NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

GROWTH PERFORMANCE OF BROILER CHICKENS FED VARIOUS DIETARY SOURCES OF ENERGY AND PROTEIN

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ABSTRACT

An experiment was conducted to evaluate the interaction of energy and protein sources on the growth performance of broiler chickens. Four different diets were formulated in which energy (yellow maize and yellow sorghum) and protein: Groundnut cake (GNC) and Soya bean cake (SBC) sources were combined. The diets were designated as T1 (yellow maize and GNC), T2 (yellow maize and SBC), T3 (yellow sorghum and GNC) and T4 (yellow sorghum and SBC), respectively. Two hundred and four (204) day old broiler chicks were randomly allotted into four dietary treatments replicated three times with seventeen (17) birds per replicate in a randomized complete block design (RCBD). The experiment lasted for eight weeks. The result showed that there was no significant ($P<0.05$) influence of diet on all performance parameters during the starter and finisher phases. The productive and overall performance of the birds were not significantly ($P<0.05$) affected by the dietary treatments. It was concluded that Soya bean cake (SBC) and Groundnut cake (GNC) are suitable plant protein sources in broiler chicken diets with either yellow maize or yellow sorghum as energy sources. Both SBC and GNC are recommended for incorporation in the diets of broiler chickens with no adverse effects on productive performance.

Key words: Yellow Maize, Yellow Sorghum, GNC, SBC, Broiler Chickens, Broiler Performance.

INTRODUCTION

Availability of animal feed and efficient feeding are the foundations of successful livestock production. The feeding of a balanced diet and correct feed formulation increases animal productivity, quality of product and animal welfare (FAO, 2011). The future development of the poultry industry in many regions of the world depends to a large extent on the availability of feedstuffs in those areas that are suitable or can be made suitable for use in poultry feeds (Nyhad, 2008). According to Kekeocha (1994) and Olomu (1995) broiler birds are fast growing birds and are described as good converters of feed and are marketed from eight to twelve weeks. Broiler birds are regarded as the type of birds that have high feed consumption and conversion ratio. They can utilize non-conventional feed ingredients that cannot be directly consumed by man and convert them into high quality meat which are needed in large quantity by man (Partmouth,

1991). This study aims to investigate the growth performance of broiler chickens fed various dietary sources of energy and protein during the starter and finisher phase

MATERIALS AND METHODS

Experimental site: The experiment was conducted at Poultry Unit of Teaching and Research Farm, Abubakar Tafawa Balewa University, Bauchi. The State lies between 9° 3' and 12° 3' North and longitudes 8° 50' and 11° East at an altitude of 600 m above the sea level (BSD, 2009).

Management of the Experimental Birds: Two hundred and four (204) day old broiler chicks were used for the experiment. After the period of about 1 week the birds were randomly allocated to four (4) dietary treatments replicated three (3) times with seventeen (17) birds per replicate in a randomized complete block design (RCBD). The birds were weighed to get the initial weight. All experimental birds were given experimental diets during starter and finisher phases as shown in Table 1. Water was provided *ad libitum*. All necessary vaccinations (Lasota and Gumboro vaccine) were administered at the appropriate time. The feeding trial lasted for eight (8) weeks where weekly weight gain, daily feed intake and feed conversion ratio were taken.

***Experimental Diets*:** Four (4) diets containing various dietary sources of Energy (Yellow Maize and Yellow Sorghum) and protein (GNC and SBC) designated as T1 (YM and GNC), T2 (YM and SBC), T3 (YS and GNC), and T4 (YS and SBC) respectively.

Statistical analysis: Data collected were subjected to analysis of variance (ANOVA). The treatment means were separated using the Duncan multiple range test (DMRT).

Table 1: The Ingredients and Calculated Composition of Broilers Diets at Starter and finisher phase

Ingredients (%)	**Treatments**			
	Yellow Maize		**Yellow Sorghum**	
	T1 (GNC)	**T2 (SBC)**	**T3 (GNC)**	**T4 (SBC)**
Yellow Maize	51.07(51.18)	51.92(55.77)	0.00(0.00)	0.00(0.00)
Yellow Sorghum	0.00(0.00)	0.00(0.00)	53.60(56.87)	53.43(57.43)
Groundnut Cake	29.53(20.42)	0.00(0.00)	28.00(18.73)	0.00
Soya Bean Cake	0.00(0.00)	28.68(19.83)	0.00(0.00)	27.17(18.17)
Wheat Offal	10.00(15.00)	10.00(15.00)	10.00(15.00)	10.00(15.00)
Fish Meal	5.00(5.00)	5.00(5.00)	5.00(5.00)	5.00(5.00)
Limestone	1.50(1.50)	1.50(1.50)	1.50(1.50)	1.50(1.50)
Bone Meal	2.00(2.00)	2.00(2.00)	2.00(2.00)	2.00(2.00)
Salt	0.25(0.25)	0.25(25)	0.25(0.25)	0.25(0.25)
*Premix	0.25(0.25)	0.25(0.25)	0.25(0.25)	0.25(0.25)
Lysine	0.20(0.20)	0.20(0.20)	0.20(0.20)	0.20(0.20)
Methionine	0.20(0.20)	0.20(0.20)	0.20(0.20)	0.20(0.20)
Total	**100(100)**	**100(100)**	**100(100)**	**100(100)**
Calculated Analysis				
Crude Protein (%)	23.00(20.00)	23.00(20.00)	23.00(20.00)	23.00(20.00)
Met Energy(Kcal/Kg)	3000(3000)	3000(3000)	3000(3000)	3000(3000)
Crude Fibre (%)	4.80(4.66)	4.74(4.62)	4.82(5.71)	5.79(5.69)

Ether Extract (%)	4.52(4.32)	5.06(4.70)	3.95(3.72)	4.79(4.06)
Calcium (%)	1.70(1.72)	1.70(1.71)	1.72(1.73)	1.72(1.32)
Phosphorus (%)	0.77(0.80)	0.85(0.84)	0.79(0.82)	0.68(0.84)
Lysine (%)	0.81(2.96)	1.14(3.72)	0.80(3.04)	1.12(3.10)
Methionine (%)	0.68(0.73)	0.69(0.96)	0.67(0.70)	0.62(0.93)
Ash (%)	3.78(0.64)	3.89(0.67)	3.93(0.64)	4.03(0.67)

Values in parenthesis are composition and calculated analysis for finisher diet.

RESULTS AND DISCUSSION

The result of Interaction of Energy and Protein Sources on the Growth Performance of Broiler Chickens are presented in Tables 2. The results showed non-significant difference among the dietary treatments in all the parameters measured at both the starter and finisher phase as well as the overall performance of the birds. Also the productive performance of birds in all the treatments were the similar. This shows that the birds were able to utilize all the experimental diets. This study agrees with the findings of Zhuye *et al.* (2009) who observed no significant difference among the dietary sources of energy and protein for broiler chicks. Rabie *et al.* (2017) in an experiment conducted on effect of dietary energy and protein on growth performance and carcass traits of mamourah cockerels reported similar results. Etalem *et al.* (2019) also observed non-significant difference between the dietary treatment at both starter and finisher phase as well as the overall performance of the bird which was in line with the findings of this study. Increased feed intake of experimental diets was observed. This indicate that the birds regulated their intake according dietary sources of energy and protein. Ghulam *et al.* (2015) suggested that birds consumed relatively more during finisher phase to meet the metabolizable energy and crude protein need at that phase of growth. This shows that the birds were able to utilize the feed. The results of the present study generally are in accordance with Azizi *et al.* (2011) who observed that feed conversion ratio was not significantly affected by different dietary energy and protein sources fed to broiler chickens. Generally, the mortality observed (1-7) was low.

Table 2: The Interaction Effects of Energy × Protein Sources on the Growth Performance of Broiler Chickens

Parameters	Diets				SEM
	Yellow Maize		Yellow Sorghum		
	T1 (GNC)	T1 (SBC)	T1 (GNC)	T4 (SBC)	
Productive Performance					
Initial weight (g)	137.99	128.07	137.25	128.56	1.15^{NS}
week 4 weight (g)	885.69	830.21	832.35	825.73	11.19^{NS}
Final live weight (g)	1797.40	2078.10	1621.00	1821.70	63.54^{NS}
Total weight gain (g)	1659.41	1950.03	1483.75	1693.14	63.05^{NS}
Starter phase(2-4 Weeks)					
Average daily feed intake (g)	67.26	67.32	65.16	67.60	1.19^{NS}
Average daily weight gain (g)	26.70	25.07	24.83	24.90	0.86^{NS}
Feed conversion ratio	2.52	2.69	2.63	2.72	0.05^{NS}
Mortality (Number)	0.00	0.00	0.00	1.00	-
Finisher phase(5-8 Weeks)					
Average daily feed intake (g)	115.04	114.93	114.03	116.92	1.49^{NS}
Average daily weight gain (g)	32.56	44.61	28.18	35.57	2.33^{NS}
Feed conversion ratio	3.54	2.58	4.05	3.29	0.04^{NS}

Mortality (number)	3.00	1.00	0.00	6.00	-
Overall performance(2-8 Weeks)					
Average daily feed intake (g)	91.15	91.13	89.59	92.26	1.35^{NS}
Average daily weight gain (g)	29.63	34.84	26.50	30.24	0.74^{NS}
Feed conversion ratio	3.03	2.64	3.34	3.00	0.00^{NS}
Mortality (number)	3.00	1.00	0.00	7.00	-

NS= Not significant, GNC=Groundnut cake; SBC= Soya bean cake.
SEM= standard Error of Mean.

CONCLUSION AND RECOMMENDATION

Birds performance in all the treatment were similar. Soya bean cake (SBC) and Groundnut cake (GNC) are suitable plant protein sources in broiler diets with either yellow maize or yellow sorghum as energy sources. Both SBC and GNC are recommended for incorporation in the diets of broiler chickens with no adverse effects on productive performance.

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Table 1: Effect of nano zinc supplementation on growth performance of Arbor acre broiler chickens (0 – 28 d)

Main effect nano zinc (mg/kg)	Initial body weight (g/b)	Final body weight (g/b)	Body weight gain (g/b)	Total feed consumed (g/b)	Daily feed consumed (g/b)	Daily body weight gain (g/b)	FCR	Mortality (%)
NZn20	61.47	930.67^{b}	889.17^{b}	1881.15^{c}	67.18^{c}	31.78^{b}	2.11	6.50^{a}
NZn30	61.59	1011.42^{a}	949.84^{a}	1932.93^{a}	69.03^{a}	33.92^{a}	2.03	0.68^{d}
NZn40	61.76	976.96^{ab}	915.25^{ab}	1905.64^{b}	68.05^{b}	32.67^{ab}	2.08	5.37^{b}
NZn50	61.56	984.41^{a}	936.35^{a}	1948.52^{a}	69.59^{a}	33.44^{a}	2.08	3.81^{c}
SEM	0.25	18.85	16.56	18.91	0.03	0.04	0.05	0.75
P-value	0.87	0.02	0.03	0.02	0.33	0.38	0.23	0.00

abcd = means in the same column with vary superscript differs significantly ($p<0.05$).

Table 3: Effect of nano zinc supplementation on nutrients digestibility of Arbor acre broiler chickens (0 – 28 d)

Main effect of nano zinc (mg/kg)	DM (%)	CP (%)	CF (%)	EE (%)	ASH (%)	NFE (%)
NZn20	83.09	78.02^{b}	75.28^{b}	79.74	77.12^{ab}	77.49
NZn30	84.60	84.04^{a}	81.27^{a}	81.17	79.16^{a}	80.15
NZn40	85.55	80.25^{ab}	79.17^{ab}	79.97	74.56^{b}	82.53
NZn50	87.47	82.68^{a}	77.22^{b}	81.18	80.16^{a}	82.91
SEM	1.71	1.40	1.30	1.91	1.36	1.87
P-value	0.34	0.01	0.02	0.92	0.03	0.16

abcd = means in the same column with vary superscript differs significantly ($p<0.05$).
DM = dry matter, CF = crude fibre, CP = crude protein, EE = ether extract and NFE = Nitrogen Free Extract.
SEM = standard error of mean
P –value = probability levels, mg = milligram and Kg = kilogram % = percentage