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Keywords: *ration, protein source, growth performance, immune response.*

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Effects of Sources of Protein on Productive Performance and Immune Response in Commercial Broiler

Sabuj Kanti Nath [α], Jotan Kar [σ], Rajib Chakrabarty [ρ], Arup Sen [ω], Saurav Kumar Ghosh [¥], Md Bayzid [§], & Mohammad Mahbub Hasan [χ]

Abstract- The study was conducted to investigate the effect of different protein supplemented feed (animal protein, plant protein and combination of animal protein and plant protein) on the growth performance of broiler and the immune response of the birds against Newcastle Disease (ND). A total of 99 broiler birds were divided into 3 groups, each group consist of 33 individuals. Rations supplemented with animal protein, plant protein and combination of animal protein and plant protein were formulated for 3 treatment groups. Newcastle Disease vaccine was administered according to the vaccination schedule. Growth performance was measured using Feed Conversion Ratio (FCR) and immune response against ND using Haemaglutination Inhibition (HI) test. There was significant difference in growth performance due to variation in protein source of the supplied ration FCR was found 2.06, 1.64 and 1.68 for group A, B and C respectively. Antibody titre of the birds against ND vaccine virus was highest at day 7 is 7.10 and at day 28 is 6.90 in group-A birds supplemented with animal protein. The finding shows that immune response in broilers against ND depends on the protein source of the ration and animal protein is the best to have strong immunity.

Keywords: ration, protein source, growth performance, immune response.

I. Introduction

Chicken contributes 51% of the total meat production in Bangladesh (BBS, 2009). Per capita annual consumption of meat in this country is 5.9 kg which is very low and only 7.98% of the universal standard *(Sabrin et al., 2012)*. The annual per capita egg consumption is only 23 although it should be 100 from a nutritional point of view. The predominant poultry breed in Bangladesh is local, kept in scavenging system. Disease challenge is one of the many factors that will have an effect on the nutrient requirements of poultry. Insufficient nutrient consumption will reduce the effectiveness of the bird's defense mechanisms. Therefore, poultry must be supplied enough dietary nutrients and energy to allow the bird to express desired growth and feed efficiency. Poultry have been produced commercially since the early 1900's, and research has been conducted for years to improve production efficiency. Poultry nutrition experts employed by the industry have access to a great amount of information allowing them to optimize the particular production parameters most important to the producers (such as breast meat yield, feed conversion, weight gain). A good example of some of this information is that supplied by the National Research Council for Poultry (NRC). The protein and essential amino acids (EAA) requirements for broilers proposed by NRC (1994) are unable to accommodate the terms of production for modern strains of birds. In order to catch up the additional growth, levels of different commercially available proteins are generally increased (Corzo et al., 2002). Among these, particularly soybean meal is now being supplemented extensively enabling increasing energy production on the body (Corzo et al., 2002). Lysine requirements of broilers are higher in low protein diets for maximum weight gain and feed efficiency (Labadan et al., 2001). Even at normal crude protein (CP) level, high lysine content has been reported to increase the growth rate in broilers (Saima et al, 2010). Increasing soybean meal above NRC (1994) recommendations has been reported to improve weight gain; feed efficiency and breast meat yield (Si et al., 2004) and This protein source reduce the deposition of extra fat in the carcass. As widely described, increasing dietary proteins generally results in improved feed intake, feed conversion, and body weight gain (Sterling et al., 2006). Kidd et al., (2004) reported that essential amino acid (lysine) produced after break down of dietary proteins in poultry diet in concentration recommended by the NRC (1994) support proper immune system functions in healthy chicks. Improvements in immunity, as affected

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by dietary proteins in animals include improved thymic weight and function, enhanced lymphocyte mitogenesis, improved immunity against tumors and enhanced wound healing (Faluyi et al, 2015).

Among infectious diseases of backyard poultry, Newcastle disease (ND) and fowl cholera (FC) are highly endemic in Bangladesh. The prevalence rate of Newcastle disease in poultry is 28.9% (Adene, 2004). The major tools that can be used to provoke immunity in birds for both the prevention and control of the spread of the disease are vaccination, good nutrition and immunomodulation. Information as to the effect of different types of protein supplementation in different levels on growth and immunological responses to Newcastle disease in broiler chickens are rare. Although vaccination is being practiced to control ND in Bangladesh but outbreaks of NDV infection has been reported by several investigators (Sarkar *et. al.,* 2012).

Malnutrition and infection are major obstacles to survival, health, growth and reproduction of animals and humans worldwide. Recent studies indicate that dietary amino acids deficiency, which reduces concentrations of most amino acids in plasma and destroys the immune system, remains a significant nutritional problem in developing countries and also occurs in populations of developed nations. Thus, there is growing interest in the role of amino acids in the immune function of mammals, birds, fish and other species (Grimble, 2006). However, only in the past 15 years the underlying cellular and molecular mechanisms began to unfold (Newsholme *et al.,* 2003). Dietary supplementation with methionine has beneficial effects on the immune system under various catabolic conditions. For example, increasing total methionine levels from 0.35 to 1.2% in the diet for chickens infected with the Newcastle Disease Virus (NDV) markedly enhanced the following key aspects of the immune response: plasma levels of IgG (Tsiagbe *et al.,* 1987), leucocyte migration and antibody titre (Swain and Johri, 2000). The energy for adaptation comes from the three energy-yielding nutrients: carbohydrates, lipids and proteins. These nutrients are only available from feed and from nutrient reserves in the animal body. Lack of energy and protein hardly damages the humoral immunity. Choosing the proper level of energy that will optimize growth, carcass quality and feed efficiency, while still allowing for profitable production, is a major concern to any commercial operation. It has been consistently demonstrated that if essential nutrients are maintained in relation to dietary energy, an increased growth rate and improved feed efficiency are observed as a result of increasing the level of dietary energy (Bartov, 1992 and Leeson *et al.,* 1996). Therefore, the major objective of this study was to provide an insight into the specific roles of different protein sources in diets on the immune function and performance of broilers.

II. Materials and Methods

a) Study area

The study was conducted at the Department of Animal Science and Nutrition in Chittagong Veterinary and Animal Sciences University (CVASU), Chittagong.

b) Duration of study

The study was carried out from April to May, 2016.

c) Sampling strategy

A total of 99 day old Cob-500 broiler chicks were obtained from commercial hatchery (MM Agha Hatchery Ltd.) and reared using common practice for broiler chicks and fed on starter broiler diets special emphasis on different sources of protein (animal, plant, mixed animal & plant protein).

d) Study design and management

A total number of 99 day old cob-500 strain chicks were collected with average weight of approximately 40g and randomly divided into three (3) groups A, B and C. Each group consisted of 33 numbers of chicks. Then chicks were reared upto 28 days and first group was reared with ration supplemented with animal protein while the second and third groups were fed the plant protein and mixed animal & plant protein diet, respectively. All groups were kept at the similar conditions of room temperature and under normal periods of light/dark. Feed and water supplementation were *ad libitum* throughout the experimental period.

e) Vaccination of the experimental broiler

All the birds from each group were chosen and each bird was vaccinated against Newcastle disease with NDV clone 30 (Nobilis ND Clone 30; Intervet) following standard ND vaccination schedule (At 5 days and 12th days of age of bird).

f) Live body weights and body weight gain

Birds were weighed (g) individually at 7, 14, 21 and 28 days of age. Chicks were weighed in the morning before offering the feeds. Body weight gains were calculated by subtracting body weight at the end of each period from the initial body weight at the same period using individual record for each bird.

g) Measurement of feed intake and protein intake

In each experiment, feed intake was recorded weekly according to the replicate feeding system followed in the present work. Each group was provided daily with enough pre-weighed amount of its corresponding diet. The remainder and scattered feeds as well as the consumed feed was weekly calculated for each replicate and thereafter, the average weekly feed intake per bird was calculated by division of group consumed by their chick number whereas, protein

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intake was calculated by multiply dietary CP% of the feed by feed intake.

h) Calculation of feed conversion ratio (FCR)

Feed conversion ratio was calculated in the form of units of feed intake required to produce one unit of live body weight gain.

i) Cumulative feed consumption ratio

Cumulative feed consumption ratio was calculated at 7, 14, 21 and 28 days of age from each group of chicks. It was done by total feed consumed by birds of each groups divided by total numbers of birds in each groups.

j) Mortality rate

Mortality rate for whole experiment period was presented as a number of dead birds in each treatment at the end of each experiment.

k) Immunological test

Blood samples were collected from wing vein using an insulin syringe at two times 4 and 21 days of post-vaccination. Blood was allowed to clot then centrifuged immediately to separate serum. After collection of serum Hemagglutination inhibition (HI) test of serum samples was done according to the method of King and Seal, (1998) to determine the immune response (antibody titer) of the chickens derived from vaccination against Newcastle Disease virus.

l) The procedure of HI test is given below

To obtain a preparation of virus with known HA titer or determine its HA titer we have to prepare two-fold dilutions of patient/test serum to be tested e.g. from 1:4 to 1:1024. Add a fixed amount of virus to every well of a 96-well plate, equivalent to 4 HA units (varies according to virus), except for the serum control wells. The plate is then allowed to stand at room temperature for 60 minutes (time varies according to specific requirements). Add red blood cells (RBC) and incubate at 4oC for 30 minutes. Then Read the wells. The highest dilution of serum (Ab) that prevents hemagglutination is called the HI titer of the serum. A smooth or jagged shield of cells or an irregular button indicates agglutination. Observation of movement of the button of red cells when the plate is tilted may help to clarify the end point. (https://microbeonline.com)

m) Ration formulation

We used animal protein, plant protein and combination of animal protein and plant protein supplement for broiler starter and grower.

Animal protein supplemented ration for broiler starter

Ingredients	Amount	ME	CP	CF	Ca	P
Maize	55	1819.95	5.06	1.32	0.0385	0.22
Auto Rice Polish	10	293.7	1.19	1.24	0.035	0.12
Full fat soya	6.8	239.292	2.584	0.34	0.017	0.0408
Fish meal	7.5	207.75	4.35	0.3	0.5775	0.2925
Meat and bone meal	7.5	158.325	4.035	0.1725	0.8475	0.40425
Vegitable oil	1.4	125.3			0.091	
Protein Conc.	8	232	4.8	0.24	0.52	0.2
Molasses	0.5	12	0.014		0.00755	0.0033
Lime stone	1				0.358	0.0002
Vit. & Min. premix	0.25					
Common salt	0.25					
DCP	0.5				0.1215	0.091
D-L Methionine	0.14					
Enzyme	0.05					
Emulsifier	0.04					
L-Lysine	0.05					
Antioxidant	0.012					
Coccidiostat	0.02					
Toxin binder	1					
TOTAL	100.01	3088.32	22.03	3.61	2.61	1.37

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Animal protein supplemented ration for broiler grower

Ingredients	Amount	ME	CP	CF	Ca	P
Maize	58	1919.22	5.336	1.392	0.0406	0.232
Auto Rice Polish	8	234.96	0.952	0.992	0.028	0.096
Full fat soya	6.8	239.292	2.584	0.34	0.017	0.0408
Fish meal	7	193.9	4.06	0.28	0.539	0.273
Meat and bone meal	7	147.77	3.766	0.161	0.791	0.3773
Vegitable oil	1.4	125.3			0.091	
Protein Conc.	8	232	4.8	0.24	0.52	0.2
Molasses	0.5	12	0.014		0.00755	0.0033
Lime stone	1				0.358	0.0002
Vit. & Min. premix	0.25					
Common salt	0.25					
DCP	0.5				0.1215	0.091
D-L Methionine	0.14					
Enzyme	0.05					
Emulsifier	0.04					
L-Lysine	0.05					
Antioxidant	0.012					
Coccidiostat	0.02					
Toxin binder	1					
TOTAL	100.01	3104	21.51	3.41	2.51	1.31

Plant protein supplemented ration for broiler starter

Ingredients	Amount	ME	CP	CF	Ca	P
Maize	54	1786.86	4.968	1.296	0.0378	0.216
Auto Rice Polish	4.34	127.4658	0.51646	0.53816	0.01519	0.05208
Full fat soya	2.5	87.975	0.95	0.125	0.00625	0.015
Soyabean meal	34	761.6	15.3	2.04	0.1088	0.2278
Vegitable oil	1.4	125.3			0.091	
Molasses	0.5	12	0.014		0.00755	0.0033
Lime stone	1				0.358	0.0002
Vit. & Min. premix	0.25					
Common salt	0.25					
DCP	0.5				0.1215	0.091
D-L Methionine	0.14					
Enzyme	0.05					
Emulsifier	0.04					
L-Lysine	0.05					
Antioxidant	0.012					
Coccidiostat	0.02					
Toxin binder	1					
TOTAL	100.05	2901.2	21.75	3.99	0.75	0.61

Plant protein supplemented ration for broiler grower

Ingredients	Amount	ME	CP	CF	Ca	P
Maize	56	1853.04	5.152	1.344	0.0392	0.224
Auto Rice Polish	2.34	68.7258	0.27846	0.29016	0.00819	0.02808
Full fat soya	1.5	52.785	0.57	0.075	0.00375	0.009
Soyabean meal	34	761.6	15.3	2.04	0.1088	0.2278
Vegitable oil	3	268.5			0.195	
Molasses	0.5	12	0.014		0.00755	0.0033
Lime stone	1				0.358	0.0002
Vit. & Min. premix	0.25					
Common salt	0.25					
DCP	0.5				0.1215	0.091
D-L Methionine	0.14					
Enzyme	0.05					

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Emulsifier	0.04					
L-Lysine	0.05					
Antioxidant	0.012					
Coccidiostat	0.02					
Toxin binder	1					
TOTAL	100.65	3017	21.31	3.75	0.84	0.58

Broiler starter ration supplemented with both animal and plant protein

Ingredients	Amount	ME	CP	CF	Ca	P
Maize	54	1786.86	4.968	1.296	0.0378	0.216
Auto Rice Polish	4.34	127.4658	0.51646	0.53816	0.01519	0.05208
Full fat soya	2.5	87.975	0.95	0.125	0.00625	0.015
Soyabean meal	30	672	13.5	1.8	0.096	0.201
Meat and bone meal	3	63.33	1.614	0.069	0.339	0.1617
Vegitable oil	1.4	125.3			0.091	
Protein Conc.	1	29	0.6	0.03	0.065	0.025
Molasses	0.5	12	0.014		0.00755	0.0033
Lime stone	1				0.358	0.0002
Vit. & Min. premix	0.25					
Common salt	0.25					
DCP	0.5				0.1215	0.091
D-L Methionine	0.14					
Enzyme	0.05					
Emulsifier	0.04					
L-Lysine	0.05					
Antioxidant	0.012					
Coccidiostat	0.02					
Toxin binder	1					
TOTAL	100.05	2903.93	22.16	3.86	1.14	0.77

Broiler grower ration supplemented with both animal and plant protein

Ingredients	Amount	ME	CP	CF	Ca	P
Maize	58	1919.22	5.336	1.392	0.0406	0.232
Auto Rice Polish	5.34	156.8358	0.63546	0.66216	0.01869	0.06408
Full fat soya	2.5		0.95	0.125	0.00625	0.015
Soyabean meal	24	537.6	10.8	1.44	0.0768	0.1608
Meat and bone meal	2.5	52.775	1.345	0.0575	0.2825	0.13475
Vegitable oil	3	268.5			0.195	
Protein Conc.	1	29	0.6	0.03	0.065	0.025
Molasses	0.5	12	0.014		0.00755	0.0033
Lime stone	1				0.358	0.0002
Vit. & Min. premix	0.25					
Common salt	0.25					
DCP	0.5				0.1215	0.091
D-L Methionine	0.14					
Enzyme	0.05					
Emulsifier	0.04					
L-Lysine	0.05					
Antioxidant	0.012					
Coccidiostat	0.02					
Toxin binder	1					
TOTAL	100.15	2976	19.68	3.71	1.17	0.73

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n) Statistical analysis

All required data were recorded and finally analyzed using software. All data were inputted to the Microsoft Office Excel-2007 and transferred to the software STATA/IC-11 for analysis. Descriptive statistics was done by using the STATA software and expressed as percentage of different variables.

III. Results

a) Effect of different protein on growth performance of broiler

Data of the effect of animal protein, plant protein and mixed animal & plant protein supplementation on growth of broiler chicks from 7 to 28 days of age are shown in Table-1 and Table-2. We found in our study that when we use plant protein then there is significant effect in body weight gain in group B as compared with group A group C. In group A the average body weight gain is 675 g when the protein source is animal protein. In group B the average body weight gain is about 1027 g when we used plant protein source and it was the highest body weight gain among 3 groups. When protein source is composed of both animal protein and plant protein then group showed that average body weight gain is 937 g.

b) Feed intake

Data for the effect of different protein supplementation on feed intake of broiler chicks from 7 to 28 days of age are presented in Table-3. In our study we found that the average feed intake weekly was significantly height is group B is about 57.6 g when protein source is plant protein. In group A and group B the average feed intake weekly were 46.70 g and 53.89 g respectively where animal protein .

c) Feed conversion ratio (FCR)

Data for the influence of different protein supplementation on FCR from 7 to 28 days are shown in Table-4. We found in our study that feed conversion ratio is only 1.24 in group B where in group A and group C it were 1.32 and 1.25 respectively. So we can say that FCR is lesser in group B in comparison with group A and group C.

d) Mortality rates

Data for the influence of different protein supplemented diet on broilers mortality are shown in Table-5. We found mortality rate in group C where mixture protein source are used is only 9%. But group A showed the highest mortality rate is 18% when protein source is animal protein and group B showed 12% mortality rate when protein source is plant protein.

e) Effects of different protein supplementation on antibody titers to Newcastle disease virus of broiler chicks

Data for the effects of different protein supplementation on antibody titers to ND virus are given in Table-6. In our study we found highest titres for ND at 4th days and 21th days in group A were 7.1 and 6.9 respectively. It showed the titres for ND at 4th days and 21th days in group B were 5.6 and 5.4 respectively. In group C at 4th and 21th days the titres of ND were 6.3 and 6.6 respectively.

IV. Discussions

It was found that, weekly body weights and average daily weight gain Table-1 were significantly increased in the plant protein consumed group-B as compared to the group-A and group-C during overall experimental period (Table -1 and Table- 2). Plants provide the major portion of protein requirements by animals. However, due to their deficiency in one or more amino acids, plant proteins are usually fortified with synthetic amino acids or another protein source such as processed oilseed meal or animal protein concentrates. Instead of animal protein feeds in poultry nutrition, plant protein feeds are used with the supplementation of synthetic amino acids (Cmiljani *et al.,* 2005). Increasing the efficiency of protein and amino acid utilization is crucial for the reduction of feed costs and maximization of meat production with an absolute minimum intake of amino acids. Synthetic amino acids have been found to facilitate the formulation of diets with an ideal amino acid profile (Han and Lee, 2000). These findings are in agreement with several reports demonstrating that probiotic supplemented to the birds improved the body weight gains of the broiler chickens (Benites *et al.,* 2008).

Weekly feed consumption and average daily feed intake were significantly decreased in the group-A where it was treated with animal protein and highest feed intake found in the plant protein treated group-B and then it was in the group-C (Table -3) Feeding with plant and animal protein did not affect feed intake of broiler chicks from day 7 to 28. These results are similar to those reported by Pinchasav *et al.* (1990), Bunchasak *et al*. (1997), Yonemochi *et al*. (2003), and Yamazaki *et al*. (2006) who found that feed intake of broiler chicks was not significantly affected by low CP amino acid supplemented diets. On the other hand, Attia *et al*. (2001) and Ghazalah *et al*. (2006) observed that feed intake was higher of broiler chicks fed low CP diet than that of those fed high CP diet may be due to the higher requirement of nutrients. Results indicated that, the FCR values were significantly decreased in the group B compared to the group-A and group C. It was positive things that, plant protein supplementation to the feed in group B consumed less amount feed to gain higher body weight where group-A and group C consumed more amount feed but body weight gain was lower than the group-B (Table- 4).

Results indicated that number of dead birds ranged from 3-6 birds/treatment. The postmortem

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investigations indicated that mortality was not related to dietary treatments. Similar results were reported by Attia *et al*. (2001) and Aletor *et al*. (2001) (Table-5). There is increasing interest in evaluating non-medical alternatives for antimicrobials and antiviruses in terms of their ability to improve disease resistance, and enhance overall animal health and production in poultry. Therefore, in the present study, attempts were made to evaluate the use of animal protein, plant protein and mixed animal & plant protein to the broiler feeds and investigate the influence of such feed supplements on immune response. Serum antibody titers against Newcastle disease virus based on HI test in chicken fed basal diet supplemented with different protein was significantly higher in group-A than those of chickens in the group-B and C on days 4 and 21 post vaccinations (Table-6). These findings are in agreement with several studies. Rowghani *et al.* (2007) reported that broiler chickens fed a diet supplemented with probiotics had a significant increase in the Newcastle antibody titers than the control group. They also reported that the antibody titers against ND in broilers fed with diets supplemented with probiotics containing *B. subtilis* was significantly higher at 10 days post-immunization compared to the control birds.

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Table-1: Effects of different protein supplementation on live weight gain of broiler

Parameters	Experimental groups			
	A (X±SE)	B (X±SE)	C (X±SE)	(P-value)
Initial body weight (g)	40.1 ± 2.33^{a}	40.5 ± 2.27^{a}	40.5 ± 2.27^{a}	0.90
BWG 1st week	124.1 ± 0.87^{a}	147.0 ± 1.15^{b}	152.0 ± 2.00^{c}	0.00
BWG 2nd week (g)	238.2 ± 1.40^{a}	310.0 ± 1.56^{c}	307.0 ± 1.76^{b}	0.00
BWG 3rd week (g)	507.0 ± 1.41^{a}	712.0 ± 1.76^{c}	618.0 ± 0.81^{b}	0.00
BWG 4th week (g)	675.0 ± 1.15^{a}	1027.0 ± 1.82^{c}	937.0 ± 1.76^{b}	0.00

BWG=Body weight gain, A= Animal protein supplementation, B= Plant protein supplementation, C= Mixed animal and plant protein supplementation

Table-2: Effects of different protein supplementation on weight gain of broiler

Body weight gain (gm)	Experimental groups			
	A (X±SE)	B (X±SE)	C (X±SE)	(P-value)
At 1st week	84 ± 0.76^{a}	106.50 ± 0.85^{b}	111.50 ± 0.77^{c}	0.00
At 2nd week	114.10 ± 0.48^{a}	163.00 ± 0.73^{c}	155.00 ± 1.01^{b}	0.00
At 3rd week	268.80 ± 0.73^{a}	402.00 ± 0.63^{c}	311.0 ± 0.61^{b}	0.00
At 4th week	168.00 ± 0.91^{a}	315.00 ± 0.68^{b}	319.00 ± 0.56^{c}	0.00
Average daily weight gain	22.68 ± 0.03^{a}	35.23 ± 0.09^{c}	32.01 ± 0.07^{b}	0.00

A= Animal protein supplementation, B= Plant protein supplementation, C= Mixed animal and plant protein supplementation

Table-3: Amount of feed consumed by birds in experimental groups

Parameter	Experimental groups			
	A (X±SE)	B (X±SE)	C (X±SE)	(P-value)
Feed intake(FI) At 1st week (g)	110 ± 3.59^{a}	129.2 ± 3.70^{b}	130.7 ± 1.94^{b}	0.00
FI At 2nd week(g)	289 ± 6.29^{a}	357 ± 5.77^{b}	441 ± 6.34^{c}	0.00
FI At 3rd week(g)	746 ± 3.89^{a}	983 ± 8.58^{b}	878 ± 4.90^{a}	0.00
FI At 4th week(g)	1155 ± 4.01^{a}	1613 ± 6.29^{c}	1509 ± 4.05^{b}	0.00
Average daily feed intake	46.70 ± 0.35^{a}	57.64 ± 0.35^{c}	53.89 ± 0.26^{b}	0.00

A= Animal protein supplementation, B= Plant protein supplementation, C= Mixed animal & plant protein supplementation

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Table-4: Feed conversion ratio in each group

Feed conversion ratio (g feed/g)	Experimental groups			
	A (X±SE)	B (X±SE)	C (X±SE)	(P-value)
At 1st week	0.88±0.06[b]	0.87±0.04[a]	0.86±0.03[a]	0.00
At 2nd week	1.21±0.04[b]	1.15±0.03[a]	1.11±0.06[c]	0.00
At 3rd week	1.47±0.02[c]	1.38±0.02[b]	1.42±0.02[a]	0.00
At 4th week	1.73±0.03[c]	1.57±0.02[b]	1.61±0.01[a]	0.00
Average FCR	1.32±.0.04[c]	1.24±0.03[a]	1.25±0.03[b]	0.00

A= Animal protein supplementation, B= Plant protein supplementation, C= Mixed animal and plant protein supplementation

Table-5: Number of dead birds in each group

Experimental groups	Number of dead birds	Mortality rates (%)
Group-A	6	18%
Group-B	4	12%
Group-C	3	9%

A= Animal protein supplementation, B= Plant protein supplementation, C= Mixed animal and plant protein supplementation

Table-6: Antibody titers against Newcastle Disease (ND) virus in each group

ND titre at different days	Antibody titers against ND virus vaccine in different experimental groups			
	A (X±SE)	B (X±SE)	C (X±SE)	(P-value)
4th day	7.1±0.13[c]	5.6±0.24[a]	6.3±0.25[b]	0.001
21th day	6.9±0.07[b]	5.4±0.20[a]	6.6±0.25[b]	0.00

A= Animal protein supplementation, B= Plant protein supplementation, C= Mixed animal and plant protein supplementation

V. Conclusion

He label of protein could be reduced of a certain limit in broiler rations along with the supplememtation of lysine plays an important role on feed consumption and weight gain, without the affects of feed convertion ratio (FCR).

References Références Referencias

1. Adene DF, Akpavie SO (2004). An overview of Mareks disease and the option in its control. In D.F Adene (eds.). Poultry health and production-Principles and practices. Stirling-Horden Publishers (Nig.) Ltd.Lagos.107-127.
2. Aletor VA, Roth FX, Brigitte R, Paulicks, Dora A, Roth Maier (2001). Growth, body fat deposition, nitrogen excretion and efficiencies of nutrients utilization in broiler chicks fed low protein diets supplemented with amino acids, conjugated linoleic acid or an–glucosidase inhibitor. Arch Geflügelk 66:2130.
3. Attia YA, AbdElRahman SA, Qota EMA (2001). Effects of microbial phytase without or with cellwall splitting enzymes on the performance of broilers fed marginal levels of dietary protein and metabolizable energy". Egyptian Poultry Sci. 21: (II) 521547.
4. Bartov I (1992). Effects of energy concentration and duration of feeding on the response of broiler chicks to growth promoters 1. British Poultry Science. 33(5): 1057-1068.
5. Benites V, Gilharry R, Gernat AG, Murillo JG (2008). Effect of dietary mannan oligosaccharide from bio-mos or SAF mannan on live performance of broiler chickens.Journal of Applied Poultry Research, 17, 471e475.
6. Bunchasak C, Santoso U, Tanaka K, Ohtani S, Collado CM (1997).The effect of supplementing methionine plus cystine to a low protein diet on the growth performance and fat accumulation of growing broiler chicks. Asian Australasian Science. 10 (2)185191.
7. BBS(Bangladesh Bureau of Statistics) (2009). Statistical Yearbook of Bangladesh, Planning Division, Minist. of Planning, Govt. People's Repub. Bangladesh, Sher-e-Bangla Nagar,Dhaka.
8. Cmiljani_CR, Pavlovski Z, Trenkovski S, Luki_CM (2005). New trends in poultry nutrition. BiotechnolAnimHusb ;21:241e5.
9. Corzo A, Moran, Hoehler D (2002). Lysine needs of summer-reared male broilers from six to eight weeks of age. Poultry Science. 82 (10): 1602-1607.
10. Efron, David T, Barbul, Adrian (1998). Modulation of inflammation and immunity by arginine supplements. Current Opinion in Clinical Nutrition & Metabolic Care. 1(6): 531-538.
11. Evoy D, Lieberman MD, Fahey TJ, Daly JM (1998). Immunonutrition: the role of arginine. Journal of Nutrition.14:7–8:611–617.
12. Faluyi, O. B, Agbede, J. O. and Adebayo I. A (2015). Growth performance and immunological response

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to Newcastle disease vaccinations of broiler chickens fed lysine supplemented diets. Journal of Veterinary Medicine and Animal Health. Vol. 7(3), pp. 77-84
13. Ghazalah AA, ElNagmy KY, Bahakim AS(2006). Response of broiler chicks to low protein diets supplemented with probiotics preparations. Egypt Poult Sci. 26: 609627.
14. Grimble RF (2006). The effects of sulfur amino acid intake on immune function in humans. The Journal of nutrition. 136(6):1660S-1665S.
15. Han K, Lee J (2000).The role of synthetic amino acids in monogastric animal production. Asian-Australas Journal of Animal Science.13:543e60.
16. Holsheimer JP, Veerkemp CH (1992). Effect of Dietary Energy, Protein, and Lysine Content on Performance and Yields of Two Strains of Male Broiler Chicks. Poultry Science.71 (5): 872-879.
17. Jackson MR, Li S, Day EJ, Omar S (1989). The effect of different lysine level fed in constant proportion to different crude protein level on the live performance and carcass characteristics of broiler chicken. Poultry Science. 68:186.
18. Kidd MT, McDaniel CD, Branton SL, Miller ER, Boren BB, Fancher BI (2004). Increasing amino acid density improves live performance and carcass yields of commercial broilers. The Journal of Applied Poultry Research;13:593-604.
19. King DJ, and Seal BS (1998). Biological and molecular characterization of Newcastle disease virus (NDV) field isolates with comparisons of reference NDV strains and pathogenicity chicken or embryo passage of selected isolates. Avian Diseases. 42, 507e516.
20. Labadan MCJ, Hsu KN, Austic RE (2001). Lysine and Arginine Requirements of Broiler Chickens at Two- to Three-Week Intervals to Eight Weeks of Age. Poultry Science. 80(5): 599-606.
21. Leeson S, Caston L, Summers JD (1996). Broiler response to diet energy. Poultry Science. 75(4): 529-535.
22. Moran Jr ET, Bilgili SF (1990). Processing losses carcass quality and meat yield of poultry chickens as influenced by dietary lysine. Poultry Science; 69: 702-709.
23. NRC, National Research Council (1994). Nutrient requirements of poultry. 9th rev. ed. Washington, DC: National Academy Press.
24. Newsholme P, Procopio J, Lima MMR, Pithon-Curi TC, Curi R (2003). Glutamine and glutamate-their central role in cell metabolism and function. Cell biochemistry and function. 21(1):1-9.
25. Pinchasav Y, Mendonca CX, Jensen LS (1990). Broiler chick response to low protein diets supplemented with synthetic amino acids. Poultry Science. 69:19501955.
26. Roch P (1999). Defense mechanisms and disease prevention in farmed marine invertebrates. Aquaculture.172(1):125-145.
27. Rowghani E, Arab M, Akbarian A, (2007). Effects of probiotic and other feed additives on performance and immune response of broiler chicks. International Journal of Poultry Science, 6, 261e265.
28. Sabrin MS, Saha S, Amin MM (2012). Immune response capability of "Shurva" chicken. Bangladesh Journal of Veterinary Medicine. 10 (1-2):1-7.
29. Saima, MZU Khan, MA Jabbar, A Mehmud, MM Abbas and A Mahmood, 2010. Effect of lysine supplementation in low protein diets on the performance of growing broilers. Pakistan Vet J, 30(1): 17-20.
30. Sarkar N, Ghosh SK, Bannerjee S, Aikat K (2012). Bioethanol production from agricultural wastes: an overview. Renewable Energy. 37(1):19-27.
31. Si J, Kersey JH, Fritts CA, Waldroup PW (2004). An evaluation of the interaction of lysine and methionine in diets for growing broilers. International Journal of Poultry Science. 3:51-60.
32. Sterling KG, Pesti GM, Bakalli RI (2006). Performance of different broiler genotypes fed diets with varying levels of dietary crude protein and lysine. Poultry Science; 85:1045-1054 .
33. Swain BK, Johri TS, Majumdar S (2000). Effect of supplementation of vitamin E, selenium and their different combinations on the performance and immune response of broilers. British poultry science. 41(3): 287-292.
34. Tsiagbe VK, Cook M, Harper AE, Sunde ML (1987). Enhanced immune responses in broiler chicks fed methionine-supplemented diets. Poultry science. 66(7): 1147-1154.
35. Wu G, Brosnan JT (1992). Macrophages can convert citrulline into arginine. Biochemical Journal. 281(1): 45-48.
36. Yaqoob P, Calder PC (1997). Glutamine requirement of proliferating T lymphocytes. Nutrition. 13(7-8): 646-651.
37. Yonemochi C, Fujisaki H, Takagi H (2003). Effects of amino acid, enzyme mixture and phytase added to low protein and low phosphorus diet on performance and excretion of nitrogen and phosphorus in broilers. Journal of the Poultry Science. 40: 114120.

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