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Effect of Dietary Supplementation of Critical Amino Acids and Multi-Enzyme with Low Protein and Energy Diet on Carcass and Blood Biochemical Performance of Broiler Chicken

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ABSTRACT

The experiment was conducted to study the effect of dietary supplementation of critical amino acids and multi-enzyme with reduced levels of energy and protein diet on carcass and blood biochemical performance in broiler chicken. Three hundred broiler chicks were allotted to five dietary treatments of three replications and 20 birds in each replication. The control (T_0) were fed with standard diet, T_1 (5% low CP and energy than standard with balancing of lysine and methionine), T_2 (T_1 + Multi-enzyme), T_3 (10% low CP and energy than standard with balancing of lysine and methionine), T_4 (T_3 + Multi-enzyme). The dressing percentage and edible meat percentage were significantly more in T_2 group. The breast meat percentage of the control group was comparable with T_2 group. The result showed that the significantly higher ($P<0.05$) gizzard weights in groups receiving enzyme combination supplementation as compared to control group (T_0) irrespective of the energy-protein levels. The mean value of total protein, albumin, globulin and blood urea nitrogen of all the experimental birds were found to be statistically similar with that of the control group. The treatment group T_2 found to be effective and economical.

Keywords: Amino acids, Lysine, Methionine, Carcass, Blood Biochemicals

Ensuring feed availability at affordable prices is the key concern for the poultry industry as 70% of production costs being in the form of feed. Maize and soy meal forms the major proportion of poultry feed with maize contributing 55-65% and out of the total feed volume soy meal forming 25-30%. There is increased competition between human and animals for these ingredients; moreover India is a net exporter of both these commodities. Therefore the gap between demand and supply is anticipated to broaden more in the coming years, creating a compelling intention to explore the convenience of locally accessible, unconventional feedstuffs in poultry diet formulation. The industry also uses feed additives such as vitamin premixes, amino acids and exogenous enzymes which are largely procured from indigenous sources. Enzyme supplementation in ration breaks down fibrous cell wall, reduces digest a viscosity and increases availability of nutrients. Enzyme addition to corn-SBM diets are frequently reported to increase ileal nutrient digestibility and feed efficiency (Cowieson and Ravindran, 2008). The positive effects of the enzymes are suggested to be due to enhancement of nutrient digestibility in young chicks as well as digestion of soluble and insoluble NSP in corn and SBM. Amino acids in general are critical for muscle development and lysine is known to exhibit specific effects on carcass composition of broilers. Lysine not only increases protein synthesis but also decreases protein catabolism (Kidd *et al.,* 2001). Breast muscle provides the greatest portion of edible meat in broilers and

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the contribution of breast muscle to total carcass meat is approximately 30 percent of total carcass meat and would contribute close to 50 per cent of total edible carcass protein (Summers *et al.,* 1988). Similarly, the dietary lysine and methionine inadequacy has been shown to reduce breast muscle yield as compared with other muscles. There are reports indicating that lysine can modify abdominal fat deposition. Methionine acts as a lipotropic agent through its role as an amino acid in balancing protein or through its role as a methyl donor and involvement in choline, betaine, folic acid, and vitamin B_{12} metabolism (Garcia *et al.*, 2000). Therefore, fulfilling dietary amino acid needs for optimum growth and meat yield has been recognized to be of utmost importance in broiler chicken (Dozier *et al*., 2007).Hence, the present study was planned to offer low protein and low energy diet supplemented with L-lysine, DL-methionine and multienzyme to meet adequate quantity of these amino acids as per BIS (2007) to broiler chicken and to study its effect on their performance of broilers.

MATERIALS AND METHODS

The present research work was undertaken at Poultry Research Centre, Post Graduate Institute of Veterinary and Animal Sciences, Akola (MAFSU, Nagpur) during the period from 15th March 2017 to 26th April 2017. Three hundred commercial, unsexed, straight run, day old Vencobb-400Y broiler chicks belonging to same hatch were procured from Venkateshwara Hatcheries Pvt. Ltd., Pune. On arrival, chicks were weighed individually and assigned randomly into five dietary treatments of three replications and 20 birds in each replication. The control (T_0) were fed with standard diet as per BIS (2007), T_1 (5% low CP and energy than standard with balancing of lysine and methionine), T_2 (T_1 + Multienzyme), T_3 (10% low CP and energy than standard with balancing of lysine and methionine), T_4 (T_3 + Multienzyme). The birds were reared on a deep litter system for 6 weeks on standard managemental practices. The blood biochemicals were studied at the end of experiment for serum total protein, albumin, globulin and BUN on Auto-analyzer by using kits of span diagnostic Ltd. Total thirty birds were sacrificed, six birds from each dietary treatment i.e. two birds from each replicate were slaughtered by standard procedure at the end of the experimental period to study the carcass characteristics. The data was analyzed by using Statistical Package for the Social Sciences (SPSS) Version 17.0. The differences between means were subjected to ANOVA by univariate analysis using General Linear Model. The Significant differences among treatment means were separated by using Duncan's Multiple Range test and considered as significant when P–value was less than 0.05.

RESULTS AND DISCUSSION

Table 1: Blood biochemical observations

Treatment	Total protein	Albumin	Globulin	BUN
T_0	7.44	3.15	4.29	4.23
T_1	6.29	2.68	3.61	4.46
T_2	6.30	3.73	2.56	3.83
T_3	6.08	2.41	3.66	3.20
T_4	7.71	2.50	5.21	3.14
Mean	6.77	2.90	3.87	3.78

Table 2: Average percent carcass yield in broilers at the end of 6th week of age

Treatment	Dressing (%)	Edible meat (%)	Giblet meat (%)	Abdominal fat (%)
T_0	80.2 ^{a}	75.66^{ab}	4.53^{abc}	1.46 ^{a}
T_1	81.01 ^{a}	76.82 ^{a}	4.18 ^{c}	1.33 ^{a}
T_2	80.51 ^{a}	76.27^{ab}	4.24^{bc}	1.44 ^{a}
T_3	77.76^{ab}	72.91^{ab}	4.85^{ab}	0.91 ^{b}
T_4	76.43 ^{a}	71.52 ^{b}	4.91 ^{a}	0.9 ^{b}
Pooled mean	79.18	74.63	4.54	1.21

Treatments end in column bearing common superscripts does not differ significantly (P<0.05).

The values pertaining to total protein were found to be non-significant. Treatment group T_4 shows numerically highest value among all the treatment groups. Plasma protein has been considered as an index of dietary protein intake (Annongu, 1997). Therefore quality and quantity of dietary protein in any diet are expected to influence blood protein concentration. The findings of present study are well corroborated with Awed *et al.* (2014) who observed reduction in protein level with amino acid supplementation. Similarly Malmo *et al.* (2013) observed reduction in serum protein in 20% crude protein diet supplemented with lysine and methionine. For serum albumin it was observed from the table that the control group T_2 recorded

Table 3: Average carcass yield (g) in broilers at the end of 6th week of age

Treatment	Fasting Body Wt	After Bleeding Wt	Defeathering Wt	Eviscerate Wt	Giblet wt	Edible wt
T_0	1782.33^{bc}	1728^{bc}	1646.83^{bc}	1429.33^{c}	80.91^{NS}	1348.42^{ab}
T_1	1882.17^{b}	1822.33^{b}	1718.67^{b}	1526.83^{b}	78.65^{NS}	1448.18^{b}
T_2	2072^{a}	1998.17^{a}	1912.5^{a}	1668.33^{a}	87.76^{NS}	1580.58^{a}
T_3	1668^{c}	1600.67^{c}	1516.17^{c}	1298^{c}	80.61^{NS}	1217.39^{c}
T_4	1790.5^{bc}	1707.33^{bc}	1620.67^{bc}	1364.17^{c}	88.24^{NS}	1275.93^{c}
Pooled mean	1839	1771.3	1682.97	1457.33	83.23	1374.1

Treatments end in column bearing common superscripts does not differ significantly (P<0.05).

Table 4: Percent ingredient composition of broiler diet

Ingredients	Pre-starter					Starter					Finisher				
	T_0	T_1	T_2	T_3	T_4	T_0	T_1	T_2	T_3	T_4	T_0	T_1	T_2	T_3	T_4
Maize	46.53	48.70	48.70	50.87	50.87	49.41	51.35	51.35	52.51	52.51	54.05	55.60	55.60	57.15	57.15
Soybean Meal	40.10	35.54	35.54	30.98	30.98	37.80	33.41	33.41	29.70	29.70	32.45	28.40	28.40	24.35	24.35
DORB	5.00	9.50	9.50	14.00	14.00	3.50	8.00	8.00	12.50	12.50	3.50	8.00	8.00	12.50	12.50
Vegetable Oil	4.40	2.20	2.20	0.00	0.00	5.30	3.15	3.15	1.10	1.10	6.00	3.90	3.90	1.80	1.80
DCP	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
LSP	1.10	1.10	1.10	1.10	1.10	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Trace Mineral Premix	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Vitamin Premix	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
DL-Methionine	0.15	0.16	0.16	0.17	0.17	0.10	0.12	0.12	0.14	0.14	0.14	0.16	0.16	0.18	0.18
L-Lysine	0.07	0.15	0.15	0.23	0.23	0.04	0.12	0.12	0.20	0.20	0.01	0.09	0.09	0.17	0.17
Choline Chloride 60%	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Toxin Binder	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

the highest value for serum albumin as compared to rest of treatment groups. Our results of albumin are in concurrence with the observation of other researchers (Ting and Balloon (1972), Hernandez *et al.* (2012). On the contrary Abudabos *et al.* (2012) did not observe any effect on serum albumin concentration fed diet low in ME and protein supplemented with lysine, methionine and threonine. The values for serum globulin was comparable and did not differ among the different groups. . Similarly Yuan *et al.* (2008) observed the addition of enzyme complexes had no significant effects on blood parameters. On contrary Awad *et al.* (2014) observed that reduction in protein level with amino acids supplementation had significantly increased serum globulin. The present study showed that feeding a low protein diet had lower blood urea nitrogen level (P>0.05) in treatments groups as compared to control one. There were significant differences among the treatments for fasting body weight, after bleeding weight of carcass, defeathering weight of carcass, eviscerate weight of carcass, and edible weight of carcass. Also significant differences were observed among the treatments for the dressing percentage, edible meat percentage, giblet percentage and abdominal fat percentage. The dressing percentage was significantly more in T_0, T_1 and T_2 group, however abdominal fat pad was found to be reduced in T_3 and T_4 group. Similar results were obtained by Raju *et al.* (1999) who observed increased abdominal fat with decreased CP contain of diet supplement with amino acid. Similarly, Panda *et al*. (2012) found a significantly lower abdominal fat percentage in the birds fed low energy diet supplemented with enzyme. However in contrast to the present result Zakaria (2010) found no significant differences in abdominal fat pad fed a diet supplemented with enzyme. Similarly, Youssef *et al.*

(2011) found decreased in abdominal fat pad in the broiler chicken fed with enzyme supplemented diet. Further Cho (2012) found no significant effect in abdominal fat. Whereas, Awad *et al.* (2014) observed that the chicken receiving 16.25% CP diet had non-significant change in abdominal fat weight.

CONCLUSION

Addition of synthetic amino acids with multi-enzyme with reduction of energy and protein up to 5 percent is found to be effective.

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