# Performance and Nutrient Digestibility of Broiler Fed Roasted Pride of Barbados Seedmeal

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## ABSTRACT

*A eight week experiment is conducted at the Poultry Unit of the Teaching and Research Farm of the Oyo State College of Agriculture, Igboora using seventy two day old Marshal Broilers chick obtained from Obasanjo farm, Igboora, Nigeria to examine the effect of roasted pride of Barbados seed meal on the performance and nutrient digestibility of finisher broilers. The ripened seeds of the pride of barbados were roasted at 100-110$^0$C using open flame for seventeen minutes in an open pan. The seeds were considered roasted when about 75-80% of the seed cracked .The finisher broilers were allocated to four dietary treatments. The treatments were replicated thrice at six broilers per replicate. The dietary treatment was formulated with 0, 5, 10 and 15% inclusion level of roasted pride of Barbados seed meal. The experimental layout and hence the data were arranged in a completely randomized design and analyzed by Analysis of Variance. Inclusion of roasted pride of Barbados seed meal resulted in a fluctuation in the final live weight of broilers fed experimental diets. The highest final weight and highest weight gain was obtained in 10% inclusion level of roasted pride of Barbados seed meal while the lowest final weight and lowest weight gain was obtained in 15% inclusion level of roasted pride of barbados seed meal. The highest crude protein digestibility was recorded in diet containing 0% inclusion level of roasted pride of Barbados seed meal, while the lowest crude protein digestibility was obtained in diet containing 15% inclusion level of roasted pride of Barbados seed meal. The results suggest that 10% inclusion level of roasted pride of Barbados seed meal could be effectively used for good performance and nutrient digestibility of finisher broilers.*

***Keywords**: Nutrient digestibility, roasted pride, Barbados, broilers.*

## INTRODUCTION

Poultry production accounts for the major parts of all meat produced in many developing countries. Being an integral component of nearly all rural, peri-urban and urban households, poultry are of considerable significance to rural as well as national economies (DFID, 2006). The major locally available plant protein sources commonly found used in poultry feed production are soya bean meal and groundnut cake has been reported to be scarce and expensive. The use of pride of Barbados seed meal in poultry nutrition has been established and success was recorded particularly in broiler chicken. Legumes are very important sources of protein, lipids and other nutrients like minerals and vitamins for proper growth. However, the quality of leguminous plants is influence by the anti-nutritional factors

present in them which make them unsuitable for consumption in their natural form (Oloyede, Minari and Muhammad, 2010). It is known however that processing techniques like fermentation, roasting, germination and autoclaving can improve nutritional quality and bioavailability of nutrients present in legumes. The objective of this study is to examine the performance and nutrient digestibility of broiler fed roasted pride of Barbados seed meal.

## MATERIALS AND METHOD

***Experimental location:*** The experiment was carried out at the poultry unit of the Teaching and Research Farm of the Oyo State College of Agriculture, Igboora, Nigeria. The experimental area lies in Savannah Forest zone on latitude $7^{l}$ $43^{0}$ N and longitude $3^{l}$ $28^{0}$E with an elevation of 140m above sea level. The average minimum temperature is about $21.5^{0}$C and maximum average temperature of about $32.5^{0}$ C. The average humidity in the study area is 58.0%. The double maximum rainfall is about 214.3mm in June and 165.2mm in September.

***Preparation and processing of Test Ingredient:*** Ripened pod of pride of Barbados seed were collected within Igboora metropolis between the months of February and March, 2013. The mature pods were processed to remove the seeds in lateral arrangements. Over 100kg seeds were collected and roasted at 100 - $110^{0}$C using open flame for up to 17minutes in an open pan. During roasting, about 1.5 - 2.0kg of the seeds were added intermittently into the pan set over the burning firewood. A small quantity of sand was added and the content stirred repeatedly to prevent charring. The seeds were considered roasted when about 75 - 80% of the seeds cracked. The seeds were then spread out to cool after which they were milled into roasted pride of Barbados seed meal using a hammer mill with a sieve size of 3mm. The meal produced was used to formulate four isocaloric and isonitrogenous experimental diets

***Experimental Animals and their Management:*** A total of seventy two day old Marshal Broiler chicks were obtained from Obasanjo Farms Nigeria Limited, Igboora. Prior to the arrival of the birds, the brooding pen had been previously washed and cleaned thoroughly with disinfectant. The bird were divided into four brooding units, each brooding unit has three replicates in a completely randomized design. The birds were weighed and their average weights per unit were determined. The birds were maintained with a twenty-four hours constant light schedule during brooding. Feed and water were supplied *ad libitum* throughout the experiment.

***Experimental Diet:*** Four experimental diets were formulated for the starter (0-4 weeks) and finisher (5-8 weeks) phase. Four inclusion levels of experimental ingredient were added at 0%, 5%, 10%, and 15% respectively.

***Digestibility Trial:*** Digestibility trial was conducted at the 7th week of the finisher phase to determine the apparent nutrient digestibility. Two birds were selected from two of the replicates in each treatment and placed in metabolic cage; known weight of feed which matched their daily feed intake was fed to the birds for seven days. The birds were first

acclimatized to the metabolic cage for the first two days. On the third day, the birds were starved for twenty-four hours daily excreta voided per bird for the remaining four days were collected and dried to a constant weight at $70^0$C. Dried excreta sample were used to determine their respective proximate composition (AOAC, 2005).

***Quantification of Toxins in RPBSM:*** The roasted pride of Barbados seed meal were determined for tannin using modified vanillin assay (Price and Buttler (1977), Oxalate by Day and Underwood (1986) procedure, Phytate by Reddy and Love (1999) method and Saponin by Huisman and Tolman (2001) method.

***Determination of Proximate Analysis:*** Samples of pride of Barbados seed, experimental diet and faecal droppings were analyzed on dry matter basis for proximate composition, according to AOAC (2005).

***Experimental Design:*** The experimental design used was completely randomized design (CRD).

***Statistical Analysis:*** Data obtained in the study were subjected to analysis of variance (ANOVA) using Statistical Package System Software (1999) and where differences exist between means Duncan's Multiple Range Test was used to separate the means at 5% probability level (Duncan, 1955).

## RESULTS AND DISCUSSION

***Performance:*** There were significant differences in all the parameters measured across the dietary treatment, the highest final weight (2390g) and weight gain (2340g) were obtained in diet three (10% inclusion level of pride of barbados seed meal) while the lowest value (2000g) and (1950g) for final weight gain respectively were recorded in diet 4 (15% inclusion level of roasted pride of barbados seed meal). The highest feed intake (4970g) was obtained in diet four while the lowest feed intake (4700g) was recorded in diet one (0% inclusion level of roasted pride of barbados seed meal). The best feed conversion ratio (2.09) was recorded in diet one while the lowest feed conversion ratio was recorded in diet four. The percentage mortality fluctuates across the dietary treatment.

***Nutrient digestibility of broiler fed experimental diet:*** There is significant difference in all the parameters measured for nutrient digestibility of broiler fed experimental diets. The highest dry matter digestibility was recorded in diet T2 (5% inclusion level of roasted pride of Barbados seed meal). The highest crude protein digestibility was recorded in diet one while the lowest crude protein digestibility was recorded in diet four. The highest ether extract was recorded in diet two (5% inclusion level of roasted pride of Barbados seed meal) while the lowest was recorded in diet three (10% inclusion of roasted pride of Barbados seed meal) (table 4). The results of the anti-nutritional factors of roasted pride of barbados seed meal reveals saponin (0.09%), phytate (0.06%), tannin (0.02%) and oxalate (0.04%) (table 5). Table 6 presents results on the proximate composition of roasted pride of Barbados seed. Present result on the proximate composition of roasted pride of Barbados seed revealed crude protein, crude fibre and dry matter as 21.93%, 5.86% and

92.42% respectively. The total ash content was 4.41% while the ether extract was 3.72% and the moisture content was 7.60%. There were significant differences in average weight gain, average feed intake, feed conversion ratio and mortality percentage across the dietary treatment. The final weight and average weight gain of the birds fluctuate across the dietary treatment. This result negates the findings of Obun and Adeyemi (2012) who report a decrease in final body weight gain across the dietary treatment. The best feed conversion ratio was recorded in diet one (0% inclusion level of roasted pride of Barbados seed meal). This result is in agreement with Obun and Adeyemi (2012) who submit the best feed conversion ratio in diet one (2.5% inclusion level of toasted *Daniella oliveri* seed meal). The highest mortality percentage (41.79) was recorded in diet three (10% inclusion level of roasted pride of barbados seed meal) while the lowest mortality percentage (34.82) was recorded in diet four (15% inclusion level of roasted pride of barbados seed meal). This result is in agreement with the findings of Obun and Adeyemi (2012) who report the highest percentage level in broilers fed 6.67% inclusion of toasted *Daniella oliveri* seed meal

The highest dry matter digestibility was in diet two (5% inclusion level of roasted pride of Barbados seed meal) while the lowest was in diet one. This result negates the findings of Obun and Adeyemi (2012) who observe the highest dry matter digestibility in diet one. The highest crude protein, crude fibre and ash digestibility was recorded in diet one this supports the findings of Obun and Adeyemi (2012) who reported the highest crude protein, crude fibre and ash digestibility of broiler fed roasted *Daniella oliveri* seed meal. The nutritional importance of a given feed depends on the nutrient and anti-nutritional constituents (Aletor, Goodchild, Moneim and Abd, 1994). The values of phytate contents determined (0.06%) were lower than 234.00 ± 3.60mg/100 as reported for raw lima beans and lima beans boiled for 160 minutes respectively.

The level of oxalate recorded was below the values reported for *Manihot esculenta*. Phytate, polyphenol oxalate affects bioavailability of composite nutrients. They complex with bivalent ions like Calcium (Ca), Magnesium (Mg), Iron (Fe) and Zinc (Zn) making them unavailable especially in monogastric animals (Aletor and Omodara, 1994). Roasting reduced the tannin content to 0.02% this is in agreement with Bressani and Elias (1980) who report that about 30 - 40% of polyphenols can be removed from *Phaseolus vulgaris* by cooking and discarding the cooking water solution and since most tannins are located in the testa, its physical removal reduced tannin content. It shows that roasting led to a decrease in the level of saponin, phytate, tannin and oxalate.

It therefore exerts positive effects as antinutritional factors are known to affect poultry birds negatively. The results of proximate analysis of roasted pride of barbados seed show that roasted pride of barbados seed meal has higher dry matter content than that of the raw pride of barbados seed meal and this shows that most of the moisture content of the roasted pride of barbados seed meal had been removed during roasting process (Aremu, Olaofe and Akintayo, 2006). The crude protein content of the roasted pride of barbados seed meal (21.93%) was lower than that of raw pride of barbados seed meal (23.96%), this might be as a result of the processing method employed to detoxify

the anti nutritional factors. The reduction in crude protein content of the roasted pride of barbados seed meal is in agreement with earlier reports on jackbean (Udedibie, Esonu, Obaji and Durunna, 1994) and could possibly be due to damage on the nitrogenous compounds during roasting and as a result of differences in geographical location. The crude fibre contents of roasted pride of barbados seed meal (5.86%) was lower than that of raw pride of barbados seed meal (6.81). This reduction in crude fibre contents of roasted pride of barbados seed meal could be attributed to the removal of the seeds hull during roasting (Ahmed *et al*., 2006). The ash contents of roasted pride of barbados seed meal was lower (4.41%) than that of raw pride of barbados seed meal (4.64%), thus indicating that the roasted pride of barbados seed meal contained reasonable amount of potash which implies that these seeds are good source of minerals.

The ether extract of the roasted pride of barbados seed meal were lower than that of raw pride of barbados seed meal (3.96%) and lower than the 22.8-23.5% reported by Salunkhe, Kadon and Charan (1985) for soybean. These results confirm the findings of (Ega, 1986) that whole seeds of legumes are richer than detoxified seeds in lipid contents and this indicates that roasted pride of Barbados seed meal as a low fat feed stuff is good for lean broiler production. The ether extract content in detoxified pride of barbados seed meal was significantly reduced as a result of the effect of roasting and possibly due to burning off of lipid related compound (Udedibie, Esonu, Obaji and Durunna, 1994).

**Table 1:** Gross Composition of Experimental Diet (Starter Phase)

| **Percentage Ingredients** | **Control T1** | **5 % T2** | **10 % T3** | **15 % T4** |
|---|---|---|---|---|
| Maize | 48.00 | 48.00 | 48.00 | 48.00 |
| Soya bean meal | 33.00 | 31.35 | 29.70 | 28.05 |
| Roasted PBSM | 0.00 | 1.65 | 3.30 | 4.95 |
| Fishmeal | 3.00 | 3.00 | 3.00 | 3.00 |
| Wheat Offal | 11.30 | 11.30 | 11.30 | 11.30 |
| Bonemeal | 2.00 | 2.00 | 2.00 | 2.00 |
| Limestone | 2.00 | 2.00 | 2.00 | 2.00 |
| Broiler Premix | 0.25 | 0.25 | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 |
| Lysine | 0.10 | 0.10 | 0.10 | 0.10 |
| Methionine | 0.10 | 0.10 | 0.10 | 0.10 |
| TOTAL | 100.00 | 100.00 | 100.00 | 100.00 |
| **Analysed Results** | | | | |
| Dry matter (%) | 90.82 | 90.69 | 90.85 | 90.83 |
| Crude protein (%) | 22.97 | 23.28 | 23.15 | 23.37 |
| Crude fibre (%) | 3.76 | 3.79 | 3.88 | 3.83 |
| Ether extract (%) | 3.58 | 3.65 | 3.62 | 3.71 |
| Ash (%) | 7.15 | 6.96 | 7.24 | 7.36 |
| Moisture (%) | 9.18 | 9.31 | 9.15 | 9.17 |
| Energy (MEKcal/kg) | 2.93 | 2.92 | 2.93 | 2.92 |

***Source:*** Experimentation, 2013


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**Table 2:** Gross composition of roasted experimental diet (Finisher Phase)

| **Percentage Ingredients** | **Control T1** | **5% T2** | **10% T3** | **15% T4** |
|---|---|---|---|---|
| Maize | 50.00 | 50.00 | 50.00 | 50.00 |
| Soya bean meal | 27.00 | 25.65 | 24.30 | 24.30 |
| Roasted PBSM | 0.00 | 1.35 | 2.70 | 2.70 |
| Fishmeal | 2.50 | 2.50 | 2.50 | 2.50 |
| Wheat Offal | 15.80 | 15.80 | 15.80 | 15.80 |
| Bonemeal | 2.00 | 2.00 | 2.00 | 2.00 |
| Limestone | 2.00 | 2.00 | 2.00 | 2.00 |
| Broiler Premix | 0.25 | 0.25 | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 |
| Lysine | 0.10 | 0.10 | 0.10 | 0.10 |
| Methionine | 0.10 | 0.10 | 0.10 | 0.10 |
| TOTAL | 100.00 | 100.00 | 100.00 | 100.00 |
| **Analysed Results** | | | | |
| Dry matter | 90.87 | 90.91 | 90.78 | 90.75 |
| Crude protein (%) | 19.48 | 19.59 | 20.04 | 20.13 |
| Crude fibre (%) | 3.81 | 3.86 | 3.92 | 3.89 |
| Ether extract (%) | 3.57 | 3.59 | 3.55 | 3.62 |
| Ash (%) | 6.88 | 6.94 | 6.92 | 6.97 |
| Moisture (%) | 9.13 | 9.09 | 9.22 | 9.25 |
| Energy (MEKcal/kg) | 2.95 | 2.96 | 2.95 | 2.94 |

***Source:*** Experimentation, 2013

**Table 3:** Growth response of broilers fed experiment diet

| **Parameters** | **0% T1** | **5% T2** | **10% T3** | **15% T4** | **SEM** |
|---|---|---|---|---|---|
| Initial weight (g) | 50 | 50 | 50 | 50 | |
| Final weight (g) | $2300^{c}$ | $2340^{b}$ | $2390^{a}$ | $2000^{a}$ | 76.02 |
| Total weight gain (g) | $2280^{c}$ | $2290^{b}$ | $2340^{a}$ | $1950^{d}$ | 76.00 |
| Feed intake (g) | $4700^{d}$ | $4800^{c}$ | $4950^{b}$ | $4970^{a}$ | 55.51 |
| Daily feed intake (g/bird) | $83.97^{a}$ | $85.71^{a}$ | $88.39^{b}$ | $88.75^{c}$ | 0.99 |
| Mortality (%) | 10.53 | 40.89 | 41.79 | 34.82 | 3.89 |
| Feed conversion ratio (%) | 2.09 | 2.10 | 2.12 | 2.55 | 0.10 |
| Daily weight gain (g) | 40.18 | 40.89 | 41.79 | 34.82 | 1.36 |
| Protein intake (%) | 1004.39 | 1009.92 | 1024.16 | 1011.89 | 3.61 |
| Protein efficiency Ratio (%) | $4.68^{b}$ | $4.75^{b}$ | $4.83^{b}$ | $4.89^{a}$ | 0.04 |

a b c d = means on the same row with different superscript differ significantly (P<0.05) significant

***Source:*** Experimentation, 2013

**Table 4:** Nutrient digestibility of broiler fed experimental diet

| **Parameters** | **T1 0 %** | **T2 5 %** | **T3 10 %** | **T4 15 %** | **SEM** |
|---|---|---|---|---|---|
| Dry matter (%) | $96.83^{c}$ | $97.68^{a}$ | $97.19^{b}$ | $97.17^{b}$ | 0.15 |
| Crude Protein (%) | $62.98^{a}$ | $60.18^{c}$ | $60.87^{b}$ | $60.16^{c}$ | 0.58 |
| Crude fibre (%) | $35.43^{a}$ | $34.72^{b}$ | $34.44^{c}$ | $34.96^{ab}$ | 0.20 |
| Ether extract (%) | $46.22^{b}$ | $47.63^{a}$ | $45.92^{c}$ | $46.69^{ab}$ | 0.32 |
| Ash (%) | $20.64^{a}$ | $20.61^{a}$ | $20.52^{b}$ | $20.57^{b}$ | 0.03 |

a b c d = means on the same row with different superscript are statistically (P<0.05) significant

***Source:*** Experimentation, 2013

**Table 5:** Anti-nutritional factors in roasted pride of Barbados seed meal

| **Anti-nutrients** | **Value (%)** |
|---|---|
| Saponin | 0.09 |
| Phytate | 0.06 |
| Tannin | 0.02 |
| Oxalate | 0.04 |

***Source:*** Experimentation, 2013

**Table 6:** Proximate composition of roasted pride of Barbados seed meal

| **Nutrient** | **Value** |
|---|---|
| Crude protein (%) | 21.93 |
| Crude fat (%) | 3.72 |
| Crude fibre (%) | 5.86 |
| Ash (%) | 4.41 |
| Dry matter (%) | 92.40 |
| Energy (MEkcal/kg) | 3.19 |
| Moisture (%) | 7.60 |

***Source:*** Experimentation, 2013

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