme activity which could have been able to improve the performance of birds fed diets containing 10% CF level.

### 3.2 Blood parameters of the broiler birds

The result of the effect of enzyme supplementation of high fibre diet on serum metabolites of broilers is presented in Table 2 and Table 3.The blood glucose level at fortnightly interval and overall mean did not show any significant difference ($P$>0.05). The level of blood glucose was found to

be in normal range between 186.07 to 187.48mg/dl. Numerical increase in blood glucose level in enzyme supplemented groups of broiler compared to control [13]. Non-significant variation in blood glucose level with or without enzyme at different level was found [14]. The blood glucose level at present study did not show any significant difference ($P>0.05$) but in normal range and are in good agreement with that of the above workers. The value of Serum Alkaline Phosphatase are almost similar and no significant difference ($P>0.05$) was observed among the groups. Serum alkaline phosphatase was not affected significantly due to enzyme supplementation [15].The present finding can be compared with the finding of the above worker.

### 3.3 Carcass Characteristics

The percent dressed weight; giblet weight and eviscerated weight have been presented in Table 5. The dressing percentage was found to be 88.11, 85.88, 87.27, 84.35 and 85.73 from $T_1$ to $T_5$ group respectively. When the data were analyzed statistically, significant difference ($P<0.05$) was observed among the group. The dressing percentage was significantly higher in $T_1$ and $T_3$ group than the other group. The giblet weight ranged from 5.84 to 6.32 and eviscerated weight 65.14 to 67.91 in different groups. In the present experiment, the dressing percentage, eviscerated weight percentage was better at 6% CF level and at 8% CF level with enzyme supplementation. Higher dressing percentage in broiler fed enzyme supplemented diet in comparison to control but did not find any significant difference between them [16]. Lower dressing percentage in birds fed on unsupplemented diet compared to those with enzyme supplementation [17]. Enzyme supplementation to fibrous diet improved the growth rate and their by increasing dressing percentage [18]. Increased carcass yield by addition of enzyme in the diet [19]. The results in the present study are in accordance with the earlier workers. On the other hand this result contradicts with some researchers [20-21].

## 4. Conclusion

The growth rate of broiler chicken was found better at 6% CF level. However, the growth rate at 8% CF level was almost same when the diet was supplemented with enzyme. Beyond 8% CF level *i.e.* at 10% CF level the growth rate was less. The blood parameter studies showed that blood glucose and alkaline phosphatase level were in normal range. The carcass characteristics results showed that the dressing percentage did not vary significantly among groups other than the group *i.e.* $T_4$ having 10% CF and fed without supplementation of enzyme. Considering the growth rate it could be concluded that the crude fibre level in broiler starter and finisher diet can be maintained upto 8% level provided the diet is supplemented with enzyme. At 10% crude fibre level growth rate and cost of feeding per kg live weight gain was not found satisfactory.

**Table 1:** Experimental ration for broilers having different level of fibre with chemical composition

| Ingredients (%) | 6% CF | | 8%CF | | 10%CF | |
|---|---|---|---|---|---|---|
| | Starter | Finisher | Starter | Finisher | Starter | Finisher |
| Maize | 50 | 55 | 45 | 45 | 35 | 34 |
| Rice polish | 10 | 11 | 21 | 22 | 31 | 30 |
| GNC | 15 | 15 | 20 | 16 | 22 | 21 |
| Soybean | 18 | 13 | 10 | 13 | 8 | 11 |
| Fish meal | 5 | 4 | 2 | 2 | 2 | 2 |
| Min. mixture | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Salt | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Chemical Composition (%)** | | | | | | |
| Dry matter (%) | 90.27 | 91.6 | 91.05 | 92.06 | 90.65 | 90.20 |
| Crude protein (%) | 22.89 | 19.01 | 22.03 | 18.93 | 22.10 | 19.03 |
| Ether extract (%) | 4.90 | 3.87 | 4.36 | 4.3 | 4.12 | 4.3 |
| Crude fibre (%) | 5.98 | 6.3 | 8.1 | 8.3 | 10.1 | 10.3 |
| Total ash (%) | 6.2 | 6.4 | 6.2 | 6.6 | 6.3 | 6.8 |
| Nitrogen free extract (%) | 60.03 | 64.42 | 59.31 | 61.87 | 57.38 | 59.59 |
| Calcium (%) | 1.28 | 1.15 | 1.02 | 1.36 | 1.10 | 1.09 |
| Phosphorous (%) | 0.65 | 0.69 | 0.50 | 0.57 | 0.61 | 0.51 |
| *Metabolizable energy (kcal/kg) | 2870 | 2910 | 2810 | 2930 | 2820 | 2941 |

**Table 2:** Mean weekly growth on birds under different experimental diets

| Treatment | Mean± SE growth (g) at | | | | | | |
|---|---|---|---|---|---|---|---|
| | Initial | 1st week | 2nd week | 3rd week | 4th week | 5th week | 6th week |
| T1 | 40.95 ± 0.36 | 87.94 $^{a}$ ±.68 | 250.63± 6.94 | 560.07 $^{a}$ ± 7.36 | 965.30 $^{a}$ ± 13.09 | 1387.11 $^{a}$ ± 9.60 | 1825.02 $^{a}$ ±9.01 |
| T2 | 41.95± 0.63 | 85.39 $^{ac}$ ± 0.78 | 239.34± 6.72 | 445.90 $^{b}$ ± 6.63 | 891.81 $^{b}$ ±5.97 | 1250.60 $^{b}$ ± 10.18 | 1625.52 $^{b}$ ±15.20 |
| T3 | 40.92± 0.76 | 82.74 $^{bc}$ ±0.79 | 245.89± 7.78 | 552.83 $^{a}$ ± 7.19 | 900.4 $^{b}$ ±11.06 | 1350.86 $^{b}$ ± 10.70 | 1795.62 $^{a}$ ±13.51 |
| T4 | 40.03 ±0.24 | 83.89 $^{bc}$ ±0.90 | 235.76 ±7.33 | 420.85 $^{b}$ ±9.99 | 810.88 $^{c}$ ±8.17 | 1200.33 $^{b}$ ± 13.00 | 1500.29 $^{b}$ ± 22.43 |
| T5 | 40.13 ±0.28 | 81.25$^{b}$ ±0.79 | 245.808 ±7.71 | 440.67 $^{b}$ ±8.34 | 870.29 $^{b}$ ± 8.43 | 1220.2 $^{a}$ ± 10.48 | 1575.05 $^{b}$ ± 11.34 |

Mean in a column bearing a common superscript do not differ significantly

**Table 3:** Fortnightly average blood glucose level (mg/dl) in different treatment groups of broiler birds

| Treatment | 1st fortnight | 2nd fortnight | 3rd fortnight | Overall mean |
|---|---|---|---|---|
| T1 | 185.47±0.13 | 187.36±0.17 | 189.51±0.13 | 187.48±0.09 |
| T2 | 184.50±0.20 | 186.37±0.12 | 188.53±0.13 | 186.47±0.06 |
| T3 | 185.15±0.03 | 187.12±0.03 | 189.20±0.07 | 187.15±0.04 |
| T4 | 184. 14±0.01 | 186.03±0.03 | 188.07±0.02 | 186.07±0.01 |
| T5 | 184.08 ±0.05 | 186.08±0.03 | 188.18±0.01 | 186.13±0.01 |

**Table 4:** Fortnightly average serum alkaline phosphatase level (Kau/dl) in different treatment groups of broiler birds

| Treatment | 1st fortnight | 2nd fortnight | 3rd fortnight | Overall mean |
|---|---|---|---|---|
| T1 | 124.60±0.35 | 126.60±0.35 | 128.35±0.35 | 126.26±0.30 |
| T2 | 123.74±0.42 | 125.44±0.42 | 127.72±0.42 | 125.63±0.26 |
| T3 | 124.51±0.03 | 126.55±0.03 | 128.64±0.03 | 126.57±0.05 |
| T4 | 123.53±0.14 | 125.37±0.14 | 127.53±0.14 | 125.20±0.04 |
| T5 | 123.10±0.35 | 125.22±0.35 | 127.14±0.35 | 125.43±0.23 |

**Table 5:** Average dressed weight (%), giblet weight (%) and eviscerated weight (%) of birds under different experimental groups

| Treatment | Dressed weight (%) | Giblet weight (%) | Eviscerated weight (%) |
|---|---|---|---|
| T1 | $88.11^{a}$ ±0.50 | $6.32^{a}$ ±0.96 | $67.91^{a}$ ±0.46 |
| T2 | $85.88^{ab}$ ±0.46 | $6.04^{bc}$ ±0.07 | $66.76^{ab}$ ±0.58 |
| T3 | $87.27^{a}$ ±0.67 | $6.21^{ab}$ ±0.016 | $67.37^{ab}$ ±0.82 |
| T4 | $84.35^{b}$ ±0.85 | $5.84^{c}$ ±0.015 | $65.14^{ab}$ ±0.33 |
| T5 | $85.73^{ab}$ ±0.720 | $5.90^{c}$ ±0.03 | $65.54^{ab}$ ±0.72 |

Mean in a column bearing a common superscript do not differ significantly

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