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# PERFORMANCE, NUTRIENT RETENTION, AND CARCASS ATTRIBUTES OF BROILER CHICKENS ON DIETARY SOYBEAN WASTE REPLACEMENT

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## ABSTRACT

*A feeding trial was conducted to evaluate the effect of dietary soybean replacement with soybean waste on growth performance, nutrient retention, and carcass characteristics of broiler chickens. Three hundred Arbor acre day-old broiler chicks were assigned into five treatments and 3 replicates each in a completely randomised design. The feeding trial was for 8 weeks. The birds were fed starter diets (23 % crude protein and 2800 Kcal/kg ME) for the first 4 weeks and finisher diets (20 % crude protein and 3000 kcal/kg ME) for the remaining 4 weeks. Final Body Weight (FBW) and Weight Gain (WG) of birds on diets of Soybean (SBW) at 0 and 40 % were significantly higher ($p<0.05$) compared with those birds on diets SBW 20, 60, and 80 %. This was reflected in their better feed conversion efficiency. There were no significant differences in the crude fibre retention of birds at the finisher stage of the experiment regardless of the experimental birds as compared with the crude fibre retention at the starter stage of the feeding trial, which showed variations in the crude fibre retention. Carcass attributes of birds on the SBW 0 % diet were significantly higher ($p<0.05$) than those birds on SBW 20, 40, 60 and 80 %, respectively. Birds on SBW 40 % had a better growth performance and enhanced carcass attributes than other*

*replacement levels of 20, 60, and 80 % diets. The performance of birds on SBW 40 % could also be compared relatively to birds on SBW 0 %, the control treatment.*

**Keywords:** Soybean waste, Replacement, Performance, Carcass attributes

## INTRODUCTION

Research indicates that substituting soybean waste for a portion of the soybean meal in broiler diets can improve performance, carcass attributes, and meat quality (Amirul *et al.,* 2023). It can boost meat quality characteristics like tenderness and juiciness as well as growth performance and carcass weight. To achieve performance, it is essential to strike the optimum balance and guarantee proper nutrient content in the feed. The replacement of soybean waste in broiler chicken diets has been the subject of numerous articles. In a study by Zelalem *et al*. (2022) which examined the results of substituting brewery-dried grains for soybean meal in broiler diets, results showed that adding fermented soybean waste enhanced growth, increasing body weight and feed conversion efficiency. The effects of substituting defatted soybean waste for soybean meal in broiler diets were assessed by Makinta *et al*. (2021). The study found that adding defatted soybean waste improved carcass characteristics (breast muscle yield and decreased abdominal fat deposition). In addition, a study by Vierira *et al*. (1992) examined the impact of switching from soybean meal to high-fibre sunflower meal as the main source of protein in laying hens, their findings showed no negative effects on body weight. They claimed that adding soybean hulls improved the qualities of meat, such as increased softness and reduced cooking loss. All of the studies mentioned above point to the possibility of improving broiler chicken performance, carcass features, and meat quality by replacing dietary soybean waste. It is crucial to keep in mind that the precise outcomes can change based on the type and processing of soybean waste, as well as the total diet composition. This study intends to ascertain the amount of soybean waste that, when used in place of soybean meal, will produce the same growth performance and good carcass qualities.

## MATERIALS AND METHODS

### Study Area

The experiment was carried out at the poultry unit of the Teaching and Research Farm of the Department of Animal Production, Kwara State University, Malete, Moro Local Government Area,

Kwara State, Nigeria. The study area is located between latitude 08° 71′ N to 08° 96′ N and longitude 04° 44′ E to 04° 76′ E at 365 m above sea level. The climatic condition of Malete is characterised by distinct wet and dry seasons with an annual mean rainfall of about 1,150 mm and an annual temperature that ranges from 25 to 28.9 $^{0}$C (Hakeem *et al.,* 2020).

**Experimental Animals and Diets**

A total of 300-day-old Arbor acre broiler chickens were purchased from an Agro-allied farm in Ilorin, Kwara State. The chickens were grouped into five (5) experimental treatments; Treatment 1 (control diet) contained 0 % soybean waste (SBW), Treatment 2 (20 % SBW replacement), Treatment 3 (40 % SBW replacement), Treatment 4 (60 % SBW replacement) and Treatment 5 (80 % SBW replacement). The treatments were replicated thrice and had 20 birds per replicate. The birds were placed on a formulated broiler starter diet which contained 23 % crude protein and 2800 kcal/kg for the first four weeks, while the finisher diet contained 20 % crude protein and 3000 kcal/kg which was given to the birds for the last four weeks (Tables 1 and 2).

**Data Collection**

Data were collected on initial body weight, final body weight, feed intake, and feed conversion ratio. The initial body weight of the birds was the weight of the birds measured at the beginning of the experiment. The final body weight was the weight of the birds taken at the end of the eighth week of the experiment. Feed intake was evaluated as the difference between the feed given, and the leftover after 24 hours. Weight gain was calculated as the difference between the final body weight and the initial body weight of the birds. While the feed conversion ratio was determined by dividing the feed intake by the body weight gain.

Nutrient digestibility was determined at the 4th and 8th weeks of the feeding trial. A quantity of 3 kg of feed daily was fed to 10 birds selected in each treatment and faecal samples were collected over 72 hours. The excreta samples were weighed and dried in the oven at 60 o C for 72 hours, re-weighed, and ground and proximate content analysed using the A.O.A.C. (2005) procedure. The same was done for the feed.

**Table 1: Nutritional Composition of the Starter Diets 23 % CP, 2800 kcal/kg of Broiler Chickens Fed with Soybean Waste**.

| Ingredients | Treatments | | | | |
|---|---|---|---|---|---|
| | (control) 0 % | (20 %) | (40 %) | (60 %) | (80 %) |
| Maize | 65.00 | 66.00 | 66.52 | 67.52 | 65.52 |
| Wheat offal | 2.52 | 0.00 | 0.00 | 0.00 | 0.00 |
| Soybean meal | 20.00 | 16.00 | 12.00 | 8.00 | 4.00 |
| SBW | 0.00 | 4.00 | 8.00 | 12.00 | 16.00 |
| GNC | 7.52 | 8.00 | 8.00 | 4.00 | 4.52 |
| Fish meal | 1.00 | 2.04 | 1.52 | 4.52 | 6.00 |
| Bone meal | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Oyster shell | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Premix | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Methionine | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Lysine | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Salt | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

SBW: Soybean waste. GNC: groundnut cake

**Table 2: Nutritional Composition of the Finisher Diets 20 %CP, 3000 kcal/kg of Broiler Chickens Fed with Soybean Waste.**

| | Treatments | | | | |
|---|---|---|---|---|---|
| Ingredient | (control) 0 % | (20 %) | (40 %) | (60 %) | (80 %) |
| Maize | 50.00 | 50.00 | 48.00 | 45.00 | 45.00 |
| Wheat offal | 5.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| SBM | 25.00 | 20.00 | 15.00 | 10.00 | 5.00 |
| SBW | 0.00 | 5.00 | 10.00 | 15.00 | 20.00 |
| Fish meal | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| GNC | 13.50 | 18.50 | 20.50 | 23.50 | 23.50 |
| Bone meal | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| Oyster shell | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Premix | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Methionine | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Lysine | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Salt | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

SBW: Soybean waste, SBM: Soybean meal, GNC: groundnut cake

**Carcass Attributes**

Two birds from each replicate were slaughtered, deplumed, and eviscerated after fasting them overnight (so that they did not have much waste content in their gut). Data were collected on carcass yield, and parameters like the primal cuts (breast, back, wing, thigh, and drumstick) were weighed and recorded. The carcass weights of each chicken were taken after the removal of the intestine

and visceral organs. The main cut parts were weighed, recorded, and expressed in g/kg dressed weight and the dressing percentage was calculated.

**Data Analysis**

Data obtained from all determined parameters were subjected to ANOVA using the PROC MIXED procedure of the SAS package (2014). Means were separated using the Tukey HSD test at $P<0.05$ significant level.

## RESULTS AND DISCUSSION

**Growth Performance**.

The final body weight (FBW) and weight gain (WG) of birds on dietary soybean waste replacement SBW 0 % and SBW 40 % were similar but significantly higher ($p<0.05$) than those birds on SBW 20 and 60 % which were also similar but significantly higher ($p<0.05$) than those birds on SBW 80 % (Table 3). Whereas, the feed intake (FI) of birds on dietary soybean waste replacement (SBW 80 %) was significantly ($p<0.05$) higher compared with those birds on SBW 60, 0, 20, and 40 %. Birds on SBW 60 had significantly higher ($p<0.05$) FI than those birds on SBW 0 %, which in turn were significantly ($p<0.05$) higher than those birds on SBW 20 %. However, the FI of those birds on SBW 40 % was significantly lower ($p>0.05$) compared with those birds on SBW 0, 20, 60 and 80 %. The feed conversion ratio (FCR) of birds on SBW 80 % was significantly ($p<0.05$) higher than those birds on SBW 60, 20, 0, and 40 %. The FCR of birds on SBW 60 % were significantly ($p<0.05$) higher compared with those birds on SBW 20 %, which in turn were significantly ($p<0.05$) higher than those birds on SBW 0 and 40 %. The FCR of birds on SBW 0 and 40 % were similar but significantly ($p<0.05$) lower compared with birds on other treatments.

**Nutrient Retention in 4th Week**

The total protein (TP) values (Table 4) of birds on SBW 0, 20, and 60 % were similar but significantly ($p<0.05$) higher than those birds on 40 and 80 % diets which had statistically similar ($p>0.05$) values. The crude fibre (CF) values of birds on SBW 40 % were significantly ($p<0.05$) higher than birds on SBW 0, 20, 60, and 80 % diets which had similar ($p>0.05$) values. The ash

**Table 3: Effect of Soybean Waste Replacement on Growth Performance of Broiler Chickens.**

| | Treatments | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameters | SBW (0 %) | SBW (20 %) | SBW (40 %) | SBW (60 %) | SBW (80 %) | SEM | P Value |
| IBW (g/b) | 31.91 | 31.95 | 31.91 | 31.95 | 31.91 | 0.014 | 0.14 |
| FBW (g/b) | 2380.00$^{a}$ | 2030.00$^{b}$ | 2310.00$^{a}$ | 2000.00$^{b}$ | 1840.00$^{c}$ | 0.26 | 0.001 |
| WG (g/b/d) | 54.66$^{a}$ | 47.33$^{b}$ | 54.01$^{a}$ | 46.80$^{b}$ | 41.80$^{c}$ | 0.01 | 0.001 |
| FI (g/b/d) | 86.66$^{c}$ | 86.55$^{d}$ | 85.46$^{e}$ | 96.75$^{b}$ | 97.12$^{a}$ | 0.008 | 0.001 |
| FCR | 1.59$^{a}$ | 1.83$^{b}$ | 1.58$^{a}$ | 2.07$^{c}$ | 2.32$^{d}$ | 0.01 | 0.001 |

abcd: Means on the same row with different superscript are significantly different ($p<0.05$)

SEM: standard error of mean, SBW: Soybean waste, Initial body weight (IBM), final body weight (FBW), weight gain (WG), feed intake (FI), feed conversion ratio (FCR). G (gram), b (bird), d(day)

values of birds on SBW 20, 60, and 80 % were similar ($p>0.05$) but significantly ($p<0.05$) higher than those birds on SBW 0 and 40 % diets. Whereas, birds on SBW 0 % were significantly ($p<0.05$) higher in ash compared with birds on SBW 40 % diet. The ether extract (EE) of birds on SBW 0 % was significantly ($p<0.05$) higher than those birds on SBW 40, 60 and 80 % diets. However, the EE of those birds on the SBW 60 % diet was significantly ($p<0.05$) lower than those birds on SBW 0, 20, and 40 % diets. The nitrogen-free extracts (NFE) of birds on SBW 20, 40, and 80 % diets were similar but significantly ($p<0.05$) higher than birds on SBW 0 and 60 % diets. Whereas, the NFE of birds on an SBW 0 % diet was significantly ($p<0.05$) higher than those of birds on a 60 % diet. However, birds on SBW 60 % diet were significantly ($p<0.05$) lower than other treatments including control.

**Nutrient Retention in the 8th Week**

The total protein (TP) values of birds on SBW 0 %, significantly ($p<0.05$) higher than those birds' 60 % diet. Whereas, birds on SBW 20, 40, 60, and 80 % were similar ($p>0.05$). The ash of birds on the SBW 0, 20, and 40 % diets were similar ($p>0.05$) (Table 5). Birds on o and 60 % SBW diets also had similar ($p>0.05$) ash values. However, birds on 80 % had lower ($p<0.05$) ash values than all the other treatments. The ether extract (EE) of birds on SBW 80 % was significantly ($p<0.05$) higher than those birds on SBW 0, 20, 40, and 60 % diets which had similar ($p>0.05$) values. The nitrogen-free extracts (NFE) of birds on the SBW 60 % diet were significantly ($p<0.05$) higher than birds on SBW 0 and 40 % diets which had similar ($p>0.05$) values.

**Table 4: Effect of Soybean Waste Replacement on Nutrients Retention at 4th Week**.

| Parameters | Treatments | | | | | | |
|---|---|---|---|---|---|---|---|
| | SBW 0 % | SBW 20 % | SBW 40 % | SBW 60 % | SBW 80 % | SEM | P-value |
| Total Protein (%) | 62.28[a] | 62.07[a] | 57.00[b] | 63.03[a] | 57.21[b] | 0.32 | <0.0001 |
| Crude fibre | 31.20[b] | 31.59[b] | 33.52[a] | 31.87[b] | 31.43[b] | 0.29 | >0.001 |
| Ash (%) | 35.00[b] | 37.56[a] | 31.06[c] | 38.24[a] | 37.03[a] | 0.32 | <0.0001 |
| Ether extract | 42.23[a] | 42.01[ab] | 41.90[bc] | 41.43[d] | 41.61[cd] | 0.06 | <0.0001 |
| NFE (%) | 67.39[b] | 70.68[a] | 70.05[a] | 62.78[c] | 70.05[a] | 0.36 | <0.0001 |

abcd Means on the same row with different superscript are significantly different ($p<0.05$)

SBW: Soybean waste, NFE (nitrogen free extracts)

**Carcass Attributes**

The live weight (LW) and bled weight (BLW) of birds on dietary SBW 0 and 40 % were similar and significantly ($p<0.05$) higher than those birds on diets SBW 20, 60, and 80 % (Table 6). Whereas, the LW and BLW of birds on SBW 20 and 60 % were similar but significantly ($p<0.05$) higher compared with those birds on SBW 80 %. The de-feathered weight (DFW) and carcass

weight (CW) of birds on dietary SBW 0% were significantly ($p<0.05$) higher than those birds on all the other treatments. Whereas, the DFW and CW of birds on SBW 40 % were significantly

**Table 5: Effect of Soybean Waste Replacement on Nutrients Retention at 8th week**.

| Parameters | Treatments | | | | | SEM | P-value |
|---|---|---|---|---|---|---|---|
| | SBW 0% | SBW 20 % | SBW 40 % | SBW 60 % | SBW 80 % | | |
| Total Protein (%) | 66.00[a] | 64.41[ab] | 64.30[ab] | 63.03[b] | 64.40[ab] | 0.32 | >0.0057 |
| Crude fibre | 32.37 | 32.51 | 32.41 | 32.07 | 33.08 | 0.40 | >0.63 |
| Ash (%) | 33.16[ab] | 34.06[a] | 34.09[a] | 32.54[b] | 31.03[c] | 0.21 | <0.0001 |
| Ether extract | 42.33[b] | 42.02[b] | 41.89[b] | 42.15[b] | 43.57[a] | 0.12 | <0.0001 |
| NFE (%) | 61.67[b] | 63.04[ab] | 62.96[b] | 65.26[a] | 63.16[ab] | 0.42 | >0.006 |

abcd Means on the same row with different superscript are significantly different ($p<0.05$)

SBW: Soybean waste, NFE (nitrogen free extracts)

($p<0.05$) higher compared with those birds on SBW 20, 60, and 80 %. The DFW and CW of birds on SBW 20 % had significantly ($p>0.05$) higher DFW and CW than those birds on SBW 60 and 80 % diets. Birds on SBW 60 % diet also had significantly ($p<0.05$) higher in DFW and CW than those birds on SBW 80 %. The dressing percentage (D %) of birds on dietary SBW 0 % was significantly ($p<0.05$) higher than those birds on all the other treatments except those on SBW 20 % diets. The D % of birds on SBW 60 % had a lower D % than all the other treatments but similar ($p>0.05$) to the birds on SBW 40 and 80 % diets.

The breast weight (BW) of birds on dietary SBW 0 % were significantly ($p<0.05$) higher than those birds on all the other diets. Birds on SBW 40 and 60 % had similar ($p>0.05$) BW their values were, however, lower than those on other diets. The wing weight (WW) birds on dietary SBW 0 % were significantly ($p<0.05$) higher than those birds on all the other diets. While the birds on SBW 80 % had the least WW and their value was lower than the birds on other diets. Birds on SBW 20 and 60 % had similar ($p>0.05$) WW, their weight was, however, lower ($p>0.05$) than those on SBW 40 %

diet. The thigh weight (TW) of birds on dietary SBW 0 % was significantly ($p<0.05$) higher than those birds on all the other diets. Birds on SBW 20 and 40 % had similar TW, their values were, however, higher than those on SBW 60 %. The birds on SBW 80 % had the least TW value, their value was significantly lower ($p<0.05$) than all the other treatments.

The drumstick weight (DW) of birds on dietary SBW 0 and 40 % were similar but significantly ($p<0.05$) higher than those birds on diets SBW 20, 60, and 80 %. On the other hand, the DW of birds on SBW 60 % was significantly ($p<0.05$) higher compared with those birds on SBW 20 and 80 % diets. The DW of birds on SBW 20 % in turn were significantly ($p>0.05$) higher than those birds on SBW 80 % diets. The back weight (BAW) of birds on dietary SBW 0 % was significantly ($p<0.05$) higher than those birds on diets SBW 20, 40, 60 and 80 %. Conversely, the BAW of birds on SBW 40 % was significantly ($p<0.05$) higher compared with those birds on SBW 20, 60, and 80 %. The BAW of birds on SBW 20 % in turn were significantly higher ($p>0.05$) than those birds on SBW 60 and 80 % diets. Birds on a diet SBW 80 % were significantly ($p<0.05$) higher in BAW than those birds on an SBW 60 % diet.

The abdominal fat weight (AFW) of birds on dietary SBW 60 % was significantly ($p<0.05$) higher than those birds on diets SBW 0, 20, 40, and 80 %. However, the AFW of birds on SBW 0 and 40 % were similar but significantly ($p<0.05$) higher compared with those birds on SBW 20 and 80 % diets. The AFW of birds on SBW 20 % in turn were significantly ($p<0.05$) higher than those birds on SBW 80 % diets.

The intestinal (IW) and gizzard weight (GW) of those birds on the SBW 80 % diet were significantly ($p<0.05$) higher than those birds on all the other diets. The IW and GW of those birds on the SBW 60 % diet were significantly ($p<0.05$) higher than those birds on SBW 0, 20, and 40 % diets. The IW and GW of those birds on SBW 40 % diet were in turn significantly ($p<0.05$) higher than those birds on SBW 0 and 20 % diets. Birds on the SBW 20 % diet had significantly ($p<0.05$) higher values than those birds on the  than those birds on SBW 0 % diet. However, birds on diet SBW 0% were significantly lower ($p>0.05$) in IW and GW than those birds on SBW 20, 40, 60 and 80% diets

**Table 6: Carcass Traits of Dietary Soybean Waste Supplementation on Broiler Chickens**

| Parameters | LW (g) | BLW (g) | DFW (g) | CW (g) | D % | BW (g) | WW (g) | TW (g) | DW (g) | BAW (g) | AFW (g) | IW (g) | GW (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SBW0 % | 2380.00$^{a}$ | 2320.00$^{a}$ | 2240.00$^{a}$ | 2030.00$^{a}$ | 85.29$^{a}$ | 548.00$^{a}$ | 185.00$^{a}$ | 311.00$^{a}$ | 193.00$^{a}$ | 409.00$^{a}$ | 43.00$^{b}$ | 55.00$^{e}$ | 60.30$^{e}$ |
| SBW20 % | 2030.00$^{b}$ | 1980.00$^{b}$ | 1900.00$^{c}$ | 1720.00$^{c}$ | 84.72$^{ab}$ | 436.00$^{c}$ | 146.00$^{c}$ | 279.00$^{b}$ | 169.00$^{c}$ | 368.00$^{c}$ | 30.00$^{c}$ | 57.00$^{d}$ | 71.00$^{d}$ |
| SBW40 % | 2310.00$^{a}$ | 2240.00$^{a}$ | 2147.33$^{b}$ | 1943.33$^{b}$ | 84.12$^{bc}$ | 500.00$^{b}$ | 163.00$^{b}$ | 290.00$^{b}$ | 193.00$^{a}$ | 382.00$^{b}$ | 47.00$^{b}$ | 60.00$^{c}$ | 74.00$^{c}$ |
| SBW60 % | 2000.00$^{b}$ | 1940.00$^{b}$ | 1860.00$^{d}$ | 1670.00$^{d}$ | 84.49$^{c}$ | 370.00$^{d}$ | 144.00$^{c}$ | 263.00$^{c}$ | 174.00$^{b}$ | 308.00$^{e}$ | 74.00$^{a}$ | 63.00$^{b}$ | 76.00$^{b}$ |
| SBW80 % | 1840.00$^{c}$ | 1780.00$^{c}$ | 1735.00$^{e}$ | 1550.00$^{e}$ | 84.23$^{bc}$ | 377.00$^{d}$ | 119.00$^{d}$ | 212.33$^{d}$ | 150.00$^{d}$ | 317.00$^{d}$ | 17.00$^{d}$ | 67.00$^{a}$ | 79.20$^{a}$ |
| SEM | 2.88 | 2.88 | 2.66 | 1.79 | 0.17 | 1.69 | 1.77 | 2.81 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 |
| P-value | <0.001 | <0.001 | <0.001 | <0.001 | 0.0005 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |

$^{abcd}$ means on the same column with different superscript are significantly different ($p>0.05$)

SBW-soybean waste, SEM-standard error of mean, TRTS-treatments, LW-live weight, BLW-bled weight, DFW-de-feathered weight, CW-carcass weight D-dressing percentage, BW-breast weight, WW-wing weight, TW-thigh weight, DW-drumstick weight, BAW-back weight, AFW-abdominal fat weight, IW-intestinal weight and GW- gizzard weight.

## DISCUSSION

### Growth Performance

Probably due to greater digestion, absorption, and utilization of nutrients, the growth performance of the birds on SBW 0 and 40 % treatments exhibited higher values of weight gain and ultimately body weight than that of the other treatments. The outcome of this investigation supports the findings of Maidala *et al*. (2019), who found that birds on diets with full soybean meal performed better than birds on diets with soybean sprouts substituted for the soybean meal. The feed conversion ratio of birds on SBW 0 and 40 % was better when compared with other dietary treatments. This is an indication that birds on SBW 0 and 40 % were able to utilize their feed more efficiently than birds on other dietary treatments. The more the content of SBW in the diet, the more the fibre content of the diet. Monogastric animals like broiler chickens cannot efficiently break down fibre diets as compared with ruminants. The result of FCR shown in this study agrees with the observation of Ishola and Atteh (2018), who observed that broiler birds fed with high content of protein plant source converted the feed source more efficiently than those diets with high fibre content.

### Nutrient Retention

The superior retention and availability of more proteins in the SBW 0 % diet as compared to the increased content of SBW prevented excessive excretion of nutrient constituents in the digested feed, leading to substantial retention (g/bird) and improved retention efficiency of protein in the form of amino acids in the first 4 weeks of feeding trial as compared with the second (finisher phase) of the broiler chickens feeding trial. The findings of this study support Ishola and Atteh's (2018) conclusion that broiler chicks fed diets high in protein from plant sources converted the feed source more effectively than those fed diets high in fibre. In contrast to the 80.72 % crude protein retention reported by Kwari *et al*. (2004) when broiler diets containing sorrel seed meal were provided, the values of nutrients retained obtained in the current study were lower. For starter and finisher diets, the retention of crude fibre was lower than that of other nutrients. This might be a result of poultry's inability to effectively digest fibre inherent in soybean waste (Bashar *et al*., 2010).

**Carcass Attributes**

The live weight, bled weight, de-feathered weight, carcass weight, breast weight, wing weight, thigh weight, and back weight performed better in the control treatment compared with other treatments. This could be attributed to the availability of adequate nutrients present in the SBW 0 % diet and the capacity with which the birds in this treatment were able to digest, absorb, and utilize the nutrients which in turn made them build more muscle than the birds in the other treatments. The findings of the present research do not agree with those of Meherunnisa *et al*. (2017), who found no difference in the weight of the gizzard and spleen with increasing amounts of linseed meal fed to broilers. However, high-fibre diets lead to an increase in gizzard weight because fibre is harder to digest than other nutrients and accumulates in the gizzard (Martínez *et al*., 2015). Birds on SBW 80 % had heavier intestinal and gizzard weights compared to birds on other treatments, and the declining carcass weight with increased SBW consumption was likely due to the bulk and high moisture content of the SBW, which increased the weight of the gut contents and the gizzard. The findings of Nguyen *et al*. (2005), who noted that as the soybean waste replacement in the diet of broiler chickens was raised, the intestinal and gizzard weight was also increased, are compatible with the results found in this study.

## CONCLUSION AND RECOMMENDATION

The results obtained showed that broiler chickens can perform well in their growth attributes, nutrient retention, and carcass attributes with the replacement level of 40 % soybean waste with soybean meal. As a result, broiler chickens' diets containing soybean meal could be replaced with up to 40 % of soybean waste.

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## REFERENCES


Amirul, F. A., Danung, N. A., Hasliza, A.H. and Mohammed, Z.S. (2023). Effect of adding soybean waste on growth performance and carcass quality in quails. *Advances in Animal and Veterinarian Science Journals*, 11(8):1307-1312. Doi: 10.17582/journal.aavs/2023/11.8.

A.O.A.C. (2005). Association of Official Analytical Chemists. Official methods of analysis. 18th ed. Washington. Association of Official Analytical Chemists; 2007.

Bashar, Y.A., Tukur, H.M., Sekoni, A.A. and Hassan, W.A. (2010). Nutrient retention and haematological indices of broiler starters fed Lablab seed meal as the source of protein. *Nigerian Journal of Basic and Applied Science,* 18(2): 285-291.

Hakeem, I., Elisha, Z. J., John, Y. A and Olushola, J. A. (2020). Effects of natural antioxidant extract supplementation on the growth performance and meat quality of broiler chickens. *Journal of Agricultural Sciences* (Belgrade), 65(4): 405-417

Ishola, H. and Atteh, J.O. (2018). Response of chicken broilers to early graded levels dietary protein and energy. *Journal of Agricultural and Research Development*, 17(1), 68-81. doi.org/10.4314/jard. v17i1.7

Kwari, I. D., Igwebuike, J. U., Bello, N., Rabo, S. T. and M. Birma (2004). Replacement of groundnut cake with sorel (Hibiscus sabdariffa) seed meal in broiler finisher diets. *Proceedings of the 9th Annual Conference of the Animal Science Association of Nigeria* (ASAN). September. 13th -16th, Ebonyi State University, Abakaliki, Nigeria.

Maidala, A.1., Doma, U. D. and Egbo, L. M. (2019). Growth performance and economics of broiler chickens' production fed full fat soy bean as affected by different processing. *Journal of Animal Science and Veterinary Medicine*. 4(1), 34-40. doi.org/10.31248/JASVM2018.

Makinta, B.G., Ibrahim, A.G., Mustapha, A. and Jibrin, T.A. (2021). Effect of dietary levels of soybean waste on digestibility and haematological indices of broiler chickens in the semi-arid region of Nigeria. *International Journal of Agricultural Science and Technology*, 9(4); 14-20.

Martínez, Y., Carrión, Y., Rodríguez, R., Valdivié, M., Olmo, C., Betancur, C., Liu, G., N.A. Al-Dhabi, N.A and Duraipandiyan, V. (2015). Growth performance, organ weights and some blood parameters of replacement laying pullets fed with increasing levels of wheat bran. *Brazilian Journal of Poultry Science,* 17 (3), 347-354

Meherunnisa, L., Leghari, I. H., Sethar, A., Sethar, G.H. and Sethar, F.M. (2017). Effect of linseed meal on broiler performance and fat content. *Journal of Animal Dairy and Veterinary Science,* 4 (1) 555628

Nguyen, T.K.D., Elwinger, K., Lindberg J.E. and Ogle, R.B. (2005). Effect of replacing soybean meal with soya waste and fish meal with ensiled shrimp waste on the performance of growing crossbred ducks. *Asian-Australasian Journal of Animal Sciences*,18(6): 825-834. https://doi.org/10.5713/ajas.2005.825

SAS (2014). Statistical Analysis System Package (SAS) Version 9.2 Software. SAS Institute Incorporate, Cary, NC, USA

Vierira, S.L., Penz, A. M., Leboute, E. M. and Corteline, J. (1992). A nutritional evaluation of a high fiber sunflower meal. *Journal of Applied Poultry Research*,1(4):382–8

Zelalem, T., Nurfeta, A. and Melesse, A. (2022). Effect of replacing soybean meal with brewery dried grain on growth performance, feed intake, carcass traits and blood hematology indices of Ross 308 broilers. *Journal of Livestock Research and Rural Development*, 34(10),