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Carcass, organ and palatability characteristics of broilers fed with graded levels of cowpea testa based diets

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Introduction

The survival and satisfactory productivity depends on feeds and it constitutes between 65 – 75% of the total production cost in intensive poultry production (Orunwani *et al.*, 1985). The demand for protein of animal origin in the diets of Nigerians is greater than the supply (Akinmutimi and Onwukwe, 2002). There is therefore an acute shortage of animal protein in our diet. The protein supplied on the average is 10 g of animal protein per day compared to a recommended daily average intake of 35 g (FAO, 1997). There is need to increase the production of livestock of animal protein source (Ani *et al.*, 2004).

Broiler production represents one of the fastest ways of animal protein source availability for consumption by the populace as their growth is fast compared to local birds (FAO, 2008). They have short generation interval, high level of growth and development and are also characterized with the best efficiency of formation into high quality of protein. Although intensive broiler production is capital intensive, because they need high quality feed to perform well. Farmers back out of its production because of the prices of grain based feed resources used in their feed formulation is very expensive. So, in order to improve broiler production among small/medium scale poultry farmers, an urgent approach of reducing production cost has to be made and only feasible way to reduce feed cost is by substituting conventional feed stuffs with the non-conventional ones (Akinmutimi *et al.*, 2002). This is the reason the experiment was focused on cowpea testa as a non-conventional feed source which attracts less attention as a partial substitute for soyabean meal in poultry production.

Materials and Methods

The study was carried out at the Poultry Unit of the Teaching and Research Farm of Osun State University, College of Agriculture, Ejigbo Campus, Osun State, Nigeria.

Experimental animals
One hundred and twenty day-old Arbor Acre unsexed broiler were purchased from a reputable hatchery in Ibadan, Oyo State, Nigeria. On arrival, birds were given water containing glucose, anti stress and antibiotics for five days. The experiment commenced from day one of the chicks and birds were randomly distributed into four treatments with 30 birds per treatment with 3 replicates of 10 birds per replicate. The birds were reared on deep litters for a period of 8 weeks and were fed compounded broiler diets for 4 week (Table 1) and compounded broiler finisher diets till 8 weeks (Table 2). Cowpea testa meal (CTM) was used to substitute soyabean partially at 0%, 15%, 30% and 50% graded level on weight by weight basis. All daily routine management were strictly adhered,

there include feeding, watering, removal of the litter after some time, vaccination and medication for boiler.

Data collection

Carcass analysis

At day 56 of the experiment, three birds per treatment were selected for carcass yield measurement. Birds were randomly picked, weighed and fasted overnight. Birds were sacrificed by slitting the throat manually, ensuring complete bleeding before the feathers were removed. The carcasses were weighed after removing heads, legs and viscera to determine the percentage of carcass weight. The heart, liver, gizzard, lungs, and proventriculus and intestine were weighed.

Palatability scores

Ten panelists were selected among the academic staff in the College for palatability study on the boiled samples of the birds from each treatment. The birds were boiled under same condition for 30 minutes with the same quantity of water and spices. Parameters examined for palatability test include the colour, flavour, tenderness, juiciness, texture and general acceptance.

Statistical analysis

Data collected were analyzed using SAS 1999 Software in a Complete Randomized Design (CRD) while means with significant differences among the treatments were separated using the Duncan's Multiple Range Test of the same software.

Table 1: Gross composition of experimental diet at starter diets

Ingredient	**Treatments (%)**			
	T1 (0% CTM)	T2 (15% CTM)	T3 (30%CTM)	T4 (50% CTM)
Maize	57.00	57.00	57.00	57.00
Soybean meal	35.00	29.75	24.50	17.50
Cowpea testa	--------	5.25	10.25	17.50
Fish meal 72%	4.00	4.00	4.00	4.00
Limestone	1.30	1.30	1.30	1.30
Bone meal	1.38	1.38	1.38	1.38
Starter Premix	1.35	1.35	1.35	1.35
Salt	0.30	0.30	0.30	0.30
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated CP (%)	23.98	22.56	21.15	19.26
Met. Energy (Kcal kg^{-1})	3039.70	2945.46	2851.23	2725.58
Calcium	0.97	0.96	0.95	0.93
Phosphorus	0.39	0.42	0.45	0.49

Table 2: Gross composition of experimental diet at finisher diets

Ingredient	Treatments (%)			
	T1 (0% CTM)	T2 (15% CTM)	T3 (30%CTM)	T4 (50% CTM)
Maize	60.00	60.00	60.00	60.00
Soybean meal	25.00	221.25	17.50	12.50
Cowpea testa	----------	3.75	7.50	12.50
PKC	4.00	4.00	4.00	4.00
Wheat offal	7.00	7.00	7.00	7.00
Bone meal	2.00	2.00	2.00	2.00
Limestone	1.10	1.10	1.10	1.10
Finisher Premix	0.35	0.35	0.35	0.35
Salt	0.35	0.35	0.35	0.35
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated CP (%)	18.75	17.94	16.93	15.58
Met. Energy (Kcal kg-1)	3008.00	2940.69	2873.38	2783.63
Calcium	0.98	0.97	0.96	0.95
Phosphorus	0.40	0.42	0.44	0.47

Results and Discussion

Table 3 shows organ and primal cuts of broiler chicken fed with different level of cowpea testa meal. There were significant ($P<0.05$) differences in the percentage weight of chest, drumstick, back and neck of the animal fed graded level of cowpea testa meal. Marguenda *et al.* (2006) reported that decrease of dietary fibre, when soluble fibrous source are included in rabbit diet enhances the carcass yield and carcass microbiology quantity in monogastric. Atteh (2004) also reported that there is an anatomical response of birds to the type of diet consumed, such as the use of whole grain in feed or large fibre particles. The internal organs were also examined and measured for the effect of cowpea testa on them. Lung weight was significantly influenced ($P<0.05$) by the inclusion of cowpea testa meal. It increased with increasing level of cowpea testa substitute from 0.72% to 1.00%, also the weight of the intestine and gizzard also increased with increasing level of cowpea testa which might be associated with the bulkiness of fibre in the cowpea testa. The heart weight was not consistently influenced by the substitution of soyabean meal with cowpea testa meal in broiler diet. However, animal fed diet 3 (T3) had the largest heart (0.73 g) while other ranged from 0.45% to 0.68%. The spleen weight was almost the same for all the diet.

Table 4 shows the effect of cowpea testa inclusion on the palatability of the broiler chicken under this study. Palatability value score for T1 and T2 had higher values for colour, flavour, tenderness, juiciness, texture and overall acceptability as compare to T3 and T4. There were significant differences ($P<0.05$) in flavour, texture and general acceptance across the dietary treatments.

Table 3: organs and primal cuts of broiler chicken fed with different level of cowpea testa meal

Organ (% Liveweight)	T1 (0% CTM)	T2 (15% CTM)	T3 (30%CTM)	T4 (50% CTM)
Heart	0.45	0.57	0.73	0.68
Kidney	0.49	0.42	0.96	0.71

Spleen	0.21[a]	0.09[b]	0.11[a]	0.14[a]
Intestine	5.21	5.65	7.05	7.64
Lungs	0.97[b]	0.72[b]	0.77[b]	1.00[a]
Liver	1.93	1.78	2.27	2.94
Gizzard	3.23[b]	4.48[a]	4.66[a]	4.76[a]
Proventriculus	0.96[b]	0.99[a]	0.81[c]	0.85[c]
Carcass (% Liveweight				
Breast muscle	17.52	14.89	15.71	16.28
Thigh	9.80	12.32	10.00	11.22
Drumstick	9.39	10.66	8.71	9.58
Wings	8.32	10.34	9.05	9.63
Back	21.27[a]	21.04[a]	17.71[b]	17.89[b]
Neck	5.08	4.28	7.05	5.06

[ab]Means on the same row with different superscript are significantly (P<0.05) different

Table 4: Palatability characteristics of broiler fed cowpea testa meal (CTM)

Parameter	**T1 (0% CTM)**	**T2 (15% CTM)**	**T3 (30%CTM)**	**T4 (50% CTM)**	SEM
Colour	6.00	6.57	5.80	5.17	0.19
Flavour	6.47[a]	6.60[a]	4.40[c]	5.20[b]	0.08
Tenderness	6.63[a]	6.62[a]	5.30[b]	5.73[b]	0.05
Juiciness	6.50	6.33	5.20	5.73	0.03
Texture	6.20[a]	6.53[a]	4.73[b]	5.33[ab]	0.06
Acceptance	7.03[a]	7.07[a]	5.30[b]	5.50[b]	0.04

[abc]Means on the same row with different superscript are significantly (P<0.05) different

Conclusions

The results of this experiment revealed that cowpea testa could be an alternative feed stuff in broilers nutrition to partially replace soybean meal up to 15% without any deleterious effect on the organ, carcass analysis and palatability characteristics of the birds.

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