INFLUENCE OF DIFFERENTLY PROCESSED ROSELLE SEED MEAL (*Hibiscus sabdariffa*) ON CARCASS CHARACTERISTICS OF BROILER CHICKENS

[1.]Ubua, J.A., [1]Aboluja, A.B., [I]Machoko, R.J.
[1.] Department of Animal Science, Taraba State University, Jalingo

*Corresponding author:ababoluja@gmail.com, +2348036546611

ABSTRACT
This study investigated the carcass characteristics of broiler chickens to differently processed Roselle (Hibiscus sabdariffa) seed meal (RSM). The study lasted eight weeks with 180 day - old chicks (Arbor Acre) used. The chicks were randomly allotted to five treatment groups, comprising 36 birds per treatment, replicated thrice with 12 birds each in a Completely Randomized Design (CRD). Five experimental diets were formulated with differently processed RSM (Sun dried, boiled, soaked, toasted and soaked/boiled). Carcass characteristics were assessed. Carcass characteristics showed significant ($P<0.05$) effect for all parameters assesses with T_5 (soaking and boiling) recording the highest values of 1,423.67, 1,282.44, 1,113.03 and 1,022.00 g for live, plucked, eviscerated and carcass weights respectively with 71.70% dressing percentage. The carcass characteristics of broiler chickens to differently processed RSM showed improved response with T_5 (soaking and boiling) based on the results of the parameters measured. Thus, revealing that nutrient availability and digestibility was adequately enhanced with combined feed processing methods.

Keywords: Roselle, Broilers, Carcass and Processing

Description of Problem

The search for replacement of conventional feed ingredients has been on the rise due to the high cost and competition between humans and livestock for conventional feed ingredients. Protein sources pose the highest threat to finding alternatives due to the quality of the essential amino acid profile that determines the value of the protein and the bioavailability of such protein (1). The high cost and lack of availability of commercial protein sources at times are known as some of the main limitations of efficient animal production (2). Globally, many studies have been conducted to evaluate the substitution of high cost conventional feeds with low-cost, locally available plant and animal protein sources including Roselle seed meal (3). Roselle (*Hibiscus sabdariffa*) is a very versatile plant similar to the coconut tree and can be found in almost all warm countries (4). The Roselle seed is rich in carbohydrates, protein and lipids (5). There are several reports on the chemical composition of roselle seeds with promising compositions. However, raw plant protein sources contain various anti-nutritional factors (ANFs) that interfere with nutrient digestibility resulting in reduction of feed intake, growth rate and efficiency of feed utilization in broiler chickens (6; 7; 8; 9). The anti-nutritional factors reported in roselle seeds include protease inhibitor, phytic acid, gossypol, tannins, saponin, hydrogen cyanide (HCN) and trypsin inhibitors (10; 5). It has been reported that the application of different seed processing methods has been advantageous in eliminating or reducing anti-nutritional factors in leguminous seeds (11; 7). Therefore, this study was conducted to assess the influence of differently processed and combined processing methods of Roselle seed meal carcass characteristics of broiler chickens.

Materials and Methods

Study Area

The study was conducted at the Poultry Unit of the Research and Training Farm, Taraba State University, Jalingo in Jalingo Local Government Area of Taraba State, Nigeria. The area is located within the Guinea Savanna Zone, which lies between latitude 8°55.619´ North of the equator and longitude 11°20.901´ East of the Greenwich meridian with an altitude of 207m above sea level (12).

Collection and processing of the test ingredient (Roselle seeds)

Composite Roselle seeds were sourced within Jalingo Metropolis for the study. The seeds were winnowed to blow off chaff and unwanted particles while stones and other hazardous materials were carefully handpicked. The Roselle

seeds were subjected to five different treatments; raw roselle seeds without any form of treatment serving as the control while the others were differently processed as boiled, soaked, toasted and combination of soaked and boiled. Roselle seeds were added to boiling water (100^{o}C), enough to immerse the seeds and left to cook for 30 minutes after which the water was drained and then sundried until crisp that was milled using hammer mill machine into particle size of about 1 mm for incorporation into the treatment diet as boiled roselle seed meal. Roselle seeds were immersed in water such that the seeds were submerged in the water and allowed to soak for 12 hours in which the foaming water was decanted within intervals and refilled with fresh water as the need arises. The water was completely drained after 12 hours and then sundried until crisp, milled with hammer mill machine to a particle size of about 1 mm and incorporated into the treatment diet as soaked roselle seed meal. The roselle seeds were toasted in a fabricated silver pot. The seeds were poured into the pot and source of heat was applied through gas flame and stirred continuously for a period of 40 minutes after obtaining a brown crisp outcome. The seeds were spread on a clean surface and allowed to cool after which it was milled using hammer mill machine to particle size of 1 mm and incorporated into the treatment diet as toasted roselle seed meal. The roselle seeds were soaked for 12 hours and immediately drained and poured into boiling water (100^{o}C) and allowed to cook for 30 minutes. It was drained and sundried, then allowed to dry until crispy in nature and subsequently milled with hammer mill machine to a particle size of about 1 mm and incorporated into the treatment diet as soaked and boiled.

Chemical analysis of Roselle seed meal

The test ingredient (Roselle seed meal) was milled, screened to fine particle size (about 0.30 mm), and samples were analysed for proximate composition (dry matter, crude protein, crude lipid, crude fibre, total ash) according to (13).

Experimental diets

Five experimental diets were formulated for this study. The test ingredient was roselle seed meal that was processed into different forms. The diets contained other basic/ conventional feed ingredients in addition to the roselle seed meal. The respective diets were described as follows: T_1 = unprocessed roselle seed meal as the control diet, T_2 = Boiled roselle seed meal, T_3 = Soaked roselle seed meal, T_4 = Toasted roselle seed meal and T_5 = Soaked and boiled seed meal.

Experimental Animal and Management

One hundred and eighty (180) day - old broiler chicks (Arbor Acre) were used in the study after observing all necessary routine broiler production procedures such as cleaning, arrangements of feeders and drinker and disinfections. The broiler chicks were weighed with electronic kitchen scale SF-400 (capacity 0.1 g – 7000 g) allotted to five experimental treatments. The birds were vaccinated according to the recommended vaccination programme for broiler chickens. In order to prevent the outbreak of coccidiosis in the birds, coccidiostat (Emberzin Forte) was also administered as well as anti-stress vitalyte at intervals. Feed and water were provided *ad libitum* every morning and evening.

Experimental procedure and data collection

The birds were fed the experimental diets for 56 days (8 weeks) and were randomly allocated to five treatments (T_1, T_2, T_3, T_4 and T_5 respectively) with 36 birds per treatment; each treatment was further replicated thrice with 12 birds per replicate. T_1 served as the control with unprocessed roselle seed meal while T_2, T_3, T_4 and T_5 contained differently processed (boiled, soaked, toasted and soaked/boiled) roselle seed meal (RSM) respectively.

Carcass evaluation

Carcass evaluation was done at the end of feeding experiment, six (6) birds per treatment (two (2) birds/replicate) were randomly selected and fasted overnight (water was supplied) for subsequent slaughtering and carcass evaluation. Each bird was weighed, slaughtered and bled. The slaughtered birds were de-feathered using hot water. Each de-feathered bird was weighed whole; shanks and primal cuts were removed thereafter. Carcass measurements such as plucked weight and eviscerated weight were expressed as absolute weights while dressed weight was expressed as relative percentage of live weight.

$$\text{Dressing \%} = \frac{Eviscerated\ weight}{Live\ weight} \text{ x } 100$$

Experimental design

The experimental design used was the Completely Randomized Design (CRD.

Statistical Analysis

All data collected in this study were subjected to Descriptive and One – way Analysis of Variance (ANOVA) for CRD and significant mean values were separated using Duncan's Multiple Range Test (DMRT) using (14) as Statistical tool.

Results and Discussions

Carcass characteristics of broiler chickens fed RSM – based diets

Carcass evaluation of broiler chickens fed differently processed roselle seed meal (RSM) – based diets are presented in Table 1. The results showed significant (P<0.05) differences on all the parameters measured. The values for live weight were 1,325.33, 1208.00, 1362.33, 1416.67 and 1423.67 g for T_1, T_2, T_3, T_4, and T_5 respectively, plucked weights were 1,192.78, 1,058.33, 1,220.10, 1279.96 and 1,282.44 g respectively across the dietary treatments while eviscerated weights were 1,008.31, 892.23, 1,053.63, 1,063.78 and 1,113.03 respectively across treatment groups. Carcass weights were 912.33, 791.33, 943.67, 965.67 and 1022.00 g obtained from T_1, T_2, T_3, T_4, and T_5 respectively while dressing percentage recorded 68.88, 65.42, 69.59, 68.25 and 71.70 % for T_1, T_2, T_3, T_4, and T_5 respectively.

The results for carcass evaluation showed significant (P<0.05) difference for carcass characteristics across treatment groups with T_5 showing the highest values of 1,423.67, 1,282.44, 1,113.03, and 1,022.00 g for live, plucked, eviscerated and carcass weights respectively and a dressing percentage 71.70%, indicating that carcass yield for the treatment is significantly effective revealing that internal organs were not compromised. This is an indication of nutrient utilization to yield quality carcass. (15) stated that the dress weight for broiler chickens is closer to 75% of the live weight.

Table 1: Carcass evaluation of broiler chickens fed RSM - based diets

	Dietary treatments					
Parameter	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**SEM**
Live Weight (g/bird)	1325.33^{b}	1208.00^{c}	1362.33^{ab}	1416.67^{ab}	1423.67^{a}	42.88
Plucked Weight (%)	1,192.78^{b}	1,058.33^{c}	1,220.10^{ab}	1,279.96^{ab}	1,282.44^{a}	0.93
Eviscerated Weight (%)	1,008.31^{b}	892.23^{c}	1,053.63^{ab}	1,063.78^{ab}	1,113.03^{a}	0.71
Carcass weight (g)	912.33^{b}	791.33^{c}	943.67^{ab}	965.67^{ab}	1,022.00^{a}	40.94
Dressing %	68.88^{b}	65.42^{c}	69.59^{ab}	68.25^{ab}	71.70^{a}	0.64

$^{a, b, c}$ Means within the same row bearing different superscripts differ significantly (P<0.05), SEM = Standard Error of Means

Conclusion and Application

From the study, it was inferred that differently processed RSM had effect on the nutritive value of the feed ingredient thus enhancing growth performance and improving carcass yield. Base on the results of this study, it is recommended that RSM can be used as an alternative source of protein in broiler chicken's diets especially for finisher phase.

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