# EFFECT OF GRADED LEVELS OF CASTOR SEED MEAL ON GROWTH PERFORMANCE OF BROILER STARTER CHICKENS

**[1]Ombugu, K.A., [1]Alu, S.E., [1]Ari, M.M., [2]Abdullahi, H.R. and [3]Mallam, I.**

*[1]Department of Animal Science, Faculty of Agriculture, Nasarawa State University, Keffi, Shabu-Lafia Campus*
*[2]Department of Animal Science, Faculty of Agriculture, Federal University of Lafia*
*[3]Department of Animal Science, Kaduna State University, Kafanchan Campus, Kaduna State, Nigeria.*
Corresponding author: ombugukuje@gmail.com; +2348039138104

**ABSTRACT**
*A four-week feeding trial was conducted to evaluate the effect of natural fermentation on the feeding value of castor seed meal for broiler chickens (starter phase) as a replacement of soybean cake. A total of 300 broiler chicks (ROSS 308) strain were randomly allotted to the five (5) experimental diets in a Completely Randomized Design with four replicates having 15 birds each. Fermented castor seed meal (FCSM) was included at 0, 25, 50 75 and 100%. Data collected included initial body weight, final body weight, body weight gain, feed intake, feed conversion ratio, protein efficiency ratio and energy efficiency ratio. All data collected on growth performance were subjected to Analysis of Variance using SAS software and means with significant differences were compared using Tukey's Test. The result showed improvement for birds fed 50 and 75 % fermented castor seed meal (FCSM) in the final body weight (457.08, 453.72 and 1912.19, 1768.81 g/bird), total body weight (411.33, 408.92 and 1473.71, 1333.08 g/bird), weight gain/day (14.69, 14.60 and 52.63, 47.61 g/bird) with better feed conversion ratio (1.38, 1.27 and 1.13, 1.09) at the starter phase. However, protein efficiency ratio (0.78 and 2.21) increased ($P<0.05$) at 100% FCSM while protein intake energy efficiency ratio (13.00) reduced significantly ($P<0.05$) due the inclusion of castor seed meal in the starter phase. It is concluded that fermented castor seed meal could be included in the diets of broiler starter feed at 50% and even 75% at starter phase without any known detrimental effect on the growth performance of broiler chickens.*
**Keywords:** Effect, Castor, Growth performance, Broiler starter, Chickens

## INTRODUCTION

Poultry production especially broiler chicken remains one of the veritable ways of achieving sustainable and rapid production of quality protein to meet the increasing national protein demand (Akinmutimi and Okwu, 2006). The conventional or primary protein sources like soybean, groundnut cake, and fishmeal and cotton seed cake are not only expensive but also competed for by humans and other industrial users (Akinmutimi, 2001). The increasing cost of these ingredients is unprecedented. The effort to use castor seed and the cake, if successful, may reduce the cost of feed production and subsequently that of animal production in general and may increase the production of the livestock sector of Nigerian Agriculture (Annongu and Joseph, 2008). Castor seed cake has high crude protein which is similar to that obtained from most conventional protein feed resource such as soya bean meal, ground nut cake and peanut meal (Akande *et al.,* 2011). The various methods of processing legume seeds for incorporation into poultry feeds like hydrothermal treatment, soaking and fermentation, may considerably reduce the levels of the anti-nutritional factors (Enujiugha and Ayodele-Oni, 2008). It is therefore, against background that this research was conducted to evaluate the effect of graded levels of castor seed meal on growth performance of broiler chickens as a replacement of soybean cake.

## MATERIALS AND METHODS

### Study location

This experiment was conducted at the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Nasarawa State University, Keffi, Shabu-Lafia Campus. The experimental area lies in the guinea savannah zone of north central Nigeria on Latitude $8^0$35'N and longitude $8^0$33'E. The average minimum temperature is $23^0$C and maximum temperature is $36.9^0$C, mean monthly relative humidity is 74%. The mean annual rainfall is 823mm; the mean monthly temperature is $35.06^0$C (NiMet, 2021).

### Sources of test ingredients

Castor seed were purchased from the local farmers in Lafia main market, Lafia Local Government Area of Nasarawa State.

### Processing (fermentation) of test ingredients

100kg of castor seed was collected and divided into 4 different pots, soaked in 20litres of clean water and covered with polythene bags and allowed to ferment for 72hours after which the water was drained and the sample was oven dried. It was then ground to powder form using a grinding machine and preserved under natural condition.

**Experimental diet formulation**

Five (5) different experimental diets tagged $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ were compounded to be isocaloric (2800 kcal/kg ME) and isonitrogeneous (23%CP) for starter diets. Treatment 1 (T1) contained soybean cake meal which serve as control, while T2 contain 25% fermented castor seed meal (FCSM) T3 (50%FCSM), T4 (75%FCSM) and T5 (100%FCSM) respectively. Broiler chicks were fed with broiler starter mash for (1-29) days.

**Experimental Design**

The experiment design was a completely randomized design (CRD). The birds were distributed randomly to five treatments at the rate of fifteen (15) birds per replicate. Each treatment was replicated four times and the diet was formulated using feed win software.

**Experimental birds and management**

A total of three hundred (300) unsexed day-old broiler chicks (ROSS 308 strain) were obtained from a commercial hatchery in Ibadan, Nigeria. The initial body weight was taken. The birds were brooded together under a deep litter house for the first five days of age to enable them acclimatized to the environment. At the seventh (7) day of age, they were randomly distributed into different compartment separated from each other by wire mash which was supported with wooden frame. Feed and water were provided *ad-libitum* to the birds throughout the experiment.

**Growth parameters**

Body Weight: Body weight: this the weight per birds and the body weight gain is difference between the final weight and the initial weight of the birds.

Body weight gain = final weight – initial weight.

Feed intake = amount of feed given – left over

Feed Conversion Ratio**:** This was calculated as the rate of feed intake to live weigh gain.

$$\text{FCR} = \frac{\text{Feed intake (g)}}{\text{Body weight gain (g)}}$$

Protein consumption: This was calculated as the amount of protein in the diet multiplied by the quantity of feed consumed.

Protein Efficiency Ratio (PER**):** This was determined as the gain in the body weight to the protein consumed.

$$\text{PER} = \frac{\text{Body weight gain (g)}}{\text{Protein consumed (g)}} \times 100$$

$$\text{Energy Efficiency Ratio} = \frac{\text{Body weight gain (g)} \times 100}{\text{Total metabolizable energy intake;}}$$

Where metabolizable energy was calculated using the formula by Pauzenga (1985)

ME=37 x % CP+81.1x % EE+35.5 x % NFE.

**Statistical Analysis**

All data on the growth performance were subjected to Analysis of Variance (ANOVA) using the SAS (2002) statistical software. Treatment means were compared for significance using Tukey's Studentized test.

## RESULTS AND DISCUSSION

Table 1 represents the growth performance of broiler starter chicks fed graded levels of fermented castor seed meal. The results showed significant difference ($P<0.05$) in all the parameters except initial body weight (IBW). For FBW, TBWG and WG/day, T3 had significantly ($P<0.05$) higher value although similar with T1 and T4 and the least were found in T2, T5 and T2 for FBW, TBWG and WG/day, respectively. For feed intake, feed conversation ratio and protein intake, the T1 had significantly ($P<0.05$) higher value compared to other treatments while the energy efficiency ratio revealed that T1 had significantly higher value. The increase in the final body weight (457.08 and 453.72g/bird), total body weight (411.33 and 408.92g/bird) and weight gain/day (14.69 and 14.60g/bird) were due to the inclusion of fermented castor seed meal in the diets. This indicated that castor seed meal supports the growth of broilers at 50 and 75% inclusion. The results are in agreement with the work of Mustapha *et al.* (2015b) who reported an improvement in the daily body weight gain and feed conversion ratio of broiler chicken when fed graded levels of raw castor seed (*Ricinus cummunis*) meal at different replacement levels and differently processed castor seed meal and reported that birds fed on castor seed meal boiled for 30 minutes and fermented for 3 days appeared to be higher compared to others. The results are similar with the findings of Akintunde *et al*. (2021) who observed that including 22.5% fermented baobab seed meal in broiler diets significantly improved growth performance without negative health effects, while 7.5% soaked baobab seed meal also showed comparable benefits

## CONCLUSION

Fermented castor seed meal could be included in the diets of broiler starter feed at 50% and even 75% at starter phase without any known negative effect on the growth performance of broiler chickens based on the findings.

**Table 1: Growth performance of broiler starter chicks fed graded levels of fermented castor seed meal**

| Parameters | T1 (0%FCSM) | T2 (25%FCSM) | T3 (50%FCSM) | T4 (75%FCSM) | T5 (100%FCSM) | SEM | LOS |
|---|---|---|---|---|---|---|---|
| IBW (g/bird) | 46.40 | 45.80 | 45.75 | 44.80 | 43.55 | 0.64 | NS |
| FBW (g/bird) | 449.85[a] | 415.30[b] | 457.08[a] | 453.72[a] | 418.63[b] | 5.05 | * |
| TBWG (g/bird) | 403.45[a] | 369.50[b] | 411.33[a] | 408.92[a] | 375.08[b] | 10.51 | * |
| WG/day (g/bird) | 14.40[a] | 13.19[b] | 14.69[a] | 14.60[a] | 13.39[b] | 0.37 | * |
| FI (g/bird) | 22.13[a] | 21.26[ab] | 20.20[b] | 18.58[c] | 18.02[c] | 0.40 | * |
| FCR | 1.53[a] | 1.61[a] | 1.38[b] | 1.27[b] | 1.34[b] | 0.03 | * |
| Protein Intake | 5.24[a] | 4.67[b] | 4.24[c] | 3.71[d] | 3.24[e] | 0.02 | * |
| PER | 0.60[e] | 0.64[d] | 0.68[c] | 0.73[b] | 0.78[a] | 0.05 | * |
| EER | 13.78[a] | 13.38[b] | 13.00[c] | 12.64[d] | 12.30[e] | 0.12 | * |

[abc] means on the same column having different superscript differ significantly ($p<0.05$); NS = not significantly different ($p>0.05$); SEM = standard error of mean; LOS= level of significant; IBW = Initial body weight; FBW =Final body weight; TBWG = Body weight gain (g); WG/day = weight gain/day, FI=Feed intake (g); FCR = Feed conversion ratio; PER=protein efficiency ratio; EER= energy efficiency ratio.

## REFERENCES


Akande, T. O., Odunsi, A.A., Olabode, O. S. and Ojediran, T. K (2011). Physical and nutrient characterization of raw and processed castor (Ricinus communis L) seeds in Nigeria. *World Journal of Agricultural Sciences*, 8(1): 89-95.

Akinmutimi, A. H. and Okwu, N. D. (2006). Efect of quantitative substitution of cooked *Mucuna utilis* seed meal for soyabeans meal broiler finisher diet. *International Journal of Poultry Science, 5*(5): 477-481.

Akinmutin, A. H (2001). The effect of potash cooked lima beans (*Phoseolus lunatus*) broiler starter diet. *Nigerian Agricultural Journal,* 32: 109-118.

Akintunde, A. R., Saidu, I. H., Oguntoye, M. A., Mohammed, H. K., Mustapha, A., Jibrin, J., Haruna, I., Adeoye, S. O. B., Mafindi, U. M., Sani, U. M. and Olusiyi, J. A. (2021). Growth performance of starter broiler starter chicks fed soaked and fermented baobab (*Adansonia digitata*) seed meal based diets. *Nigerian Journal of Animal Production*, 48(1):69–75. https://doi.org/10.51791/njap.v48i1.2892.

Annongu, A.A. and Joseph, J.K (2008), proximate analysis of castor seeds and cake, *Journal of Applied Science and Environmental Management,* 12(1): 39-41.

Enujiugha, V.N and Ayodele-Oni, O. (2008). Evaluation of nutrients and some anti-nutrients in lesser-known, underutilized oilseeds. *International Journal of Food Science and Technology,* 38 (5):525-528.

Mustapha, G.G., Igwebuike, J.U., Adamu, S.B., Kwari, I.D. and Gashua, M.M. (2015b). The Effect of Feeding Raw Castor Seed (*Ricinus cummunis*) Meal, its Replacement Levels and Processing on the Productive Performance of Broilers. *International Journal of Agriculture and Biosciences*. P-ISSN: 2305-6622; E-ISSN: 2306-3599.

Nigerian Meteorological Agency (NiMet) (2021). Nigerian Meteorological Agency, Lafia, Nasarawa State, Nigeria Proceedings. In Geographic Perspective on Nasarawa Company Keffi, Nasarawa State.

Pauzenga, U. (1985). Feeding parentstock. *Zootechnica International*, Pp. 22-24.

Statistical Analysis System (SAS) Institute (2002). SAS/STAT User's Guide. Version 8, 6th Edition, SAS Institute, Cary, 112.