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Asian Journal of Plant Science and Research, 2014, 4(2):1-6

ISSN : 2249-7412
CODEN (USA): AJPSKY

Chemical composition and effect of mechanical processed of African Yam bean on carcass characteristics and organs weight of broiler finisher

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ABSTRACT

Chemical *composition and effect of feeding graded levels (0, 5, 10, 15, and 20%) of mechanically processed African yam bean seeds to broiler finishers on carcass characteristics and organ weights was investigated. Proximate composition of brown seeds of African yam bean was within standard value. One hundred and fifty (150) day-old unsexed Marshal R strain were randomly allocated to five treatments of 30 birds each, replicated thrice with 10 birds per replicate in a completely randomized design. All management procedures were strictly adhered to throughout the feeding trial. In this study, Weight of carcass cuts were not significantly (P>0.05) different except wing .Internal organs and visceral were not significantly (P>0.05) different. The study showed that African yam bean cake can be used up 20 % in broiler finisher.*

Keywords: African yam bean cake, Broiler finisher, Carcass characteristics, organs weight and soybean

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INTRODUCTION

Poultry production especially broiler chicken remains one of the veritable ways of achieving sustainable and rapid production of high quality protein to meet the increasing demand of the Nigerian teeming populace [1]. Moreover, poultry industry is an area where scientific innovations have served to make production of the most technologically advanced protein production systems in the world [2]. Consequently, poultry production is the most economic route for producing high quality animal protein within the shortest possible time for the rapidly increasing human population across the world and especially in the sub-Sahara African countries. This is because of their short generation interval and the intensive method of production which allows high stocking density. Poultry meat has many desirable nutritional benefits such as low lipid content with a relatively high concentration of polyunsaturated fatty acids and higher protein content [3 and 4]. Inadequate feeding and poor management practices are some of the major problems facing animal production in developing countries. Animal nutritionists are challenged on a daily basis to assess the nutritive values of feedstuffs available in their communities and to propose the possible combinations of these feedstuffs into complete feeds that meet the nutrient requirements of livestock at a reasonable cost. Feed alone accounts between 70 to 80% of the total cost of broiler production [5] and adequate nutrition is one of the major inputs necessary for the full expression of the genetic potentials of poultry and the prevention of stress [6], which has been attributed to over dependence on the conventional feedstuffs such as soybean and groundnut cake [7]. A high demand for these feed ingredients has resulted in an increase in products [8]. So the development of non-conventional feed ingredients in the poultry nutrition is currently receiving attention. One of such non-

convectional feed ingredients that can be used as an alternative to conventional protein is the African yam bean seeds.

African Yam bean [*Sphenostylis stenocarpa*] is one of the edible, underutilized legumes grain widely cultivated in Africa that is used for man and animal nutrition [9]. It is a climbing legume adapted to lowland tropical conditions. Like most grain legumes cultivated in Africa, (widely cultivated in the southern, eastern and western parts of Nigeria). It is commonly known as "Agwa" in some parts of Igboland for instance in Abia State, it is known as "Odudu", Urhobo in Delta state calls it "Ekpakpani" while Edo calls it 'illoloegwa and called Sumunu or Sese in Oke-Ogun area of Oyo state, Nigeria. Its protein is made up of over 32 % essential amino acids, with lysine and leucine being predominant [10]. African yam bean seeds are good source of dietary protein. Nutritionally, the seeds are known to posses' high crude protein (21% to 29%) and approximately 50% carbohydrate [11]. Lysine and methionine content of African yam bean seeds are comparable and even better than those of soybeans. It's use has been limited by the presence of anti-nutritional factors which include Trypsin inhibitor, haemagglutinatin, tannin, phytic acid, oxalate e t c [12 and 13]. But can be reduced or eliminated by processing methods. Conventional methods like boiling, soaking, fermentation, germination (sprouting),chemicals had been used to reduce anti-nutritional content of African yam bean seeds but there is no available or little information on mechanically processing method, therefore, this study is directed toward investigating proximate composition and effect of mechanical processed of African yam bean seeds on carcass characteristics and organs weight of broiler finisher.

MATERIALS AND METHODS

Location of the study

The experiment was conducted at the Training and Research Farm, Oyo state college of agriculture Igbo-ora, latitude 7˚15 'N and longitude 3˚30 E with average annual rainfall of 1278mm and average temperature of 27^0C.

Processing of African yam bean (AYB) seeds

The brown variety of African Yam Bean seeds (picture 1) used in this study was purchased from Bodija market, Ibadan North local Government area of Oyo state, Nigeria. Other materials like maize, Soybean, methionine, lysine, broiler premix and table salt (NaCl) were procured from Adom feed mill, Orogun area, Ibadan. Beans were sorted by removing foreign materials like; stone, dirty and unwanted seeds. African yam bean seeds were toasted by using pop corn machine at the temperature of 110°C for 35 minutes and beans were stirred at regular interval to ensure evenly distribution of heat. Then, subjected to mechanical processed by using palm kernel cake extractor machine to produced African yam bean cake.

Proximate Analysis of Tested Ingredient (AYB)

African yam bean cake was analyzed according AOAC 2010 (Table 1) to know its nutritive values like crude protein, crude fibre, fat, ash, dry matter while Metabolizable Energy (ME Kcal/kg) was calculated by using [14]

ME= (37 x CP) + (81.8 x FAT) + (35.5 x NFE). NFE= (100 – CP-CF- FAT- ASH-MC).

Milling of Experimental Ingredients

African yam bean cake and other ingredients were milled separately at feed-mill unit of Training and Research Farm, Oyo State College of Agriculture, Igboora.

Feed Formulation

Five different treatments (T1, T2, T3, T4 and T5) were formulated. All the treatments contained African yam bean cake except control diet (T1). Dietary treatments T2, T3 T4, and T5 contained 5, 10, 15 and 20% African yam bean cake as shown (Table 1).

Experimental Birds, Design and Management

One hundred and fifty day old Marshal R strain broilers were bought at Fol-Hope farms, Ibadan, Oyo State, Nigeria and were fed experimental broilers starter for five weeks. The birds were divided into five equal groups of 30 birds in a treatment with three replicates per treatment in a Complete Randomized Design (CRD). Each replicate was house in a floor pen measuring 2.4m cover with wood shaving as litter materials and equipped with feeders and drinkers. Feed and fresh water were supplied *ad libitum* throughout the finishing phase. Routine vaccines and drugs were administered as at when due.

Table 1: Percentage Composition of broiler finisher

Ingredients (Kg)	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)
Maize	69.00	66.44	63.87	61.25	58.70
Soybean meal	26.00	24.70	23.41	22.10	20.80
African yam bean cake	0.00	3.86	7.72	11.65	15.50
DCP	2.50	2.50	2.50	2.50	2.50
Limestone	1.50	1.50	1.50	1.50	1.50
Methionine	0.25	0.25	0.25	0.25	0.25
Premix (B)	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	O.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
ME (cal/kg)	3043.08	3084.70	3099.25	3114.03	3128.64
Crude Protein (%)	17.58	17.35	17.13	16.90	16.67
Crude Fibre (%)	3.16	3.14	3.12	3.10	3.07
Ether Extract (%)	3.67	3.73	3.79	3.85	3.91
Ash (%)	0.90	1.03	1.16	1.29	1.42
Calcium (%)	0.90	1.17	1.18	1.19	1.20
Phosphorus (%)	0.65	0.65	0.65	0.65	0.65

DCP= Di-calcium phosphate *ME= Metabolizable Energy*

Statistical Analysis

Data collected were subjected to one-way analysis of variance using [15] (Inc Chicago IL. USA). The means were separated by using Duncan Multiple Ranged Test [16].

RESULTS

Chemical composition and calculated metabolizable energy content of both raw and processed African yam bean seeds are presented in table 2 as follows; moisture content: 8.70%, ether extract: 2.50%, crude protein: 22.30%, crude fibre: 4.20%, ash: 3.80%, nitrogen free extract: 59.40% and metabolizable energy: 3106.35 Kcal/kg in the raw African yam bean seeds while mechanical processed African yam bean (cake) had moisture content: 8.10%, ether extract: 5.36%, crude protein: 14.77%, crude fibre: 2.90%, ash: 4.23%, nitrogen free extract: 65.37% and metabolizable energy: 3279.66 Kcal/kg.

TABLE 2: Chemical Composition of Raw and Processed African Yam Bean Cake

Composition (%)	Raw	Processed
Moisture content	8.70	8.10
Ether Extract	2.50	5.36
Crude Protein	22.30	14.77
Crude Fibre	4.20	2.90
Ash	3.80	4.23
NFE	58.50	64.64
Calcium	1.70	0.26
Phosphorus	1.40	0.23
CALCULATED ANALYSIS		
ME (Kcal/kg)	3106.35	3279.66

NFE= Nitrogen free extract. *ME= Metabolizable Energy*

Table 3: Carcass characteristics of experimental birds

Parameters (g)	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)	SEM
Head	78.55	66.00	72.95	75.65	65.95	3.41
Neck	149.20	122.85	139.25	143.50	130.10	4.23
Drumstick	142.45	121.80	142.70	140.15	121.15	4.32
Thigh	164.90	131.35	166.85	157.15	144.45	5.59
Back	257.60	234.70	257.75	227.20	200.60	9.88
Wing	225.60^{abc}	189.05^{c}	245.65^{ab}	262.25^{a}	219.30^{bc}	8.98
Breast	349.70	271.00	284.65	265.65	206.60	21.86
Shank	56.00	47.55	54.80	56.55	51.20	1.80
Abdominal fat	28.35	38.00	35.40	19.35	22.65	5.20

^{Abcd} *means within the same row with different superscripts differ significantly (P<0.05)*

Picture 1: shown African yam bean seeds

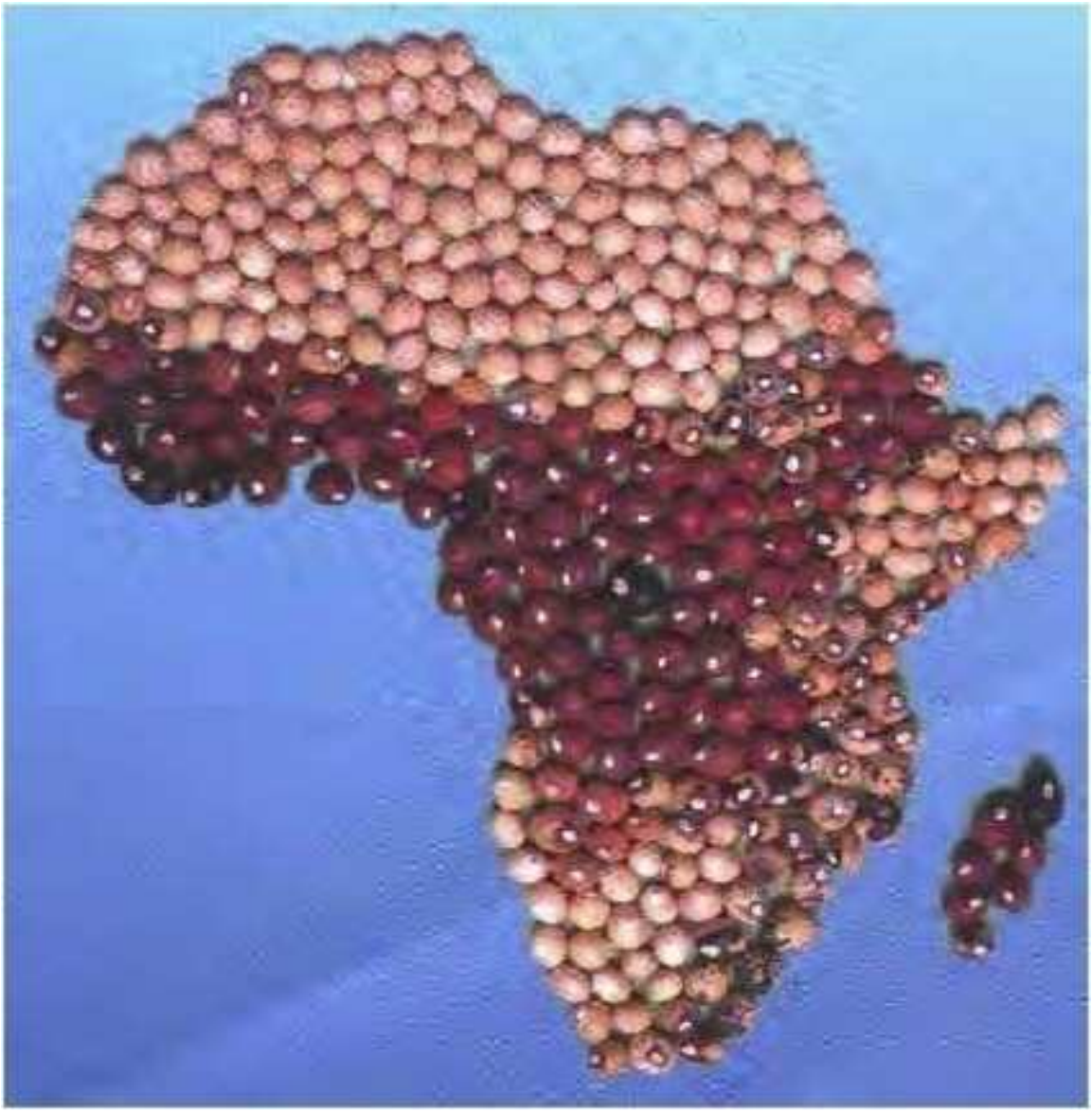

Table 4: Organs weight of the experimental birds

Parameters (g)	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)	SEM
Heart	14.20	11.10	14.80	10.95	10.85	0.88
Liver	42.60	34.60	44.40	38.05	37.40	1.65
Lung	13.90	10.55	14.25	14.45	11.15	0.78
Spleen	3.00	3.10	2.70	2.65	2.65	0.12
Bile	3.70	3.15	3.75	3.85	3.80	0.13
Kidney	16.05	15.50	16.38	14.00	11.20	0.82
WG	59.70	69.75	65.00	62.80	61.50	2.87
EG	46.70	49.65	51.20	51.47	53.00	1.69
WI	97.80	105.45	115.60	94.00	87.60	4.73
IL	214.50	212.00	234.00	215.00	212.50	4.95
PROV.	11.05	10.95	14.65	10.30	11.00	0.77

^{abcd} means within the same row with different superscripts differ significantly (P<0.05)

WG = Whole Gizzard; EG = Empty Gizzard; WI = Whole Intestine; IL = Intestine Length. PROV = Proventriculus.

The result of the carcass characteristics of the experimental birds are shown in Table 3. The results showed that African yam bean cake had no significant (P<0.05) effect on the carcasses yield except wing weight that significantly affected, while organs weight followed the same pattern with carcass yield (P<0.05) as shown in table 4.

DISCUSSION

The proximate values obtained in this study fall within the normal range [11] who opined that crude protein of raw African yam bean was between 21-29 % While energy content in this study is accord with [11] reported 3270 ME Kcal/kg. Differences in proximate compositions of legumes and oil seeds have been attributed to differences in the varieties of seeds used [17 and 18]. Processed African yam bean seeds in this study had 14.77 % crude protein; the processed adopted in this study reduced nutritive values of the tested ingredient.

Weight of carcass in this study fluctuate across the dietary treatments which implied that the utilization of protein from AYBC did not suppress physiological development of birds. This result is in agreement with [19] who made similar observation in broiler birds fed fermented *mucuna* seed meal and suggested that fermentation as a processing method eliminated toxic compounds, which in turn removed depression observed when raw *mucuna* seed meal were fed to broilers. There was significant (P<0.05) difference in the weight of wing across the dietary treatments. This result negate the findings of [20] who reported no significant (P>0.05) difference in the weight of wing across dietary treatments. The mean weight of organs as a percentage dressed weight in this study support the finding of [21 and 22] who reported a similar pattern in broiler birds fed CMSM, the author concluded that residual anti-nutritional factors do not adversely affect organs.

All internal organs and visceral were not significantly (P>0.05) different. This suggests that anti nutritional factors in AYBC were not enough to cause depressed physiological conditions in broiler starters. This observation is in agreement with the finding of [19] who reported that broilers fed processed mucuna seed meal had a reduced anti-nutritional factors. [23 and 24] observed that internal organ enlargement, particularly, liver and pancreas, become inflamed in reaction to the release of trypsin inhibitors in legumes.

CONCLUSION

Conclusively, African yam bean cake diets gave higher carcass yield at eight weeks. Therefore, well balanced diets containing African yam bean cake with up to 20% replacement of soybean could improve carcass characteristic in broiler finisher. Further level of inclusion of African yam bean cake should be encouraged with the use of enzyme in broiler production.

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