CARCASS YIELD AND GUT CHARACTERISTICS OF BROILER CHICKENS FED GRADED LEVELS OF COOKED COWPEA (*Vigna unguiculata* L Wolf)

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ABSTRACT

An experiment was conducted to assess the effect of replacing soyabean with cowpea seeds on blood parameters of broiler chickens Two hundred Anak 2000 one week old broiler chicks were randomly allocated to five dietary treatments in which cowpea seeds replace soyabean at 0%, 20%, 30%, 40% and 50%, each treatment was replicated four (4) times with ten birds per replicate in a Complete Randomized Design (CRD). Results showed that live weight (2200-2750g), slaughter weight (90.68-96.83%), pluck weight (90.18-94.67%), dressed, weight (65.73-71.00%), thigh weight (14.26-13.94%), wings (4.44-4.97%) and pectoral muscle (9.45-11.65%) were affected by the different levels of cooked cowpea seeds. Similarly gizzard (0.81-1.15%), liver (1.26-1.74%) and abdominal fat (1.54-2.43%) were affected by the different levels of cooked cowpea seeds. Cooked cowpea seeds can be incorporated up to 30% in the diet of broiler chickens without deleterious effects on carcass yield and gut characteristics

Keywords: cooked cowpea, carcass characteristics, organs weight, cut of parts.

INTRODUCTION

The demand for animal protein is increasing as a result of increase in population and hunger, and malnutrition remain one of the major problems facing higher number of Nigerians resulting into lower protein in their diets. The contribution of animal protein in most of Nigerians diet is very low. The inability of Nigeria to feed their teeming population with qualitative and quantitative food is a problem associated with high cost of animal protein accompanied with biological factors such as disease and pest, social factors such as custom and tradition and ignorance Esonu *et al*., 2002. However, poultry bird has been reported to bridge the gap within a shortest possible time due to their short generation interval, short gestation period, and fast growth rate (Maidala and Istifanus, 2012). Abeke *et al.* (2007) reported that among the various poultry species, broilers birds are important in meat production because they provide quicker returns in the investment within a short period of six to eight weeks (6-8 weeks). As a result of high cost of ingredient used in poultry production, conventional poultry feeds continue to increase in price in Nigeria over several decades. The use of low price ingredient is encouraged to reduce the cost of production. The use of cheap alternative source of protein is to be encouraging hence soya bean and groundnut cake are the main source of protein which can be grown in all and semi arid areas. Cowpea (Vigna unguiculata L. walp) is a herbaceous short term, annual legumes plant which is grown in many tropical and subtropical countrie (Ameen *et al*., 2005). Cowpea originated in Africa and is widely grown in Africa Latin America, Southeast Asia and in the Southern United State (Davis *et al.*, 1991). Cowpea is the second most important food grain legume crop in tropical Africa in Nigeria, Niger, Burkina Faso, Uganda and Senegal in nearly all Africa countries south of the Sahara (Onwuene and Sinha, 1990). Cowpea is an available crop that provides a cheap source of plant protein for poor people in the third world countries (Walker, 1981). Cowpea dry seeds have high percentage of protein (20-30) that is characterized as a complete protein compared with those of other vegetable (Hafiz and Damarny, 2006). Cowpea is an important source of protein, carbohydrate, vitamins and minerals in the diet of many populations especially in developing countries (Udensi *et al*., 2007). Cowpea is a highly nutritious crop with a dry seed protein about 25% and protein digestibility higher than that of other legumes (Ologhobo and Fetuga, 1983). Cowpea protein shows a well balanced amino acid content with a deficient of methionine (Carnaval *et al*., 1990). The chemical

composition of cowpea meals varies depending on the process used for their elaboration. In general cowpea meals can be considered as good source of available protein, carbohydrates, amino acid and energy (Laurena *et al.*, 1991). Dietary fiber content represented by 10% of soluble fiber is lower than in other legumes such as (bean, chickpea, faba bean lentil pea) This aspect is important in the evaluation of nutritional quality (Carnovale *et al.*, 1990). Cowpea is an excellent and inexpensive source of protein, fatty acid, essential amino acid, vitamins and minerals (Fagreia *et al.*, 1990). The proximate chemical composition of cowpea found that crude protein is 24.7% crude fiber is 2.7%, crude fat is1.30% and ash is 3.60% (Defang *et al.*, 2008). All the parts of the plant that are used for food are nutritious and provide protein, vitamins and minerals. Cowpea plant can tolerate drought and poor soils hence it is an important crop in the savanna regions where these constraints restrict other crops (IITA, 2004). It also contains reasonable amount of other water-soluble vitamins such as riboflavin, pyridoxine and folacin, in addition to potassium, iron, zinc and phosphorus (Aykrayd *et al.*, 1982). Cowpea is considered an important food for human being, it also provide feed, forage, silage and hay for livestock (Onwueme and Singha, 1990). Different types of local varieties of cowpea exist in and around Katagum Local Government of Bauchi state which include:- kananado (big seed and coiled one), (silver variety) Yabarem (small seed variety). The use of this local varieties will reduce the cost of poultry production and over dependence on soyabean as source as source of protein as they are known to have similar amino acid profile (Aduku, 2004). However, recent studies agreed that the utilization of raw cowpea was limited by the presence of antinutritional factors (ANFs) (Chakam, *et al* ., 2010), which negatively affect broilers feed consumption, growth and utilization thus confirming previous reports on the necessity to detoxify grain legumes before they can be included in monogastric animals' diets (Maidala, 2015). The research reported here in is the replacement value of cooked cowpea as replacement soyabean on carcass yield and gut characteristics of broiler chickens.

MATERIALS AND METHODS

The experiment was conducted at poultry house of School of Undergraduate, Collage of Education Azare, Bauchi state. Katagum local government is situated on the northern part of Bauchi State, Nigeria. It is located between latitudes $11^0 42'$ and $11^0 40^0$ and longitude $10^0 31'$ and 10^0 11' east (Anon, 2009). Two hundred Anak 2000 day old broiler chicks were used for this study. The birds were brooded for one week. The chicks were individually weighted and randomly assigned to five treatments diet in which cooked cowpea replace full fat soya bean at: control 0%, 20%, 30%, 40% and 50% inclusion. Each treatment was replicated four (4) times consisting of ten birds per replication in a completely randomized design (CRD). The cowpea seed were cooked for about 30 minutes after the boiling point of water (Maidala, 2015). After cooking the cowpea seed was sun dried for five days before milling. The seeds were used to formulate the experimental diets. The composition of the experiment is shown Table 1 and 2 for starter and finisher respectively. The birds were administered with vitamin and amprolium in their drinking water. The vaccination of Gumboro was been administered after one week and Lasorta was also administered after two weeks (14 days). Water is giving to the bird *adlibitum*. The birds were placed on the experimental diet for eight weeks (56 days) during which they were fed the experimental diets. At the end of the experiment a total number of ten (10) birds two from each treatment were randomly selected and starved of feed overnight. Each bird was weighted before have been slaughtered by slitting of throat and then bled. Each bird was defeathered after emercing in hot water and weighted for plucked weight. The offal for each carcass were removed and measured. Eviscerated weight, the head, legs gut and organs for each were removed leaving the nominal fat pad intact and the carcass was weighted. Each carcass was assessed for dressing percentage, gut characteristics and retail (cut up parts) parts then expressed as percentage of dressed weight was taken to the nearest two decimal places using electronics sensitive weight balance. All the weights taken were recorded and dressing percentage was calculated from the recorded data. The weights of all organs (the

heart, liver, lungs, and gizzard) were measured using station 461 an electronic scale. The gut components were expressed as percentage of live weight. The dressing of a bird is eviscerated weight of the bird divided its live weight as shown below

$$\text{Dressing Percentage} = \frac{\text{Carcass weight}}{\text{Live weight}} \times 100$$

The data generated were subjected to analysis of variance technique (Steel and Torrie, 1980) and Duncan's multiple ranged tests (DMRT) were used to separate the means (Duncan's, 1955). The diets were isocaloric and isonitrogenous and meet the requirements of the broilers in the tropics (Aduku, 2004).

RESULTS AND DISCUSSION

The carcass yield is shown in Table 3. The initial live weights of the birds in the various treatments were similar (P>0.05). Significant differences (P<0.05) were however observed in their final live of 2200. 2600, 2650 2750 and 2700 for 0%, 20%, 30%, 40% and 50% respectively. Slaughter weight pluck weight and dressed weight followed the same trend, it increase as you increase the level of cooked cowpea up to 40% and decline hence forth, this is agreement with the earlier reports of Abeke, *et al.,* 2008 on cooked lablab seeds fed to broiler chickens. The weight of gizzard (0.91-1.15%) was affected by the different levels of cowpea (P<0.05), the weight increases as you increase the level of cooked cowpea, this can be attributed to fibrous nature of cowpea seeds compared to soyabean (Carnovale *et al.*, 1990). The liver weight (1.09-1.72%) was affected by the levels of cowpea cooked seeds (P<0.05), the weight increases as you increase the level of cooked cowpea, this can be attributed to presence of ANFS in cowpea which is not totally destroyed even after cooking (Defang *et al.*, 2008). The increase in liver weight in 40-50% of broiler chickens can be attributed to high amount of metabolism to increase detoxification of antinutritional factors in cowpea seeds, this partly concurred the earlier reports of Maidala *et al.*, 2011: Maidala, 2015 who reported that hypertrophy of liver may occur as a result of their attempt to detoxified antinutritional factors. The abdominal fat (1.54-2.43) increases as you increase the level of cooked cowpea (P<0.05), The increase in abdominal fat of different levels of cowpea seeds suggest poor carcass yield when compared with soyabean and this reaffirm findings of Medugu *et al.*, 2010 who reported that high amount of abdominal fat in finished broiler chickens suggested poor finishing. Most of the gut content were not affected by the levels of cooked cowpea (P>0.05) and are within the range of values reported by Chakam *et al.*, 2010 for boiled cowpea seeds in Cameroon. The cuts of parts of broiler chickens fed different level of cooked cowpea are presented in Table 4. The weight of the neck varied between 2.88% in broiler chickens fed control diet to 3.37% in broiler chickens fed 40% level of cowpea and the differences between the values were statistically similar (P>0.05). Broiler chickens fed 40% cowpea level has the highest neck weight which is statistically different from the control diet. The weight of thigh ranged between 13.54% in the in 40% cowpea inclusion level to 14.40% in broiler fed 30% cowpea inclusion level and the difference between the values are statistically significant (P<0.05). The weight of pectoral muscle varied between 9.45% in broiler chickens fed 50% cowpea to 11.65 in the control diets which are statistically similar to 20-40 cowpea level and the difference between the values were statistically significant (P<0.05). The weight of pectoral muscle is within the range reported in literature by Defang *et al.*, 2008 on broilers fed cowpea. The weights of thigh and pectoral muscle are the major determinants of carcass yield in poultry chickens (Medugu *et al.*, 2010). The weight of back varied between 3.30% in broilers fed 20% cowpea to 4.07% in broiler chickens fed cowpea seeds and the difference between the values are statistically not significant (P>0.05). Broilers on 40% cowpea levels have the highest weight of back. Cooked cowpeas seeds can be incorporated into broiler diets up to 30% without deleterious effect on carcass yield and gut characteristics.

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Table 1: Percentage composition of experimental diet fed to starter (1-4 weeks of age)

Ingredients	1 Control	2 20%	3 30%	4 40%	5 50%
Maize	44.35	42.98	41.64	41.16	30.57
Soya beans	36.75	29.40	25.73	22.05	18.37
Cowpea	00.00	7.35	11.03	14.70	18.37
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
premix *	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
Crude protein	23.00	23.00	23.00	23.00	23.00
Metabolizable energy (kcal/kg)	28207	28197	28105	2896	2875

Each kilogram contains; vit. A, 10,000,000 IU, vit. D_3 2,000,000 IU, Vit. E 23,000mg, Vit. K_3 2.000mg, Vit, B_1 1,800mg, Panthothenic Acid 7,500mg, Vit. B_6 3,000mg, Vit. B_{12} 15mg, Folic acid 750mg, Biotin 11260mg, Choline Chloride 300,000mg, Cobalt 200mg, Copper 3,000mg, Iodine 1,000mg, iron 20,000mg, Manganese 40,000mg, Selenium 200mg, Zinc 30,000mg, Antioxidant 1,250mg

Table 2: Percentage composition of experimental diets feed to finisher (5-8 weeks of age)

Ingredients	1 Control	2 20%	3 30%	4 40%	5 50%
Maize	43.64	43.64	43.64	43.64	43.64
Soya beans	27.46	21.97	19.22	16.42	13.73
Cowpea	00.00	5.49	8.24	10.98	13.73
Wheat offal	20.00	20.00	20.00	20.00	20.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
premix *	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
Crude protein	20.01	20.01	20.00	20.00	20.00
Metabolizable energy(kcal/kg	3330	3330	3320	3320	3320

*Each kilogram contains Vit A 3600, 000iu. Vit. D_3 600.000 IU. Vit E 4.000.000mg. Vit B_1-B_6 640, 1600, 600, 4.00mg. Panthothenic acid 2000mg, Biotin 300mg. Manganese 16000mg. Manganese 16000mg. Selenium 80mg. Vit. K_3 600mg. Cobalt 80mg. Copper 1200mg. Zinc 12,000mg. Folic acid 200mg. Choline chloride 700000mg. Antioxidant 500mg.

Table 3: Carcass characteristics and gut contents of broiler chickens fed cowpea as replacement of soyabean

Parameters	Level of cowpea 1 0%	2 20%	3 30%	4 40%	5 50%	SEM	Sig.
Initial weight (g)	40.12	41.04	42.00	40.23	41.25	1.80	NS
Final weight (g)	2200[b]	2600[b]	2650[a]	2750[a]	2700[a]	120	*
Slaughter weight (%)	90.68	95.09	96.33	96.83	94.30	6.12	*
Pluck weight (%)	90.18	91.20	92.64	94.67	90.66	4.46	*
Dressed weight (%)	65.73	66.27	67.85	71.00	66.48	5.15	*
Gizzard (%)	0.81	0.86	0.95	1.12	1.15	0.31	*
Liver (%)	1.35	1.09	1.26	1.72	1.37	0.65	*
Lungs (%)	0.28	0.14	0.37	0.54	0.18	0.19	NS
Heart (%)	0.21	0.22	0.20	0.33	0.36	0.15	NS
Small intestine (%)	0.42	0.47	0.61	0.62	0.80	0.38	NS
Large intestine (%)	1.31	1.62	1.64	1.67	1.23	0.43	NS
Small intestine (cm)	59.00	74.00	78.00	66.00	53.00	23	*
Abdominal fat (%)	1.54	2.07	2.08	2.43	2.43	1.12	*

Head and legs (%)	3.75	1.77	2.80	3.33	3.87	2.20	*

Table 4: Cut of parts of broiler chickens fed cowpea as replacement for soyabean

Parameters	Level of cowpea						
	1	2	3	4	5		
	0%	20%	30%	40%	50%	SEM	Sig.
Neck (%)	2.88	3.02	3.00	3.37	2.91	0.45	NS
Thigh (%)	14.26	13.67	14.40	13.54	13.94	0.36	*
Chest (%)	3.52	2.93	3.62	3.16	3.42	0.59	NS
Wings (%)	4.44	3.81	4.32	4.97	4.79	2.84	*
Pectoral muscle (%)	11.65	10.95	12.28	10.38	9.45	1.90	*
Back (%)	3.62	3.30	3.35	4.07	3.48	0.37	NS