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Carcass, organ and organoleptic characteristics of broilers fed yeast treated raw soya bean and full fat soya bean

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Carcass, Organs and Organoleptic Characteristics of broilers fed yeast treated raw soya bean (RSB) and full fat soya bean (FFSB) were studied using one hundred and eighty day old chicks. Standard poultry management techniques were applied and experimented diets provided ad libitum. Fifteen diets consisting of various proportions of FFSB, RSB and yeast were formulated for the starter phase (0- 28 days) and finisher phase (29-56 days), respectively. The diets in each phase were formulated to be isocaloric and isonitrogenous with the starter diets containing approximately 2900 kcal/kg ME and 23% crude protein, and the finisher diets containing approximately 3000 kcal/kg and 20% crude protein. The carcass and organs studied include weights after defeathering, cut- up parts which include thighs drumstick, shanks, wings, neck, back, breast head, and organs such as heart, liver, spleen and gizzard. The lengths of the proventriculus, small intestine, colon and caeca were also measured. The study showed that RSB at the levels fed with and without yeast inclusion had no lethal effect on broiler chickens. However, higher performance may be achieved when RSB is fed at 25 % with 6 g/kg yeast inclusion at starter phase and at 25 % without yeast or 75 % with 12 g/kg yeast inclusion. The study therefore, further maintained that inclusion of RSB with or without yeast in the diets of broilers can equally produce broiler with good weight comparable with feeding FFSB or conventional diets; feeding 75 % FFSB + 25 % RSB without yeast inclusion is capable of increasing the proportion of the broilers' head and shank; RSB inclusion in broiler diets cause increase in the weight of the gizzard, pancreas as well as on the abdominal fat, and feeding FFSB and RSB with or without east inclusion do not exert any noticeable effect on the organoleptic ualities tenderness, flavour and in general acceptability) of broilers. However, RSB enhances the juiciness of broilers.

1. Introduction

Ration – balancing of poultry diets is important, to achieve the right nutrients to meet the daily requirement of the animal. If diets are not properly balanced, then birds will suffer from nutritional diseases. The quality of the protein is important since it is made up of individual amino acids, some of which are essential to the health of the bird. It has been reported that amino acids and protein in general affect in a different manner such parameters as carcass fat deposition (Cabel and Waldroup, 1991), individual muscle development and feather growth (Fisher et al., 1981; Pesti and Miller, 1997). Some diets that are nutritionally inadequate at the start of the growth period may be come adequate as the broiler grows (Parks, 1982). Surplus protein leads to high heat increment, particularly in the case of birds were surplus nitrogen is excreted in the form of uric acids rather then as urea as is the case with mammals. When higher levels of protein are fed to birds already exhibiting signs of heat stress, the stress is exacerbated. The situation with regards to the amino acids profile of the diets that are used for the broiler breeders are less clear than that of energy. In fact the daily intake of amino acids should be of primary concern than the level in the diet. Consequently, evaluation of carcass quality and organoleptic properties of animals is paramount after feeding doubtful feed stuffs such as soya bean with its historic record of containing anti nutritional factor.

Again, yeast cell wall contain natural sugar complex known as mannan oligosaccharides (MOS), which act to reduce pathogenic bacteria in the digestive tract. Pathogenic bacteria such as E.coli and salmonella attach themselves to the intestinal wall lining. When pathogenic bacteria bind to MOS, they cannot colonize the intestinal tract and instead are excreted with the faeces. When whole yeast cells are fed, such as brewers yeast or active dry yeast, their primary nutritional contribution comes from the protein peptides, vitamin and minerals contained within the cell. Thus, for these nutrients to become available, the yeast cell must be lysed or broken open so that the contents within the cell become available for digestion and absorption. For this to happen, protease and glucanase enzymes from micro-organism in the digestive tract must break open the cell via hydrolysis from the outside to inside. Work done by Reed and Nagodawithana (1991) shared the gross composition of yeast biomass to be, moisture -2.5 %, crude protein – 50 – 52 %, true protein -42 – 46 %, nucleic acids - 6 – 8 %, minerals – 7- 8 %, lipids - 4 -7 % and carbohydrates – 30 -37 %. Schmidt (1953) pointed out that the animal organism cannot build up all the protein complex it requires from yeast protein alone, and so for best results, yeast must be employed in a mixture in the other animal and plant protein. In this study, therefore, based on the fermentative quality of yeast and the anti-nutritional factors inherent in raw soya bean, the yeast ingredient is applied to the soya bean. This is to observe if there is any marked effect of the yeast on the anti-nutritional factors with regards to the bird's carcass and organs developments. Therefore, the study is designed to assess carcass quality and organ development and properties of broiler chickens fed graded levels of yeast treated raw soya bean and full fat soya bean.

2. Materials and methods

2.1. Experimental site

The birds used in this study were raised at the poultry unit of the Teaching and Research Farm of Delta State University, Asaba Campus, Asaba, Delta state, Nigeria. The farm is located on Longitude 600 45/E and Latitude 600

12/N, with an annual rainfall that ranges from 1800 mm to 3000 mm, and also with the maximum day Temperature range of 27.50C to 30.90C.

2.2. Poultry house and management

Standard floor space and brooding allowance were maintained. The area used was partitioned into 30 units of equal sizes, measuring 6ft x 5ft (1.8m x 1.5m) each. Uniform environmental condition was maintained across the pens. Fifteen experimental treatments designated as T1, T2, T3, T4… and T15, and two experimental replicates denoted as R1 and R2 were used.

2.3. Experimental diets

Soya beans used for the study were purchased at Ose market in Onitsha, Anambra State. They were divided into two equal parts for the respective preparatory methods of the Soya bean processing before inclusion in the diets.

One part of the soya bean was roasted to ensure that the oil inherent in the soya beans was intact, and it was designated as full fat soya bean (FFSB). The second part of the Soya bean was used raw; hence it is designated as raw soya bean (RSB). Both the FFSB and RSB were milled prior to inclusion in the poultry diets.

With the exclusion of the First group diets which have 100 % FFSB, 100 % RSB and a combination of 75 % FFSB and 25% RSB, respectively, the rest test ingredients have various levels of yeast inclusion. The Second group test ingredients consist of a combination of 75 % FFSB and 25 % of RSB, the third group is a combination of 50 % FFSB and 50% RSB, the fourth group is combination of 25 % FFSB and 75 % RSB, while the fifth group test ingredients consist of 100 % RSB. Furthermore, each of 2nd, 3rd, 4th and 5th group test ingredients was partitioned into three equal portions, whereby graded levels of powdered yeast on the progressive order of 6 g, 12 g, and 18 g of yeast /1kg of soya bean were incorporated into the test ingredients.

The yeast product which contained natural yeast (Saccharomyces cerevisiae) was purchased in an aluminium foil container of 450-gramme weight. Then it was first prepared into pastry in warm water before it was mixed with the milled soya bean. Each of these treated portions of soya bean was packaged into cellophane bags and tied. They were left in this form for 18 hours. Each portion was thereafter incorporated into other ingredients to form a normal standard broiler ration. Thus fifteen diets were compounded.

Fifteen diets consisting of various proportions of FFSB, RSB and yeast were formulated for the starter phase (0- 28 days) and finisher phase (29-56 days), respectively. The diets in each phase were formulated to be isocaloric and isonitrogenous with the starter diets containing approximately 2900 kcal/kg ME and 23% crude protein, and the finisher diets containing approximately 3000 kcal/kg and 20% crude protein. The proximate compositions of the starter and finisher diets are presented in Tables 1 and 2, respectively.

2.4. Experimental birds and Management

One hundred and eighty (180) days old Marshal broilers chicks were procured from Fidan Hatcheries located at Oluyele Industrial Estate, Ibadan, for the study. The chicks were on arrival, randomly allotted to fifteen treatments groups of six (6) chicks per replicate. Adequate temperature and precautionary measures were taken to ensure maximum comfort for the birds. The chicks were given an anti- stress formulation in their drinking water on the first day to relieve transportation stress. Experimental starter diets were administered from inception and replaced with finisher diet at 29th day of age. Feed and drinking water were provided ad libitum. The broilers were vaccinated against Gumboro and Newcastle diseases at 2 and 3 weeks of age, respectively. Prophylactic doses of coccidiostat, Pantacox (Pantex Holland) were regularly provided in their drinking water at a dose of 1 ml/litre of water.

2.5. Carcass characteristics and organ weight carcass

At the end of the metabolism trial, the birds were starved overnight to empty their gut contents, weighed and slaughtered. They were left to bleed completely then scalded in hot water and defeathered by hand. Their weights after defeathering, dressing and evisceration were also taken. The cut- up parts which include thighs drumstick, shanks, wings, neck, back, breast and head were weighed and expressed as percentage of the eviscerated weight (EW). The organs such as heart, liver, spleen and gizzard were also weighed. The lengths of the proventriculus, small intestine, colon and caeca were measured and expressed in cm/100g dressed weight.

Table 1
Proximate Composition of the Broiler Starter Diets (% Dry Matter).

Treatment	% Dry Matter	% Crude Protein	% Crude Fibre	% Ether Extract	% Ash	% NFE	ME (kcal/kg)
T1	89.50	23.40	1.10	5.00	15.50	44.49	2954.20
T2	88.49	23.25	1.08	2.00	15.20	46.96	2790.93
T3	88.78	23.30	1.20	9.50	8.50	46.28	3382.14
T4	89.00	23.69	1.11	3.00	12.50	48.79	2950.65
T5	88.50	23.65	1.08	5.50	8.50	49.87	3190.57
T6	88.52	23.62	1.05	4.50	8.50	51.85	3182.72
T7	88.65	23.50	1.31	1.50	12.50	49.84	2861.57
T8	88.38	23.55	1.61	2.50	1.50	50.22	2957.01
T9	88.50	23.58	1.50	2.50	9.50	51.42	3002.37
T10	88.49	23.55	1.49	11.00	10.00	43.45	2718.33
T11	90.02	23.57	1.40	4.79	7.50	52.76	3236.89
T12	88.36	23.55	1.21	4.05	10.50	50.55	3079.42
T13	89.45	23.05	1.33	5.05	13.00	47.02	3035.15
T14	88.40	23.25	1.13	3.70	14.00	47.32	2942.77
T15	88.42	23.20	1.21	4.02	14.50	46.49	2937.64

Where; T1=100 % Full fat Soya Bean (FFSB), T2=100 % Raw Soya Bean (RSB), T3= 75 % FFSB + 25 % RSB, T4=75 % FFSB + 25 % RSB + 6 g/kg yeast, T5=75 % FFSB + 25 % RSB + 12 g/kg yeast, T6=75 % FFSB + 25 % RSB + 8 g/kg yeast, T7= 50 % FFSB + 50 % RSB + 6 g/kg yeast, T8=50 % FFSB + 50 % RSB + 12 g/kg yeast, T9= 50 % FFSB + 50 % RSB + 18 g/kg yeast, T10= 25 % FFSB + 75 % RSB + 6 g/kg yeast, T11=25 % FFSB + 75 % RSB + 12 g/kg yeast, T12=25 % FFSB + 75 % RSB + 18 g/kg yeast, T13= 100 % RSB + 6 g/kg yeast, T14= 100 % RSB + 12 g/kg yeast, T15=100 % RSB + 18 g/kg yeast.

Table 2
Proximate Composition of the Broiler Finisher Diets (% Dry Matter).

Treatment	% Dry Matter	% Crude Protein	% Crude Fibre	% Ether Extract	% Ash	% NFE	ME (kcal/kg)
T1	88.90	20.87	1.45	4.20	15.50	46.88	2879.99
T2	88.49	20.61	1.32	1.89	15.20	49.47	2773.36
T3	88.40	21.02	1.60	8.50	8.50	48.78	3152.24
T4	88.35	21.05	1.50	2.85	12.50	50.45	3304.73
T5	88.40	21.00	1.33	5.00	8.50	52.57	2902.96
T6	88.50	21.01	1.30	4.20	8.50	53.49	3119.83
T7	88.49	20.68	1.78	1.41	12.50	52.12	2977.18
T8	88.30	20.58	1.85	2.00	11.50	52.37	2892.34
T9	88.50	20.49	1.80	2.10	9.50	54.61	2968.57
T10	88.42	20.55	1.71	2.50	10.00	53.66	2969.78
T11	88.72	20.58	1.68	4.20	7.50	54.76	3149.00
T12	88.40	20.51	1.66	3.85	10.50	51.88	3015.54
T13	88.71	19.98	1.80	4.75	13.00	49.18	2846.91
T14	88.98	20.01	1.61	3.00	14.00	50.36	2873.55
T15	88.70	20.02	1.70	3.20	14.50	49.28	2851.94

Where; T1=100 % Full fat Soya Bean (FFSB), T2=100 % Raw Soya Bean (RSB), T3= 75 % FFSB + 25 % RSB, T4=75 % FFSB + 25 % RSB + 6 g/kg yeast, T5=75 % FFSB + 25 % RSB + 12 g/kg yeast, T6=75 % FFSB + 25 % RSB + 8 g/kg yeast, T7= 50 % FFSB + 50 % RSB + 6 g/kg yeast, T8=50 % FFSB + 50 % RSB + 12 g/kg yeast, T9= 50 % FFSB + 50 % RSB + 18 g/kg yeast, T10= 25 % FFSB + 75 % RSB + 6 g/kg yeast, T11=25 % FFSB + 75 % RSB + 12 g/kg yeast, T12=25 % FFSB + 75 % RSB + 18 g/kg yeast, T13= 100 % RSB + 6 g/kg yeast, T14= 100 % RSB + 12 g/kg yeast, T15=100 % RSB + 18 g/kg yeast.

2.6. Organoleptic quality assessment

The thighs of the broiler birds were deboned and muscle carefully cut into 15 bits of approximately 2 g each. Care was taken to remove all tendons. The pieces were dipped in concentrated brine for approximately two seconds, packed singly into transparent polythene bags, tied tightly, and put into boiling water to cook for approximately 20 minutes. Thereafter, they were presented in dishes under bright light to an untrained panel of 15 tasters. A structured questionnaire, designed to solicit responses about tenderness, juiciness, flavour and over all acceptability of the meat using nine point Hedonic Scale was thoroughly explained to the panellists prior to the tasting session. Warm water was provided with which panellists rinsed their mouth between samples tasted.

2.7. The experimental design and data analyses

The experimental design was a one- way classification in a completely randomized design (CRD) with the following model,

$X_{ij} = \mu + \alpha_i + e_{ij}$

Where Xij = the observed value of each of the response variables (broiler performance characteristics carcass characteristics and organ weight or organo- leptic quality characteristics)

μ = the over all population mean.

αi = observed effect of the ith dietary treatment

eij = random or residual error due to the experimentation

All data collected from the field and laboratories were subjected to analysis of variance (Steel and Torrie, 1980). Means showing significant differences were separated using the Duncan's Multiple Range Test (Duncan, 1955).

3. Results

3.1. Carcass characteristics and organ weights

The results of the carcass evaluation and organ weights are presented in Tables 3 and 4, respectively. The plucked weight, dressed weight, eviscerated weight, back, wing, neck of birds did not differ significantly (P > 0.05) among treatment means. Other parameters considered in the carcass evaluation were significantly (P < 0.05) affected. Eviscerated carcass weight (% LW) was lower (P < 0.05) in treatments 3 and 13 compared to treatments 1 and 12 which were slightly higher. Birds fed dietary treatment 3, had the highest value in the weight of head (% LW) which differed significantly (P < 0.05) from that of birds fed dietary treatments 1, 4, 5, 7, 10, 11, 12, 13 and 14. The highest shank weight (9.72 % EW) was recorded in the birds fed dietary treatment 2 (T2) which varied significantly (P < 0.05) from that of bird fed dietary treatment 5, 7, 13 and 14. Birds fed dietary treatment 8 had the highest breast weight (26.75 % EW) which varied significantly (P < 0.05) with that of birds fed dietary treatments 3 and 13. For the weight measurements of drumstick, thigh, wing and neck (all expressed as percentage of EW), birds fed dietary treatment 8 (T8) recorded higher values.

Variation in the organs and Gastrointestinal Tract (GIT) parameters were unaffected (P > 0.05) by variation in the dietary RSB levels (with and without yeast). The heart weight recorded a value range of 0.58% DW – 0.82 % DW, being ascribed to birds fed dietary treatments 6 and 3, respectively. Liver weights ranged between values of 1.28% DW and 2.37% DW which were obtained from birds fed dietary treatments 10 and 7, respectively. Birds fed dietary treatment 7 likewise recorded higher gizzard weight.

A range of values, 0.21 %DW- 0.45 %DW was recorded for the pancreas weight, of which birds that fed the control diet (T1) had the lower value, while those fed dietary treatment 14 had the higher value. For spleen weight, bird fed dietary treatments 6(T6) and 7 (T7) had a higher spleen weight, whereas birds fed dietary treatment 10 recorded a range of 0.63 cm/100gDW to 1.05 cm/100gDW. Birds fed dietary treatment 5(T5) had the lower value while those that fee dietary treatment 13 (T13) had the higher value. Birds fed the dietary treatment 14(T14) had the longest small intestine (18.62cm/100gSW) , while the shortest (11.35cm/100gDW) were recorded in the birds fed dietary treatment 5(T5).The values of the caecum (cm/100gDW) were recorded of rang between 1.09 and 1.75. Abdominal fat measured in grams (g) varied among treatment means. Birds b fed dietary treatment T3 had abdominal fat of 1.08g which varied significantly (P < 0.05) significantly (P < 0.05) with that (3.71) of birds fed dietary treatment T7. For the proventriculus, the values among treatment means were similar (P> 0.05).

Table 3
Carcass weights of broilers fed the experimental Diets.

	Treatments															
Parameters	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**T9**	**T10**	**T11**	**T12**	**T13**	**T14**	**T15**	**SEM**
Live Wt. (LW) (kg)	1.65ab	1.40ab	1.40ab	1.90ab	2.00a	1.75ab	2.00a	1.60ab	1.50ab	1.90ab	1.65ab	1.60ab	1.95ab	1.45ab	1.35b	0.05
Plucked Wt. (kg)	1.45a	1.15a	1 10a	1.65a	1.70a	1.45a	1.70a	1.30a	1.25a	1.35a	1.40a	1.45a	1.60a	1.20a	1.15a	0.05
Dressed Carcass Wt (DW) (kg)	1.35a	1.06a	1.00a	1.51a	1.60a	1.40a	1.38a	1.25a	1.21a	1.53a	1.26a	1.33a	1.33a	1.12a	1.11a	0.05
Dressed Carcass (% LW)	81.71a	77.13a	71.43a	79.53a	80.00a	78.68a	68.75a	76.67a	80.67a	79.28a	76.09a	82.69a	67.70a	73.72a	81.67a	1.19
Evisc. Carcass Wt. (EW) (kg)	1.17a	0.85a	0.80a	1.27a	1.34a	0.88a	1.21a	1.02a	0.97a	1.29a	1.04a	1.14a	1.13a	0.92a	0.89a	0.05
Evisc. Wt. (%LW)	70.55a	60.51ab	57.14b	66.53ab	67.00ab	62.13ab	65.50ab	61.59ab	64.33ab	67.97ab	61.99ab	71.30a	57.57b	63.48ab	65.50ab	0.96
Head (%LW)	4.10bc	4.86ab	5.61a	3.80bc	3.64bc	4.39abc	3.65bc	4.65abc	4.37abc	3.57bc	3.70bc	3.78bc	3.47c	4.02bc	4.66abc	0.13
Shank (%EW)	7.67abc	9.16ab	9.72a	6.92abc	6.44bc	6.99abc	6.24bc	8.79ab	8.86ab	6.83abc	7.01abc	6.79abc	5.65c	6.00bc	7.17abc	0.27
Breast (%EW)	25.83ab	21.34bc	20.00c	25.13abc	25.16abc	25.09abc	25.96ab	26.75a	22.42abc	24.98abc	25.62ab	25.24ab	20.95bc	23.29abc	25.39ab	0.47
Back (%EW)	21.29a	20.53a	24.78a	22.26a	21.48a	26.38a	24.35a	22.85a	20.72a	21.00a	22.12a	27.14a	20.70a	21.96a	22.87a	0.53
Drumstick (%EW)	14.71ab	16.72ab	18.32ab	15.03ab	13.70b	14.95ab	15.29ab	20.98a	15.15ab	15.01ab	15.16ab	14.73ab	13.11b	15.34ab	14.31b	0.48
Thigh (%EW)	14.89b	16.46b	15.04b	15.72b	14.14b	16.35b	14.39b	20.17a	15.64b	15.82b	15.85b	13.44b	12.60b	15.12b	14.48b	0.38
Wing (%EW)	12.87a	14.50a	14.93a	11.82a	11.20a	12.49a	11.87a	15.32a	12.00a	12.17a	12.51a	12.66a	14.15a	12.25a	12.37a	0.32
Neck (%EW)	8.53a	9.07a	10.33a	8.36a	8.05a	8.46a	9.07a	9.31a	7.33a	7.42a	7.98a	7.38a	8.66a	7.40a	7.81a	0.28

a b c; means with the same superscripts within each column, are not significantly (P>0.05) different. SEM = Standard error of the means.

Table 4
Organ weights of broilers fed the experimental diets at nine week.

Treatments	Organs									
	Heart Wt (%DW)	Liver Wt (%DW)	Gizzard Wt (%DW)	Pancreas Wt (%DW)	Spleen Wt (%DW)	Colon(cm/100g DW)	Small Int(cm/100 g DW)	Caecum (cm/100gDW)	Abdominal Fat (g)	Proventriculus (cm/100g DW)
T1	0.68a	1.34a	2.28ab	0.21b	0.19a	0.66a	14.48a	1.35b	2.65ab	0.80a
T2	0.69a	1.44a	2.22b	0.41ab	0.19a	0.90a	16.92a	1.44a	1.44ab	0.82a
T3	0.82a	1.64a	3.05ab	0.35a	0.20a	1.05a	17.75a	1.75b	1.08b	0.86a
T4	0.70a	1.65a	2.69ab	0.30ab	0.19a	0.76a	12.43a	1.19b	2.18ab	0.74a
T5	0.71a	1.29a	2.97ab	0.25ab	0.15a	0.63a	11.35a	1.11b	2.12ab	0.72a
T6	0.58a	1.84a	3.06ab	0.31ab	0.21a	0.97a	14.67a	1.56b	2.19ab	0.93a
T7	0.72a	2.37a	3.72a	0.42a	0.21a	0.86a	15.10a	1.33b	3.71a	0.73a
T8	0.68a	1.84a	2.94ab	0.31ab	0.16a	1.01a	14.94a	1.59b	2.08ab	0.93a
T9	0.63a	1.63a	2.61ab	0.24ab	0.15a	0.99a	16.90a	1.68b	1.86ab	0.88a
T10	0.66a	1.28a	2.51ab	0.26ab	0.14a	0.85a	13.38a	1.15b	2.59ab	0.78a
T11	0.72a	1.68a	3.06ab	0.34ab	0.18a	0.79a	14.56a	1.51b	1.99ab	0.89a
T12	0.59a	1.40a	2.15b	0.36ab	0.16a	0.83a	12.71a	1.44b	2.20ab	0.72a
T13	0.75a	2.11a	2.43ab	0.44a	0.20a	1.07a	15.91a	1.09b	1.80ab	0.68a
T14	0.64a	1.40a	2.82ab	0.45a	0.18a	0.85a	18.62a	1.45b	1.89ab	0.96a
T15	0.64a	1.36a	2.77ab	0.36ab	0.19a	1.04a	16.94a	1.22b	2.47ab	0.93a
SEM	0.02	0.18	0.11	0.02	0.01	0.05	0.65	0.35	0.17	0.02

a b c; means with the same superscripts within each column, are not significantly (P>0.05) different. SEM = Standard error of the means

3.2. Organoleptic Qualities of the Broilers

The results of the organoleptic quality test of the experimental broilers at 56 days of age were presented on Table 5. The meat tenderness, juiciness and flavour were affected (P<0.05) by the dietary treatments, but the overall acceptability was not affected (P<0.05). Meat tenderness of birds fed dietary treatment T9 of mean value 6.07 which was significantly (P < 0.05) lower than birds fed diets T10 (8.27) and T13 (7.80), T4 (7.60) and T5 (7.60). For juiciness , birds fed the control diet had 6.47 mean value which varied significantly (P < 0.05) to the value 7.93 by birds fed diet T4; 7.80 by birds fed diet T13, and 8.00 by birds fed diet T14.

Birds fed dietary treatment T8 recorded the highest flavour mean value of 8.13 which varied significantly (p<0.05) to that of birds fed T2 (6.67), T3 (6.80), T6 (6.40), T12 (7.00) and T15 (6.40).

Table 5
Organoleptic quality of meat from broilers fed the experimental diets.

	Parameters			
Treatments	**Tenderness**	**Juiciness**	**Flavour**	**Acceptability**
T1	6.87abc	6.47b	7.07abc	7.60a
T2	6.80abc	7.53ab	6.67bc	7.53a
T3	7.53abc	7.07ab	6.80bc	7.33a
T4	7.60ab	7.93a	7.27abc	7.80a
T5	7.60ab	7.27ab	7.40abc	7.60a
T6	7.47abc	7.33ab	6.40c	7.40a
T7	7.33abc	7.07ab	7.40abc	7.33a
T8	7.33abc	7.13ab	8.13a	7.53a
T9	6.07c	7.13ab	7.20abc	7.40a
T10	8.27a	7.13ab	7.73ab	7.67a
T11	7.20abc	7.53ab	7.07abc	7.53a
T12	6.67bc	7.60ab	7.00bc	7.27a
T13	7.80ab	7.80a	7.20abc	7.73a
T14	6.87abc	8.00a	7.33abc	8.00a
T15	6.60bc	6.93ab	6.40c	7.27a
SEM	0.12	0.10	0.09	0.08

a b c; means with the same superscripts within each column, are not significantly different (P>0.05); SEM = Standard error of the means.*
Means were based on a nine-point hedonic scale as follows, 9 = Extremely tender, juicy, flavored, acceptable; 8 = Very tender, juicy, flavored, acceptable; 7 = moderately tender, juicy, flavored, acceptable; 6= slightly tender, juicy, flavored, acceptable; 5 = Neither tender nor tough, juicy nor dry, flavored nor unflavored, acceptable nor unacceptable; 4 = Slightly tough, dry, unflavored, unacceptable; 3 = Moderately tough, dry, unflavored, unacceptable; 2 = Very tough, dry, unflavored, unacceptable; 1 = Extremely tough, dry, unflavored, unacceptable.

4. Discussion

4.1. Carcass characteristics and organ weight of the broiler

The non-significance effect of feeding varying levels of full fat soya bean (FFSB) and raw soya bean (RSB) treated with varying yeast levels to broilers on their carcass characteristic is an indication that the use of FFSB with yeast as feed ingredient at the specified levels in the broiler diets did not interfere with normal tissue synthesis in the birds, and that the nutrient profile of experimental diets were adequate and produced comparable carcass parameters that were similar. The carcass empirical values obtained in this study were comparable with values reported by Obun et al. (2008) and Bratte (2007) for broilers in humid tropics.

The live weight and the gross carcass characteristics (plucked, eviscerated and dressed weights) of the broilers, which is a true reflection of the tissue development, were similar across the board confirming that the nutrients supplied by these diets were adequate and produced uniform carcass parameters that were similar. However, those fed 25% RSB with 12g/kg yeast + 75%FFSB level diet gave higher numerical and consistent data, though not significant (p>0.05). Conversely, the breast, drumstick and thigh, which are very good indices of muscle development, tended to be higher at 50 % FFSB + 50 % RSB with 12 g/kg yeast incorporation into the broiler diets. It could be that the rate of synthesis of these organs was higher in birds fed this diet. The high proportion of shank measurement associated with 75 % FFSB + 25 %RSB without yeast diet (T3) compared favourably with the control, which were higher than those of other levels of dietary inclusion.

Apart from the heart, the proportions of the other major organs (liver, gizzard, pancreas and spleen) were generally higher at 50 % FFSB + 50 %RSB with 6 g/kg fed yeast levels of dietary inclusion. This could be related to the live weight and the plucked weight and not necessarily due to a physiological malfunction. According to Aderemi, (2003), enlargement of the organs especially liver and pancreas of birds could possibly be due to increased metabolic activities in an effort to make up for the reduced availability of protein inhibited by the ANF through increased production of proteolytic enzymes by the pancreas. Etuk and udedibe (2006) reported that when ANFs were reduced through some treatments to non toxic level, the liver could not be enlarged. This confirms the result of birds fed 100 %FFSB. The birds fed T14 (100 % RSB with 12 g/kg yeast) recorded the highest pancreas weight, which significantly higher that of the control, but not significantly different from the pancreas weight of diet T2 (100% RSB without yeast). This could be caused by the adverse effect of the anti-nutrient factor present in the RSB on the pancreas. That is, the anti-nutrient factor in RSB caused the enlargement of the pancreas. The abdominal fat weight of the birds on diet T7 (50% RSB with 6g/kg yeast inclusion) was heavier than that of birds on diet T3 (75% FFSB + 25% RSB without yeast). The increased gizzard weight of birds on dietary level 50% FFSB + 50% RSB with 6g/kg yeast may reflect the extra muscular activity in breaking down the ingesta of which the diet had relatively higher crude fibre than the other diets. The size of gizzard is determined by the amount of work required by the muscular walls of the organ to grind feed particles (Abdelsamic et al; 1983; Johnson and McNab, 1983). There were no significant ($p<0.05$) differences in the length of colon, small intestine and proventriculus, even in the control diet. In other words, the performance of broilers fed this dietary inclusion indicates a comparable utilization of soya bean. This is in line with the findings of Akpodiete and Okagbare (2005), which inferred that if the fermentation process with the yeast did not reduce the anti-nutritional factors significantly, it may have had a masking effect on the anti-nutritional factors.

4.2. Organoleptic quality of the broilers at 56 days of age

The similarity in the organoleptic parameters between meat from the control group and from the other experimental treatments indicates that inclusion of the test ingredient in broiler diets does not interfere with the organoleptic quality of the meat from the broilers. The mean scores of the organoleptic attributes obtained in this study were similar to those reported for broiler meat by Okeudo et .al. (2005). However, for juiciness measurement, the birds fed control diet were significantly ($p<0.05$) lower than those of birds fed diets T4, T13 and T14. This variation cannot be strictly attributed to the dietary treatment in this study. The general acceptability (tenderness, juiciness and flavour) is an important palatability attribute for consumer acceptance. In this study, the meat tended to increasingly become more juicy and tender as the level of RSB with yeast inclusion in the diet was increased. Perhaps the yeast inclusion may have to some extent influenced this.

5. Conclusion

The study therefore, maintained that inclusion of RSB with or without yeast in the diets of broilers can equally produce broiler with good weight comparable with feeding FFSB or conventional diets; feeding 75 % FFSB + 25 % RSB without yeast inclusion is capable of increasing the proportion of the broilers' head and shank; RSB inclusion in broiler diets cause increase in the weight of the gizzard, pancreas as well as on the abdominal fat, and feeding FFSB and RSB with or without yeast inclusion do not exert any noticeable effect on the organoleptic qualities tenderness, flavour and in general acceptability) of broilers. However, RSB enhances the juiciness of broilers.

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