Journal of Animal and Veterinary Advances 2 (5): 301-304, 2003

Effect of Different Levels of Dietary Protein on the Grwoth of Broiler

Solangi, A. A., G. M. Baloch, P. K. Wagan, B. Chachar and [1]A. Memon
Department of Animal Nutrition, Sindh Agriculture University, Tando Jam, Sindh, Pakistan
[1]Department of Poultry Husbandry, Sindh Agriculture University, Tando Jam, Sindh, Pakistan

Abstracts: 200 Hubbard broilers were examined to determine the effect of differnet dietary protein levels on the production perofrmance of broilers, at Poultry Experimental Station, Sindh Agriculture University, TandoJam during August-September, 2002. The birds were designated groups A, B, C and D, (fifty chicks each) given 17, 20, 23 and 26 percent protein, respectively. The results revealed that broiler growth and carcass parameters were affected significantly by increasing level of dietary protein. Weight gain in groups A, B, C and D was 1402.40, 1639.63, 1844.90 and 1866.54g against the feed consumption of 3200.00, 3612.28, 3924.78 and 3742.50 g/bird, respectively. Feed Conversion efficiency 2.281, 2.203, 2.127 and 2.005, Carcass percentage 53.88, 59.22, 62.56 and 62.26 percent, Liver weight 39.40, 39.80, 39.60 and 41.20 g, Spleen weight 4.60, 5.00, 6.60 and 6.80g, Heart weight 9.40, 10.40, 11.80 and 12.00g, Gizzard weight 25.90, 30.00, 35.00 and 34.00g, water intake 7469.40, 7771.72, 8263.66 and 8429.50ml. Greater carcass percentage was obtained from ration contained 23% or 26% dietary protein (62.56 and 62.26%). The sale price of the broilers in groups A, B, C and D was Rs. 57.76, 67.24, 75.24 and 76.32 against the production cost of Rs. 54.16, 59.77, 67.24 and 69.59 per bird, respectively. The net profit obtained from groups A, B,C and D were Rs. 3.60, 7.47, 8.24 and 6.73, respectively. Thsi shows that group A (17% CP) or group D (26% CP) were less economical against 23% and 20% CP levels where fairly higher net profit was earned.

Key words: Dietary protein, growth and broiler

Introduction

Every living animal has a need for protein. It is the basic structural material from which all body tissues are formed. There are two types of protein required for poultry production i.e. animal protein and vegetable protein. Animal protein sources are blood meal, fish meal, meat meal and feather meal, while vegetable protein sources are cereals, oil crops and legume crops. No doubt the superiority of animal protein over vegetable protein is established due to its better amino acid profile. But now-a-days due to high cost and scarcity of animal protein sources, coupled with the unscientific methods of their preparation limit broiler production performancd and mortality increases (Alleman, 2000).

The primary function of protein is to supply the amino acids. Therefore, the requirement for protein is essentially the requirement for amino acids. The quality of protein depends upon its amino acids makeup. An essential amino acid is one needed by the animal that cannot by synthesized by the animal in the amounts needed and so must present in the protein of the feed as such. On the other hand, a non-essential amino acid is one needed by the animals that can be formed from other amino acids by the animal sand so does not have to be present as that particular amino acid in protein of the feed. Those amino acids which function in animal nutrition are usually classified on the basis of their essentiality.

On an average 18 gm of protein of animal origin is available per capita per day in Pakistan, thus making it short by 9 gm against recommendation of 27 grams (GOP, 2001). This puts great pressure on the national protein supplies from farm animal, poultry, fish and other protein sources.

Feed cost is the single most imporatnt factor, which accounts more than 70 percent of total cost in poultry production. Availability of balanced and economical ration have great importance in broiler production. Due to high cost of feed, it is difficult to increase the broiler production. Therefore, it is need of time to prepare the least cost ration to meet the increasing demand of animal protein. Protein accounts for a significant part of total feed cost and affect many aspects of bird's performance and profitability.

How much protein is used in broiler feeding, is a challenging decision, that must be made by all producers and nutritionsits. The challenge for nutritionist and production managers in not only to provide a feed cheaper to a maximum possible leve, but also to maximize profitability, because performance of the bird depends upon a board range of dietary protein. Keeping in view the

importance of poultry and its economic production, the present study was carried out to evaluate the effect of different levels of dietary protein on weight gain, feed and water consumption and FCR.

Materials and Methods

The experimental chicks were housed in well managed shed and were weighed at the time of arrival at farm, allocated space of 1 sqft/bird. Initially, chicks were brooded under electric brooding system under 90 to 95 °F temperature after that is was gradually lowered at the rate of 5°F each week till 75°F. The light was provided 24 hours. Chicks were fed *ad libitum*. Fresh and Clean water was provided 24 hrs throughout the experimental period. The chicks were vaccinated against contagious diseases. The ingredients were chemically analysed (Table 1). The analysis of feed was carried out according to the standard analytical methods described by the Association of Official Analytical Chemists (AOAC, 1990).

Table 1: Chemical composition of experimental rations

Nutrients	Rations			
	A	B	C	D
Crude protein %	17	20	23	26
ME (kcal/kg)	3000	3000	3000	3000
Calcium	1.12	1.23	1.22	1.28
Phosphorus	0.75	0.80	0.90	0.95
Lysine	1.15	1.20	1.35	1.25
Methonine 0.42	0.45	0.40	0.50	

After completion of 6 weeks experimental period, five randomly selected broliers from each groups have been slaughtered from carcass weight and for the calculation of dressing percentage and weight of internal organs and finally the economics of different groups was calculated. The data on various parameters related to the objectives were collected, arranged in tables and analysed by standard statistical method of analysis of variance, following Gomez and Gomez (1984).

Results and Discussion

Feed Consumption: Average feed consumtpion in groups A, B, C and D was 3200.00, 3612.28, 3924.78 and 3742.50g, respectively (Table 2). Significantly ($P<0.01$) greater feed was consumed by chicks in group C where 23% dietary protein was given as compared to groups with relatively higher or lower dietary protein contents to this certain limit. It was further observed that the feed consumption increased significantly with each increased leve of dietary protein upto 23%, further increase in dietary ptotein did not show any stimulation for broilers to consume more feed. The L. S. D. illustrates statistically highly significant differentces ($P<0.01$) among all the treatments including control and group D was considered better where the chicks consumed least amount of feed on average. The results of the present study are well comparable with those of Abd El-=Latif (1997) who obtained average broiler weight gain of 423.25, 1312.30 and 1854.30g with high protein diets of 27.25, 26.07 and 24.49% CP as compared to the low protein diets contained 16.96, 16.35 and 15.55% CP, having weight gain 151.00, 212.32 and 519.25g respectively.

Water Intake: The average water intake of broilers in groups A, B, C and D was 7469.40, 7771.72, 8263.67 and 8429.50 ml, respectively (Table 2). Significantly ($P<0.01$) maximum quantity of water was taken by the chicks of groups D (26% protein) as compared to the broilers of other groups with relatively lower dietary protein contents to this certain limit. It was further observed that the water intake increased significantly with each increased level of dietary protein upto 26%. The L. S. D. test showed statistically highly significant differences ($P<0.01$) among all the treatments including control and envisaged that group D was significantly better where the chicks took lesser amount of water than group C.

Weight Gain: The average weight gain of the broilers in group A, B, C and D was 1402.40, 1639.63, 1844.90 and 1866.54g, respectively (Table 2). Significantly ($P<0.01$) greater weight gain was recorded in case of the brids in group D where the ration contained 26% protein as comapred to rest of the groups with relatively lower protein contents. It is obvious from the results that the weight gain was significanly improved with each increased dietary protein level in broiler ration. The L. S. D. test suggested that statistically significant differences among all the treatment groups ($P<0.01$) when compared with control, with the exception of groups C and D where non-significant differences ($P>0.05$) were noticed. The results are well comparable with those of Abd El-Latif (1997) who obtained average broiler weight gain of 423.25, 1312.30 and 1854.30g with high protein diets of 27.25, 26.07 and 24.49% CP as compared to the low protein diets contained 16.96, 16.35 and 15.55% CP, having weight gain 151.00, 212.32 and

Table 2: Effect of different levels of dieatary prrotein on the quantitative and qualitative performance of broilers.

Groups (Dietary protein levels)	Feed Consumption (G/bird)	Water Consumption (lit/bird)	Weight gain (G/bird)	F. C. R %age	Carcass Weight (g)	Liver weight (g)	Gizzard weight (g)	Heart weight (g)	Spleen weight (g)	Net profit (Rs/ bird)
A 17%	3200.00	7469.40	1402.40	2.281	53.88	39.40	25.00	9.40	4.60	3.60
B 20%	3612.28	7771.72	1639.63	2.203	59.22	39.80	30.00	10.40	5.00	7.47
C 23%	3924.78	8263.66	1844.90	2.217	62.56	39.60	35.00	11.80	6.60	8.24
D 26%	3742.50	8429.50	1866.54	2.005	62.26	41.20	34.00	12.00	6.80	6.73
LSD 0.05	49.31 116.23	109.40	0.2231	2.58	1.25	1.49	1.18	2.43	-	
LSD 0.01	65.12 162.77	144.40	0.2943	3.56	1.72	2.06	2.49	2.99	-	

519.25g, respectively.

Feed Conversion Ratio: The average feed conversion ratio of groups A, B, C and D recorded was 2.281, 2.203, 2.127 and 2.005 (Table 2) and birds fed on ration with 26% protein utilized feed more efficiently with feed conversion ratio of 2.005 as compared to the broilers fed on ration containing lower protein percentage than this specific limit. Results illustrate of significant improvement ($P<0.01$) in feed conversion ratio of broilers reared on each increased dietary protein level as compared to control or succeeding lower protein contained diets. The L. S. D. test led to assume significant differences ($P<0.05$) between groups A and D, while non-significant between rest of the groups as well as control. The feed conversion ratio was though, better in group D (26% dietary protein) but differences were non-significant statistically when this group was compared with group C (23% CP) ($P>0.05$), hence group C was considered as an optimum dietary protein level. Moreover, the birds in group D consumed relatively less quanitty of feed and produced relatively greater amounts of weight gain but due to high cost of feed this group could be uneconomical. The experimental results of the author are partially supported by Abd El-Latif (1997) who was of the experience that 24% or 27% CP had best feed/gain ratios and feeding up to 27% protein had no further advantage over 24% protein.

Carcass Percentage: The carcass percentage for groups A, B, C and D was 53.88, 59.22, 62.56 and 62.26%, respectively (Table 2). The broiler fed with ration contained 23% or 26%^ dietary protein recorded significantly ($P<0.01$) greater carcass percentages (62.56 and 62.26%) as comapred to the broilers fed on ration containing lower protein percentage of 20 and 17%. This greater carcass percentage in broilers fed on ration contained higher dietary proteins levels could be reasoned that proteins are essential elements for growing strong muscles, thus carcass quantity in such broilers increased. The L. S. D. test depicts that differences either between treated groups or control were highly significant ($P<0.01$) with the exception of groups C and D where non-significant differences noted. The findings of the present study on carcass percentage are further supported by those of Erazo and Gernat (2000) who were of the conclusion that protein at the rates 23, 26. 29 and 32% had no significant differences for carcass, while our findings showed non-significant differences between 23% and 26% protein levels.

Liver Weight: Average liver weight in groups A, B, C and D was 39.40, 39.80, 39.60 and 41.20g, respectively (Table 2); the broiler fed on ration with 26% (D) dietary protein had comparatively increased liver weight (41.20g) than the broilers fed on ration containing lower protein levels of 23, 20 and 17%. It is obvious that proteins are essential amino acids and upto a certain limit its inclusion in the broiler ration is so advantageous to maintain weight of internal organs within normal survival. These results are partially supported by the results of Kahl, *et al.* (2002) who mentioned that high protein levels can alter the liver weights.

Liver Weight: Average liver weight in groups A, B, C and D was 39.40, 39.80, 39.60 and 41.20g, respectively (Table 2); the broiler fed on ration with 26% (D) dietary protein had comparatively increased liver weight (41.20g) than the broilers fed on ration containing lower protein levels of 23, 20 and 17%. It is obvious that proteins are essential amino acids and upto a certain limit its inclusion in the broiler ration is so advantageous to maintain weight of internal organs within normal survival. These results are partially supported by the results of Kahl, *et al.* (2002) who mentioned that high protein levels can alter the liver weights.

Gizzard Weight: The gizzard weight in groups A, B, C and D was 25.00, 30.00, 35.00 and 34.00g, respectively (Table 2); the broiler took feed with 23% protein had significantly greater gizzard weight (35.00g) as comapred to the broilers fed on ration containing higher or lower protein levels. It is observable that proteins has a chief role to keep broilers in good health and to maintain the weight of internal organs within normal values. L. S. D.

test concede that differences were significant ($P<0.01$) either among treated groups or when compared with control with the exception fo groups C when it was compared with group D, where non-significant differences were observed.

Heart Weight: The heart weight in groups A, B, C and D was 9.40, 10.40, 11.80 and 12.00g, respectively (Table 2). The birds fed with 26% (D) protein had significantly increased heart weight (12.00g) as compared to the broilers fed on ration containing lower protein levels of 23, 20 and 17%. It is appearent that proteins are essential for every living animal for survival and upto a certain limit its inclusion in the broiler ration is so good to maintain weight of internal organs within normal size, because increased heart weight over and above the normal size may be harmful for birds. The L. S. D. test illustrates that differences were significant ($P<0.0$) when groups D and C were compared with group A, while differences among all rest of the groups were statistically non-significant ($P>0.05$). These results are partially supported by the findings of Men, *et al.* (2001).

Spleen Weight: Spleen weight in groups A, B, C and D was 4.60, 5.00, 6.60 and 6.80g, respectively (Table 2); 26% dietary protein groups had slightly increased spleen weight (6.80g) as compared to broiler fed on ration containing lower 23, 20 and 17% dietary protein. It is visible from the result that spleen weight increased with each increased dietary protein level. However, this increase was not so pronounced. The results of the present study are further supported by Aletor, *et al.* (2002).

Economics: After necessary observations and data record, the experimental birds were marketed and net profit was worked out (Table 2). The average total sale price of the broilers in groups A, B, C and D Rs. 57.76, 67.24, 75.24 and 76.23 against the total production cost Rs. 54.16, 59.77, 67.24 and 69.59 per bid, respectively. In this way after deducting the production cost per bird from the sale price per bird, the net profit obtained in groups A, B, C and D was Rs. 3.60, 7.47, 8.24 and 6.73, respectively. This hsows that broilers in group C, where 23% dietary protein was supplemented showed maximum net profit, closely followed by group B (20%). Thus, group A (17& CP) or group D (26% CP) were not economical against 20% and 23% CP levels where fairly higher net profit was earned.

Conclusions

From the results of the present study it was concluded that broiler feed with 20-23% protein remained fairly economical as compared to the higher protein levels. Though, weight gain was higher in broilers fed on ration contain high protein (26%), but the birds in this group consumed significantly more feed and remained uneconomical. Thus, ration containing 20-23% protein proved to be more profitable.

Suggestions

1. The feed for broiler chicks should contain a minimum of 20% CP and a maximum of 23% CP for proper growth and economical production.
2. The 20% CP can be used for whole of the grwoth period (1-6 weeks) without considering the starter (high protein) ration.
3. The broilers may be fed on ration containing 20-23% CP economically and profitably under prevalent conditions.

References

Abd, El-Latif, S. A., 1997. Growth performance and feathering for growing male turkeys fed low protein diet during the early stage of growth. Egyptain J. of Nutrition and Feeds: 273-279.

Aletor, V. A., F. X. Roth, B. R. Paulicks and D. R. Roth-Maier, 2002. Growth, body-fat deposition, nitrogen excretion and efficiencies of nutrients utilization in broiler-chicks fed alpha-glucosidase inhibitor. Archiv fur Geflugelkunde, 66: 21-30.

Alleman, F., J. Michel, A. M. Chagneau and B. Leclercq, 2000. The effects of dietary protein independent of essential amino acids on growth and body composition in genetically lean and fat chickens. Birtish Poultry Science. 41: 214-218.

AOAC, 1990. Official Methods of Analysis (15th ed). Association of Official Analytical Chemists. Arlington, VA.

Erazo, J. A. and A. Gernat, 2000. Effect of four levels of protein in pre-starter diets during first 3, 5 or 7 days of age of broiler chicks. CEIBA, 41: 53-58.

Gomez, K. A. and A. A. Gomez, 1984. Statistics for Agriculture Research (2nd Ed). John Wiley & Sons, New York.

GOP, 2001. Economics Survey 2000-2001. Government of Pakistan, Economic Advisor's Wing, Finance Division, Islamabad, pp: 27.

Kahl, S., R. W. Rosebrough and Elsasser, 2002. T. Hepatic 5' deiodinase activity in the broiler chicken: effects of diet and prior thyroid status. Nutrition Research 22: 375-383.

Men, B., B. Ogle and J. E. Lindberg, 2001. Effect of choice feeding on the nutrient intake and performance of broilers. Asian - Australasian J. of Animal Sci., 14: 1728-1733.