GROWTH PERFORMANCE, DIETARY SELECTIVITY AND NUTRIENTS PROFILE OF BROILER CHICKENS ON A CAFETERIA FEEDING REGIME

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Abstract
The study was conducted to determine growth performance, dietary selectivity of feed ingredients and nutrient profile of broiler chickens at 42 days of rearing. Two hundred and eighty-eight (288) unsexed day-old FUNAAB ALPHA Strain broiler chicks raised in battery cages were randomly distributed in a completely randomized design into 5 cafeteria dietary treatments and a basal dietary treatment groups of 6 replicate each containing 20% crude protein and 300kcal MC/kg. The results showed significant differences (P<0.01) among the treatment for all production variables except for feed: water radio. Weight gains were better (P>0.01) in broiler fed Red sorghum-soyabean meal-concentrate and Red sorghum-millet-soyabean meal-groundnut cake-concentrate. The feed conversion ratio showed similar trends with the weight gains and final body weights. The co-efficient of preference (%) indicated higher values (74g 5%) for millet in millet-soyabean concentrate diet compared to 67.43% for red sorghum in Red sorghum-soyabean meal- concentrate diet. Nutrient profile of the cafeteria dietary treatments showed similar trends with other measured variables. It was shown that Red sorghum and millet can nutritionally and suitably be used with soyabean meal for cafeteria-fed broilers that can select and consumed feedstuffs to meet energy, protein and mineral needs for growth and production.

Keywords: Cafeteria, coefficient of preference, dietary selectivity, nutrient profile, growth indices.

Introduction
Birds' performance and their products are affected by nutrition and feeding systems. Poultry can be managed under different feeding systems.Feed intake is influenced by the interface between nutrition, management and animal responses (Church and Pond, 1988; Leeson and Summer, 2005). About 86.2 percent of the poultry are managed under traditional husbandry systems (Tewe, 1998). Cafeteria system could be an option to *ad libitum* complete diet feeding. It allows the animals to select their own diet (Forbes and Shariatmadari, 1994; Forbes and Covasa, 1995). Cafeteria feeding has recently not received considerable research attention to meet the current needs of the poultry industry. Cafeteria study will serve as a basis for establishing semi intensive system for rural small-scale poultry production. The objective of the study was to evaluate the production response, dietary selectivity and nutrient profile of broiler chickens on a cafeteria feeding system.

Materials and Methods
The experiment was conducted at the poultry unit, Teaching and Research Farm, Agricultural Education Department, Adeniran Ogunsanya College of Education, Otto/Ijanikin, Lagos. Two Hundred and Eighty-eight unsexed day-old broiler chicks obtained from the hatchery of the Federal University of Agriculture, Abeokuta were randomly allotted to six experimental diets with six replicates of 48 broiler chicks each in a completely randomized design and raised in constructed cage system. The dietary treatments are presented in Table 1.

Table 1: Gross and Nutrient Composition of Test Finisher Diets

	COMPOSITION, %					
Ingredients	***Ma-SBM-C***	***S-SBM-C***	***S-GNC-C***	***Mi-SBM-C***	***Mi-GNC-C***	***S-Mi-SBM-GNC-C***
Maize	58.60	-	-	-	-	-
Sorghum	-	62.00	52.00	-	-	31.00
Millet	-	-	-	61.20	50.50	25.25
Soyabean meal	19.40	16.00	-	16.80	-	8.40
Groundnut cake	-	-	26.00	-	27.50	13.;75
Brewer's Dried Grain	5.00	5.00	5.00	5.00	5.00	5.00
Palm kernel cake	3.00	3.00	3.00	3.00	3.00	3.00
Wheat offal	6.00	6.00	6.00	6.00	6.00	6.00
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00
Dicalcium phosphate	2.00	2.00	2.00	2.00	2.00	2.00
Oyster shell	1.00	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25
L-Lysine	0.25	0.25	0.25	0.25	0.25	0.25
DL-methionine	0.25	0.25	0.25	0.25	0.25	0.25
*Vitamin/Mineral premix	0.25.	0.25	0.25	0.25	0.25	0.25
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis	20.00	20.00	20.01	19.97	19.56	20.02
Crude Protein, %	4.34	4.19	4.25	7.90	7.33	5.78
Crude Fibre, %	3.95	3.35	4.05	3.97	4.60	3.99
Fat, %	157.56	150.01	152.49	150.79	153.63	154.92
Calorie:Protein ratio	3151.28	3001.10	3051.38	3011.20	3005.10	3101.50
ME,Kcal/kg						

**Contain per kg of diet: 10,000 iuVit. A, 2000 iuVit. D_3 51 iuVit. E, 2.24mg Vit. K, 5.5mg riboflavin, 10mg Vit. B_{12}, 25mg Niacin, 1mg Folic Acid, 250mg Choline, 8mg pantothenate, 54mg, Mn, 48mg Zn, 10mg Cu, 20mg Fe, 2.25mg Cobalt and BHT antioxidant*.

SBM – Soya bean meal, GNC – Groundnut cake, Ma – Maize, S – Sorghum, Mi – Millet, C – Concentrate Supplement

The feeds were presented in a mash form with 3 - compartment feeding troughs to separate the sources of energy, protein and concentrate with the exception of 5 - compartment feeder for treatment containing all the energies and protein sources.

The following parameters were measured; weight gain, feed intake, feed conversion ratio, feed/gain ratio, water consumption, feed to water ration co-efficient of preference and nutrient profile. The data obtained were subjected to analysis of variance using the General Linear model procedure (SAS Institute, 2012).

Result and Discussion

The results of the growth performance, co-efficient of preference and the nutrient profile of the broiler chicken at the finisher stage (22-42 days) are presented in Tables 2, 3 and 4 respectively.

Table 2: Growth Performance of Broiler Chickens at the Finisher Phase (22-42days)

PARAMETERS	Ma-SBM-C	S-SBM-C	S-GNC-C	Mi-SBM-C	Mi-GNC-C	S-Mi-SBM-GNC-C	P-Value
MBW, g/bird	183.8±10.5^{a}	181.8±17.8^{ab}	98.1±9.3^{c}	163.8±14.6^{c}	118.5±14.6^{c}	171.5±15.1^{ab}	<0.001
MBW @ day 42, g/bird	1158.7±20.6^{a}	1020±95.41^{b}	311.6±122.5^{c}	858.5±55.1^{b}	428.2±139.2^{c}	1001±99.9^{b}	<0.001
Total Feed intake, g	2256.6±120.5^{bc}	2436.4±343.7^{ab}	895.8±211.2^{d}	1941.9±245.9^{c}	1185.4±186.2^{d}	2162.5±110.7^{bc}	<0.001
Feed Intake , g/b/d	376.1±15.5^{bc}	406.1±57.2^{ab}	149.3±35.2^{d}	323.6±40.9^{c}	197.5±31.03^{d}	360.4±18.4^{bc}	<0.001
Weight gain, g	974.8±61.8^{b}	838.2±81.8^{b}	213.5±113.2^{c}	694.7±59.4^{b}	309.8±130.9^{c}	829.5±109.5^{b}	<0.001
Weight gain, g/bird	162.4±13.5^{a}	139.7±13.8^{b}	35.5±4.3^{d}	115.7±12.3^{c}	51.6±9.57^{d}	138.2±11.3^{b}	<0.001
Feed Conversion Ratio	2.31±0.03^{a}	2.89±0.19^{b}	5.05±2.43^{a}	2.80±0.32^{b}	4.09±0.96^{ab}	2.64±0.37^{b}	0.089
Feed Efficiency	0.43±0.16^{a}	0.35±0.02^{ab}	0.22±0.10^{c}	0.36±0.04^{ab}	0.25±0.06^{bc}	0.38±0.05^{a}	0.029
Mean total water intake (ml)	4563.8±360.4^{a}	4747±1502.9^{a}	1736.3±625.7^{b}	3975.1±204.1^{a}	2111.4±776.8^{b}	4511.7±435.3^{a}	0.001
Mean water intake (ml/b/d)	126.7±4.8^{a}	138.2±43.6^{a}	48.7±18.5^{b}	113.4±5.7^{a}	60.2±21.8^{b}	128.7±12.5^{a}	0.009
Feed: Water ratio	0.49±0.06	0.53±0.11	0.53±0.06	0.49±0.06	0.61±0.22	0.48±0.03	0.709

MBW=Mean Body weight
a, b, c, d Means with different superscripts in the same row are significantly different

SBM – Soya bean meal, GNC – Groundnut cake, Ma – Maize, S – Sorghum, Mi – Millet, C – Concentrate Supplement

There were significant differences (P<0.01) among the treatments for all variables except for feed to water ratio. Feed intake was greater in broilers on cafeteria feeding of red sorghum - soya bean meal - concentrate differing significantly (P<0.01) from birds on free-choice feeding of sorghum-GNC-concentrate and millet-GNC concentrate. Feed intake was not statistically different (P>0.01) among the treatments of red sorghum-soyabean meal concentrate, millet-soyabean meal- concentrate and millet- red sorghum-soyabean-GNC-concentrate.

Table 3: Co-efficient of Preference and Proportion (%) of each Ingredient consumed by Broiler chicken at Finisher Phase (22-42 days)

INGREDIENTS	TREATMENTS					
	Ma-SBM-C	S-SBM-C	S-GNC-C	Mi-SBM-C	Mi-GNC-C	Mi-S-SBM-GNC-C
Maize (Ma)	74.20±3.49	-	-	-	-	-
Sorghum (S)	-	67.43±2.45	60.59±9.81	-	-	7.47±2.89
SBM	22.85±1.52	30.69±2.14	-	23.14±4.31	-	19.90±2.61
Millet (Mi)	-	-	-	74.95±4.49	66.22±5.59	53.26±7.13
GNC	-	-	37.17±9.89	-	32.28±6.07	16.28±6.06
*Conc (C)	2.95±0.68	1.87±0.68	2.24±0.27	1.91±0.77	1.50±0.25	2.55±0.65

SBM – Soya bean meal, GNC – Groundnut cake, Ma – Maize, S – Sorghum, Mi – Millet, C – Concentrate Supplement

The result indicated higher preferences for millet, red sorghum and soyabean meal as good sources of energy and protein for better performance. Birds consumed less groundnut cake probably due to its low protein quality, poor palatability and unattractiveness compared to soyabean meal.

Table 4: Nutrient Profile of Broiler Chickens at Finisher Phase (22-42 days)

Parameters	TREATMENTS							
	Ma-Soy-C	S-Soy-C	S-GNC-C	Mi-Soy-C	Mi-GNC-C	S-Mi-SBM-GNC-C	SEM	P – Value
Feed Intake, g/b/d	376.1±15.5^{bc}	406.1±57.2^{ab}	149.3±35.2^{d}	323.6±40.9^{c}	197.6±31.1^{d}	360.4±18.4^{bc}	-	<0.001
Weight gain, g/bird	162.4±13.6^{a}	139.7±13.8^{b}	35.5±4.35^{d}	115.7±12.3^{c}	51.6±9.5^{d}	138.2±11.3^{b}	-	<0.001
ME intake, Kcal/Kg	1135.2^{c}	8032.1^{a}	2334.3^{bc}	6471.4^{a}	3749.6^{b}	7272.7^{a}	292.94	<0.0001
Energy conversion	7.3^{c}	13.3^{b}	15.56^{a}	13.24^{b}	19.41^{a}	11.99^{b}	3.40	<0.0001
CP intake, g/bird	75.2^{d}	643.5^{a}	168.8^{cd}	447.7^{b}	248.9^{c}	577.1^{ab}	29.1	<0.0001
Protein conversion	0.46^{b}	1.07^{a}	1.13^{a}	0.92^{a}	1.26^{a}	0.96^{a}	0.24	0.0001
Calorie: Protein ratio	15.7^{ab}	12.6^{c}	14.1^{bc}	14.4^{bc}	15.4^{ab}	12.7^{c}	0.6	0.005

ME - Metabolisable Energy CP - Crude Protein
a, b, c, d, Means with different superscripts in the same row are significantly different.
SBM – Soya bean meal, GNC – Groundnut cake, Ma – Maize, S – Sorghum, Mi – Millet, C – Concentrate Supplement

The birds utilized the nutrient in feedstuffs according to their choice to meet their nutritional needs. Poultry has been reported to adjust voluntary intake of feeds with different energy and protein densities (*Cruz et al, 2005; Rose, 1997).*

Conclusion and Recommendations

Red sorghum and millet as energy sources can adequately be utilized in combination with soya bean meal as the broilers on the diets containing these ingredients presented better growth performance, dietary selectivity and nutrient profile than when groundnut cake was used. This therefore will provide a guide for the improvement of feeding and nutrition of the rural poultry system, which will ultimately improve smallholder poultry production in a sustainable and economic manner for higher animal protein intake.

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