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Comparative studies on the effect of different levels of crude protein on Growth performance and Blood profiles of broiler chicks raised in North Central Nigeria

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In order to compare the effect of different crude protein levels on growth performance and blood profiles of broiler chicks in north central Nigeria, 150 day-old-chicks were allotted to 21%, 22%, 23%, 24% and 25% CP dietary groups in a Completely Randomised Design. Diet with 23%CP was served as the Control diet (NRC, 1994). Data on growth performance revealed that birds fed 22%CP diet had significantly (P<0.05) higher weight than those fed other levels of crude protein. Average daily feed intake was not affected (P>0.05) by the dietary treatments. Also, data obtained on haematological parameters and serum biochemical indices revealed that all the parameters measured were not (P>0.05) influenced by the treatments. It was concluded that 22%CP level should be maintained for broiler chicks in north central Nigeria.

Keywords: Broilers, crude protein, growth performance, blood profiles.

INTRODUCTION

The average Nigerian consumes only 3.245g of animal protein per person per-day which is far below the FAO (2000) recommended value of 34g. This low level of animal protein intake by Nigerians has generated concern as it affects both physical and mental development of Nigerian youths and labour force in Nigeria (Akinmutimi, 2004). One way of solving this problem is by focusing on production of animals with high rate of production and growth. One of such animals is poultry (Ezieshi *et al*., 2004). It is the quickest source of meat and it matures very quickly as compared to livestock production. Poultry is free from the various social religious taboo and economic constraints which affects the commercial production of livestock. They are

also characterized by low capital requirement and quick returns (Obioha, 1992, Onwukwe, 2000).

In Nigerian poultry industry, there are several studies on crude protein requirement of broiler chickens (Aduku, 1992; Olomu, 1995; Oluyemi and Robert, 2000). Although National Research Council (NRC, 1994) recommended a feeding standard for broilers among other classes of livestock under temperate climatic conditions, this has not been totally practicable in the tropics for the obvious reasons of environmental differences and type and quality of available feed ingredients. Hence, a need to compare other levels of crude protein with 23% CP (broiler starter) recommended by NRC (1994) most especially in the north central Nigeria where the ambient temperature can be as high as 42^{o}C. Therefore, the present study was aimed at comparing the effect of different levels of crude protein on growth performance and blood profiles of broiler chicks raised in North Central Nigeria.

MATERIALS AND METHODS

Study site

This study was conducted at the Poultry Unit of the Teaching and Research Farm, Federal College of Wildlife Management (FCWM), New Bussa, Niger State, Nigeria. The poultry building is an open sided type that permits adequate ventilation in the house, with a concrete floor and zinc-roofing sheet. New Bussa sits at 9°53′N 4°31′E, and the original town of Bussa was located about 40 km North of New Bussa at 10°13′51″N 4°28′31″E (altitude 561 ft or 170 meters). The climate of the area is tropical with monthly average temperature of 34°C and mean annual relative humidity of 60%. The ambient temperature range at the period of the study was 36.5-40.5^{o}C.

EXPERIMENTAL DESIGN AND MANAGEMENT OF BIRDS

A total of one hundred and fifty (150) one-day-old Arbor-Acres broiler chicks were used in this study. The birds were raised in deep litter system at the College Poultry Farm. They were randomly assigned into the four (5) dietary treatments in a completely randomized design (CRD). There were 30 birds per treatment with 3 replicates of 10 birds each. Routine management and medications were supplied. Feed and water were provided *ad-libitum.*

EXPERIMENTAL DIETS

Five (5) experimental diets were formulated such that diets 1,2,3,4 and 5 contained 21, 22, 23, 24 and 25% crude protein respectively. Diets 3 which contained 23% CP (NRC, 1994 recommendation) served as control diet. The diets were formulated to be isocaloric (2850kcal/kg ME). The birds were fed with five dietary treatments for 28days. The ingredients composition of the diets is shown in Table 1.

DATA COLLECTION

Performance data

The amount of feed given and left over was recorded on daily basis and it was used to calculate the feed intake. Before the commencement of the experiment, the initial weights of the birds were taken and the birds were weighed weekly thereafter to obtain weekly weight gain. Feed intake and weight recorded were used to calculate feed conversion ratio (FCR) using the formula below. Feed conversion ratio (FCR) =feed intake/weight gain

Haematological and biochemical indices

At the end of the study period, 3 birds per treatment were starved for 12 hours. They were then slaughtered by severing the jugular vein for the purpose of blood sample collection. 5mls of blood sample was collected from the jugular vein of each slaughtered chicken and put into bottles containing Ethylene Diaminetetra-acetic Acid (EDTA) for the haematological study. Blood samples meant for serum biochemical studies were collected into plain bottles (without anticoagulant) to enhance serum separation. Serum was obtained by centrifugation and the harvested serum samples were used for analysis. The packed cell volume (PCV), red blood cells (RBC), haemoglobin (Hb), and white blood cells (WBC) were analyzed according to Schalm *et al*. (1975) methods. The blood serum was also used to determine total protein (TP) following the Kjeldahl method as described by Kohn and Allen (1995). Albumin, Globulin and Urea were determined using the BCG (bromocresol green) method as described by Peters *et al.* (1982). Glucose was analyzed using Sigma assay kits as described by Coles (1986). All the analyses were done at the College Research Laboratory.

Data Analysis

All data collected were subjected to analysis of variance (SAS, 2008). Differences between the treatment means were separated using Duncan's New Multiple Range Test (Duncan 1955). All statistical procedures were according to methods of Steel and Torrie (1980).

Table 1: Percentage Composition of the Experimental diets (0-4wks)

	Different Crude Protein Levels (%)				
Ingredient (%)	**21**	**22**	**23**	**24**	**25**
Yellow Maize	52.00	52.00	52.00	52.00	53.00
Wheat offal	6.00	6.00	6.00	6.00	6.00
GNC	23.00	20.00	16.00	14.00	14.00
Soybean	10.60	10.60	10.60	10.60	10.60
Fish meal	1.00	4.00	8.00	10.00	12.00
Rice offal	2.00	2.00	2.00	2.00	2.00
Limestone	0.50	0.50	0.50	0.50	0.50
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25
Palm oil	1.00	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00	100.00
Calculated nutrient (%)					
ME (Kcal/kg)	2850	2855	2857	2851	2858
Crude protein (%)	21.05	22.03	23.04	24.07	25.02
Crude fiber (%)	4.06	4.07	4.02	4.04	4.01
Ether Extract (%)	5.46	5.49	5.53	5.55	5.61
Calcium (%)	1.10	1.22	1.39	1.48	1.57
Available P (%)	0.61	0.68	0.79	0.84	0.89
Lysine (%)	1.03	1.80	1.30	1.37	1.47
Met. + Cyst.	0.86	1.15	0.97	0.97	1.01

*Vitamin premix contains the following per kg diet. Vit. A 10000,IU, D3, 2000'IU E15,IU, K31.5mg, B2 5mg, B6 2mg, B12 10pg Pantothenic acid 12mg, Biotin 10pg, Niacin 25mg,Chonin Chloride 900mg, Folic acid 0.5mg,cu 10mg, Mn 52.5 mg, Zn 60mg, Fe 100mg, I 1.5mg, Co 0.25mg

RESULTS

The result of the growth performance of broiler chicks fed experimental diets is shown in Table 2. The result shows that there were significant (P<0.05) differences in the average daily weight gain of birds. Birds fed 22%CP diet had significantly higher weight than those fed other diets including the control diet. The weight gain of birds fed the control diet (23%CP) and those fed 25%CP were not significantly (P>0.05) different. The crude protein levels had no effect on average daily feed intake. Feed conversion ratio was significantly (P<0.05) better for birds fed 22% and 24%CP diets than those fed other levels.

The result of the haematological parameters of broilers chicks fed the experimental diets is shown in Table 3. The result shows that there were no significant (P>0.05) differences in all the parameters measured. Although birds fed diet containing 24%CP had higher values for PCV, HB, MCV and MCH, the values were significantly comparable (P>0.05) to other dietary groups.

The result of the serum biochemical indices of broiler chicks fed the experimental diets is shown in Table 4. The result shows that the crude protein levels fed had no effect (P>0.05) on all the parameters measured. Birds fed diet containing 24%CP had higher values for Glucose, Urea and Albumin, the values were not significantly (P>0.05) different from other dietary groups.

DISCUSSION

The average body weight gain of birds fed 22%CP level (17.86g) was the highest in this study contrary to (13.57g) observed among bird fed the 23%CP level as recommended by NRC (1994). This contradiction may be attributed to the season of the study (March), species of broiler used and differences in environmental temperature which was averagely 38.05^{o}C at the period of this research. Waldroup *et al.* (1976) had earlier reported that minimizing excess dietary amino acid at

Table 2: Effect of different levels of crude protein on the growth performance of broiler chicks (0-4 wks)

Parameters	21%	22%	23%	24%	25%	SEM	LOS
Initial weight, g/b	90.05	90.01	90.10	90.04	90.09	2.40	NS
Final weight, g/b	510^{c}	590^{a}	470^{d}	540^{b}	473^{d}	11.28	*
Total weight gain, g/b	423.33^{c}	500.00^{a}	380.00^{d}	450.00^{b}	383.00^{d}	11.86	*
Average weight gain, g/b/d	15.12^{c}	17.86^{a}	13.57^{d}	16.07^{b}	13.69^{d}	0.42	*
Total feed intake, g/b/d	1463.33	1486.67	1516.67	1473.33	1426.67	72.79	NS
Average daily feed intake, g/b/d	52.26	53.10	54.17	52.62	50.95	0.27	NS
Feed conversion ratio	3.49^{b}	2.99^{a}	4.02^{c}	3.30^{ab}	3.74^{b}	0.08	*

Mean with different super scripts a, b, c on the same row are significantly ($p<0.05$) different. g/b= gram per bird, SEM= Standard Error of Mean. LOS=Level of significant

Table 3: Effect of different levels of dietary protein on haematological parameters of broiler chicks

Parameters	21%	22%	23%	24%	25%	SEM	LOS
PCV (%)	21.67	21.93	20.63	23.97	20.07	1.22	NS
White Blood Cell (x10^{9}/l)	31.83	27.07	26.76	34.77	35.74	8.01	NS
Red Blood Cell (x10^{12}/l)	10.07	8.07	6.46	7.17	7.37	8.86	NS
HGB (g/dl)	7.23	7.27	5.17	7.97	6.67	3.44	NS
MCHC (%)	33.37	32.77	33.03	33.25	33.31	9.04	NS
MCV (fl)	1.63	2.49	2.38	3.58	2.58	0.19	NS
MCH (pg)	8.45	9.36	8.29	11.92	9.48	1.58	NS

SEM: Standard Error of Mean.

higher temperature resulted in improved performance of broiler chicks. Also, Cheng *et al.*, (1997) showed that feeding high CP diets to heat stressed broilers adversely affected weight gain, carcass composition and feed efficiency, protein and energy utilization. In this present trial, it could be deduced that, though body weight gain increased among birds fed 24% level, it was however not comparable to those fed 22%CP diet. At the same time, as the crude levels decreased from 22% to 21% in this study, average body weight gain also decreases. The result may suggest that broiler chicks in the warm environment require less crude protein of 22% compare to 23% recommended by NRC (1994).

It is quite interesting to note the feed intake among broilers in all the treatments were not significantly different ($P>0.05$). This result indicates that the feed intake of broiler chicks in warm environment is not affected by levels of crude protein in the dietary treatments. Kubena *et al.*(1972) reported that there were no significant differences in the intake of broiler birds

Table 4: Effect of different levels of dietary protein on serum biochemical indices of broiler chicks.

Parameters	21%	22%	23%	24%	25%	SEM	LOS
Glucose (mg/dl)	208.57	206.67	203.67	224.33	233.00	3.87	NS
Urea (mg/dl)	13.84	13.74	15.48	17.79	15.52	6.69	NS
Total Protein (g/dl)	6.50	6.02	6.67	6.83	6.81	0.19	NS
Albumin (g/dl)	4.17	4.15	4.47	4.49	4.13	0.08	NS
Globulin (g/dl)	2.33	1.87	2.20	2.34	2.68	0.29	NS

SEM: Standard Error of Mean. LOS: Level of Significant

raised under different temperature with different protein levels. However, Jackson *et al*. (1982) observed that voluntary intake of broilers was affected by protein content although intake was depressed by diet of low protein concentration. Also, Plavnik and Hurwitz (1990) reported a significant reduction in feed intake of broilers fed low CP diets. FCR was significantly better ($P<0.05$) for birds fed 22%CP diet and this was followed by 24%CP diet. Birds fed 23%CP diet performed poorly and could not utilized the feed to gain more weight.

All the haematological parameters measured in the present experiment were within the normal physiological ranges reported for broiler chicks (Olaiya *et al*., 2013). The non significant effect of dietary treatments on the heamatological parameters of broilers implies that the levels of crude protein studied were not detrimental to the health status of the birds. The values obtained on PCV for all the treatment groups were within the normal range of 24.9-45.2% as reported by Mitruka and Rawnsley (1977). It is also in agreement with the range (22-26%) as reported by Ameen *et al.* (2007). The values obtained for haemoglobin (6 – 7g/d) were within the range of 7 – 10g/dl reported by Nworgu *et al.* (2007). The values obtained for total protein (6.02-6.83mg/dl), albumin (4.13-4.49mg/dl), globulin (1.87-2.68 mg/dl), urea (13.74-17.79 mg/dl) and glucose (203.67-224.33mg/dl) in this study are within the normal ranges reported by Mitruka and Rawnsley (1977) but higher than the ranges reported by Obun *et al*.(2012).

CONCLUSION

It was evident from the study that diet containing 22%CP gave better performance under the study environmental temperature. Though, this effect is yet to be confirmed at the finisher stage. It is therefore recommended that 22%CP level should be maintained for broiler chicks in the north central Nigeria. Further studies should be conducted to investigate the effect of different crude protein levels on finishing broiler birds.

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REFERENCES

Aduku AO (1992). Practical Livestock Feeds Production in the Tropics. S. Asekome and Co. Publishers, P.O.Box 15, Samaru, Zaria.

Akinmutimi AH (2004). Evaluation of sword bean (*Canavalia gladiata*) as an alternative feed resource for broiler chickens. Ph.D thesis Michael Okpara University of Agriculture, Umudike.

Ameen SA, Adedeji OS, Akingbade AA, Olayemi TB, Aderinola OA (2007). The effect of different feeding regimes on haematological parameters and immune status of commer-cial broilers in derived savannah zone in Nigeria. Pp. 176-178 in Proc. 32nd Annual Conf. Nigerian Soci. Anim. Prod. (NSAP). University of Calabar, Nigeria.

Cheng TK, Hamre ML, Coon CN (1997). Effect of environmental temperature, dietary protein, and energy levels on broiler performance. *J. Appl. Poult. Res.*, 6:1-17.

Coles EH (1986). Veterinary clinical chemical pathology. 4th edition. W.B. Saunders Co. Philadelphia, USA. p. 10-97.

Duncan DE (1955). Multiple Range and Multiple F-tests. Biometrics. 11: 1- 42.

Ezieshi EV, Okhueubie IF, Ezennabike CC, Olomu JM (2004). Comparative performance of broiler chicks fed graded levels of palm kernel cake and maize offal. Proceedings of the 29th Annual conference of NSAP. pp: 253-256.

Food and Agricultural Organisation (FAO), (2000). Bullet in Rome Italy.

Jackson S, Summers JD, Leeson S (1982). Effect of dietary protein and energy on broiler carcass

composition and efficiency of nutrient utilization. *Poult. Sci*., 61: 2224-2231.

Kohn RA, Allen MS (1995). Enrichment of proteolytic activity relative to nitrogen in preparations from the rumen for *in vitro* studies. *Anim. Feed Sci. Technol.* 2 (1): 1-14.

Kubena LF, Deaton JW, Reece FN, May JD, Vardaman TH (1972). The influence of temperature and sex on amino acid requirements of the broiler. *Poult. Sci*., 51: 1391-1396.

Mitruka BM, Rawnsley HM (1977). Clinical Biochemical and Haematological Reference Value in Normal Experimental Animals. Masson Publishers Inc. NY. USA.

NRC. (1994). National Research council. Nutrient requirements of poultry 9th Rev. Edn. National Academy press, Washington, D. C.

Nworgu FC, Ogungbenro SA, Solesi KS (2007). Performance and some blood chemistry indices of broiler chickens served fluted pumpkin leaves extract supplement. *Ame-Eurasian J. Agric. and Env. Sci*. 2(1) 90 – 98.

Obioha FC (1992). A guide to poultry production in the tropics: Acena publishers. Nigeria, pp: 18-35.

Obun CO, Adeyemi OA (2012). Effects of raw and toasted *Daniellia oliveri* Rolfe seed meal as replacement for groundnut meal on the performance of broiler chickens. *Revista Científica UDO Agrícola*. 12 (4): 947-954.

Olaiya OD, Dafwang H, Bawa GS, Makinde OJ (2013). Growth performance and Haematological indices of growing broilers fed roasted sesame seed meal. *Int. J. of Applied Research and Tech.* 2(9):79-85.

Olomu JM (1995).Monogastric animal nutrition: principle and practice.Benin, NG: A Jachem Publication.

Oluyemi JA, Robert FA (2000). Poultry production in warm wet climate (2nd edn). Spectrum books Ltd. Ibadan Nigeria.

Onwukwe CC (2000). The effect of lema beans (Phaeolus Lunatus) cooked with potash (Akawu) on broiler finisher diet. B.Sc thesis. Michael Okpara University of Agriculture, Umudike, pp: 6-25.

Peters T, Biamonte GT, Doumas BT (1982). Protein (total protein) in serum. *In*: Selected methods of clinical chemistry. (G. W. R. Faulkner and S. Mcites, Eds). American Association of Clinical Chemistry. Pg. 100-115.

Plavnik I, Hurwitz S (1990). Performance of broiler chickens and turkey poults subjected to feed restriction or to feeding of low sodium diets at an early age. *Poultry Science.* 69(4):945-952.

SAS (2008). Statistical Analysis System Institute. Users Guide Version 10 for Windows. Cary North Carolina USA.

Schalm OW, Jain NC, Carrol EJ (1975). Veterinary haematology 3rd Ed. Lea and Fabinger,Philadelphia, USA.

Steel RGD, Torries JH (1980). Principles of Procedures of Statistics. A Biometrical Approach. (2nd ed). McGraw Hill Book Coy, N.Y., Pp. 633.

Waldroup PW, Mitchell RJ, Payne JR, Hazen KR (1976). Performance of chicks fed diets formulated to minimize excess levels of essential amino acids. *Poult. Sci*., 55:243- 253.