PROFITABILITY OF BROILER CHICKENS FED DIFFERENTLY PROCESSED BAOBAB SEED MEAL (*ADANSONIA DIGITATA*) AS A REPLACEMENT FOR SOYA BEANS

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Abstract

The study assesses the financial benefits of feeding broiler chickens with differently processed baobab seed meal at the Poultry unit of College of Agriculture, Garkawa, Plateau State, Nigeria. The experimental diets were control, raw baobab seed meal (RBSM), cooked baobab seed meal diet, (CBSM), toasted baobab seed meal diet (TBSM), fermented baobab seed meal diet (FBSM) and sprouted baobab seed meal diet (SBSM) to replace the conventional soya bean full fat at 10% inclusion across treatments. A Total of one hundred and eighty (180) broilers chickens were used for this study. The six dietary treatments were replicated in a completely randomized design. The economic parameters considered in these study were cost of feed consumed per bird, cost saved, total cost of production, revenue, net income per bird, net income ratio, and return on naira invested. Significant (P<0.05) difference existed in all the parameters except fixed cost, operating cost and prevailing market price across treatments. The revenue of CBSM (₦2533.33) and TBSM (₦2493.33) were significantly lower (P<0.05) than the control diet ₦2826.66 which was comparable to that of RBSM, FBSM and SBSM, (₦2713.33, ₦2560.00 and ₦2634.66). Among the processing methods, this study recommended RBSM, CBSM, FBSM and SBSM as the best since net income (₦/bird) were comparable to the control diet.

Key words: Baobab, processing, broilers, cost of feed consumed, revenue

Introduction

The primary objective of raising livestock and poultry is to produce good quality animal products in the form of milk and eggs to the consumer in a profitable enterprise with least contribution to climate change (Reddy, 2012). Nutrition tackles the problems of supplying nutrients to animals at economic level and provides balance nutrients to animals to reduce the cost of production (Aduku, 2012). Nutrition has been a major determinant of profit in the poultry business as it accounts for 70-80% of the cost of production (Reddy, 2012).

Nowadays commercial feed produced by millers are usually costly and this reduces the profit margin to the farmers. However, several studies on baobab seeds in Nigeria and elsewhere in the world have shown its potential in supplying good quality food for humans and livestock (Osman, 2004 and Nkafamiya *et al*., 2007). Guluwa *et al*. (2015) reported that diets containing toasted baobab seed meal up to 10% levels of inclusion brought proficient growth in broiler chickens. Baobab seed meal was also reported to be tolerated by broilers at 5% (Mwale *et al*. 2008) and 10% (Guluwa *et al.*, 2015).

Bale *et al*. (2013) opined that the cost per gain of using baobab seed decreased as the inclusion level increased. This implied that it was cheaper to use baobab seed meal as feedstuff in broiler diets compared to the use of convectional feed ingredients such as soya-beans which is expensive and highly competitive for human consumption. Oladunjoye *et al*. (2014) reported reduction in feed and production cost with increased levels of baobab seed meal in the diets of chickens.

The convectional protein feedstuffs continue to be scarce and expensive as they are competed for by animals, human and other industrial users, hence the need to seek alternative plant protein sources for poultry feeds. There is therefore an urgent need to turn attention to the processing of non-conventional protein sources like baobab seed meal, one of the neglected protein-rich crops in the tropics for monogastric use to boost agricultural productivity. Therefore, the objective of the study was to determine the profitability of using baobab seed meal as protein source in the diet of broiler chickens.

Material and methods

The experiment was carried out at the Poultry unit of the Plateau State College of Agriculture, Garkawa. Garkawa town is located on latitude 8^0 58E and longitude $9^0$45N, with an elevation of 240m above sea level determined using global positioning system (GPS) (Guluwa, 2014). It lies within the southern guinea savanna zone of Nigeria. The experiment was conducted from October 27th – December 22nd, 2015. Baobab seeds as the test ingredient were purchased from Dawaki market in Kanke Local Government Area of Plateau State. The seeds were divided into five equal parts and washed in water to completely remove the whitish pulp attached to the hard coat of the seed. The water was drained off in a basket and processed as described below:

Boiling: The water was brought to boil at 100 ^oC; the seeds were poured in to it and cooked for 60 minutes, after which the seeds were turned into a basket to drain off the water.

Toasting: Toasting was done by placing the seeds in an empty pan and stirred continuously, .the toasting continued until its outer coat turned brownish.

Fermentation: After cooking as described above, the cooked seeds were kept in a plastic jar and closed for five (5) days to keep out oxygen inside for fermentation to take place.

Sprouting: The seeds were soaked for three days and kept in a basket and covered with tarpouline. Daily, the seeds were washed in water gently until germination process initiated.

Raw: The seed were only washed to remove the pulp and then sun dried.

All the raw and processed seeds were milled to obtain baobab seed meal(BSM) and coded as follows: cooked baobab seed meal (CBSM), toasted baobab seed meal (TBSM), raw baobab seed meal (RBSM), fermented baobab seed meal (FBSM), sprouted baobab seed meal (SBSM) and incorporated into different experiment diet.

Six diets were formulated for the finisher phase. Diet one (T_1) contain no baobab seed meal; diets 2, 3, 4, 5, and 6 contained raw, cooked, toasted, fermented, sprouted baobab seed meal respectively. Treatments 2 to 6 replaced soya- beans at 10% inclusion levels. The birds were fed iso-nitrogenous diets (20% CP) and Iso-caloric (2666.19 - 2935.56 kcal/kg during the finisher phase and the metabolizable energy was balanced by adding palm oil where necessary. The experiment lasted 21 days.

Market cost of ingredients at the time of the study were used to calculate the cost of feed cost of feed per kg weight gain and cost saving. The composition of feed ingredients presented in Table 1 were used to calculating the cost of feed ingredients per kg of diet by multiplying the cost (₦) of each ingredient by its fraction per unit of the diet to determine its cost contribution to the diet. The cost of every operation was recorded as they occurred. The variable costs include: cost of vaccine, vitalyte, drugs, day old chicks, kerosene and polythyene bags while fixed costs depreciation were those of equipment such as drinkers and feeders. Total costs of production were the sum of total variable and fixed costs. The market prices of the chicken were determined as the cost of ₦/kg of birds at the time of the study. Cost saved was calculated as the total cost of production of birds fed the control diet minus cost of production of birds fed baobab-based diets. Net income ratio was calculated as the cost of production divided by the net income / bird. Total revenue realized was determined as the total sales valued in ₦/bird and net income as the difference between revenue and cost of production. Cost of feed consumed was determined by calculating feed consumed by a bird in Kg and multiplied by unit cost of feed in naira. Cost of feed per kg /weight gain for a bird was determined by multiplying the feed conversion ratio as fed-basis by cost per kg of diet. However, cost of housing was calculated by measuring the space used comparing to the monthly rent equivalent of such space of similar structure in a town, and return to naira invested on capital was calculated as the ratio of net income divided by total cost of production or total expenditure incurred (Ogundipe and Sanni, 2002).

All data obtained were subjected to analysis of variance procedure of SPSS (2010). Duncan option of the same package was used to separate the means.

Results and Discussion

The feed cost of broiler production using baobab seed differently processed as alternative protein source to the competitive soya beans full fat is presented in Table 2. Significance (P<0.05) different existed between all the dietary treatments in all parameters except fixed cost, operating cost and prevailing market price.

At the starter phase, the cost of feed consumed per ₦/bird of the RBSM, CBSM, TBSM, and SBSM were similar to the control diet and significantly (P<0.05) higher than FBSM. This can be attributed to the low level of feed intake of the FBSM. This significant difference agrees with the findings of Bale *et al.* (2013) and Oladunjoye *et al.* (2014) who reported low feed cost with increase in inclusion of BSM. The reduction observed could be due to the low cost and ready availability of baobab seed meal Oladunjoye *et al*. (2014). This suggests that it may be cheaper to use BSM as an alternative protein source to replace soya beans in broiler diets. This study elucidates the effectiveness of processed baobab seed meal as a potent tool for reducing feed cost which accounts for 70-80% cost of producing broiler chickens (Aduku, 1993); Adegbola (2004); Lawrence *et al*. (2008) and Atteh (2014).

The finisher average cost of feed consumed of 263.35 ₦/bird of the soya beans-based (control) diet was found to be significantly (P<0.05) higher than the feed consumed of the birds fed differently processed baobab seed meal-based diets RBSM, CBSM, TBSM, FBSM, and SBSM respectively. The high cost of feed of T_3-T_6 above T_2 RBSM was due to the extra cost of processing in terms of firewood and water used for the toasting, cooking, fermentation and sprouting.

The total cost of production of chickens fed the control diet was significantly ($P<0.05$) higher than the total cost of production of birds fed RBSM, CBSM, TBSM, FBSM, and SBSM respectively.

This revealed that the cost of producing broiler chickens production cost could be reduced by the use of baobab seed meal as an alternative protein source since all the experimental diets gave an average final live weight of (1650-1916.67g/bird) at starter phase and (3116.67-3333.339$_g$/bird) at finisher phase which is comparable to the weight of broiler fed with the convectional protein source (soya beans diet). This agrees with the observation Bale *et al.* (2013), Sola-Ojo et al (2013) and Saulawa *et al.* (2014) that baobab seed can be incorporated into poultry diets without negative effects on growth performance with concomitant reduction in feed cost.

The revenue of CBSM and TBSM were significantly lower ($P>0.05$) than the control diet which was similar to that of RBSM, FBSM and SBSM. The comparable revenue of control diet to BSM based diets could be due to the comparable final weights of the birds in those treatments since the price of the birds was based on their live weight.

Considering the total cost of production and the revenue, the experimental diets had a similar net income (₦/bird) compared to the control diet, except for TBSM which recorded a lower net income. This could be due to the low final weight recorded.

Conclusion

The inclusion of baobab seed meal in the diets of broiler chickens at 10% of the total diet is economically feasible since it resulted in a significant reduction in the feed cost.

Recommendation

Further study should be conducted using different processing methods with higher inclusion levels since weight gain was not impaired.

References

Adegbola, T.A. (2004). *Utilizing proven alternative feed ingredients in the livestock industry*. Proceedings of the 27th Annual Conference of the Nigerian Society for Animal Production held at Sokoto, pp: 431-436.

Aduku, A.O. (1993). *Tropical Feedstuffs: Nutrient Analysis Table*. Zaria: Ahmadu Bello University Press.

Aduku, A.O. (2012). Animal nutrition in the tropics. Feed and feeding, pasture management, monogastric and ruminant nutrition.

Atteh J.O (2014). *Principle and practices of feed manufacturing*. Ilorin: Atlex printer.

Bale, J.S Mancha, Y.P., Sanusi, M and Doma, U.D. (2013). Effect of Graded Levels of Baobab (*Adansonia digitata*) Seed Meal on the Growth Performance and Production Economic Analysis of Broiler Chickens. *International Journal of Poultry Science*, 12 (5), 273-276.

Guluwa, L.Y. (2014). *Feed value of water soaked sweet orange (citrus sinensis) peel meal in broiler production*. (Unpublished M.Sc. Thesis.) Department of Animal Nutrition, University of Agriculture, Makurdi, Benue State, Nigeria.

Guluwa, L.Y., Wumnokol, P.D., Ajiji I., Magaji, S.T. and Alokoson, J.I. (2015). *Effect of Inclusion of Various levels of Baobab Seed Meal Toasted in the diet of Broilers Chickens on their Growth*

Performance. Institute of Professional Agriculturists of Nigeria 20th Annual International Conference Book of Proceedings, Pp 30-37

Lawrence J.D, Mintert J. and Anderson D.P. (2008). Feed grains and livestock impacts on meat supplies and prices. *Choice Magazine*, 23(2), 11 – 15.

Mwale, M., Mupangwa, J.F., Mapiye, C., Saina, H., Chimvuramahwe, J. (2008). Growth performance of guinea fowl keets fed graded levels of baobab seed cake diets. *International Journal of Poultry Science* 7, 429–432.

Nkafamiya, I., Osemeahon, S., Dahiru, D & Umaru, H. (2007). Studies on the chemical composition and physicochemical properties of the seeds of baobab (*Adasonia digitata*). *African Journal Biotechnology*, 6, 656-659.

Ogundipe, S.O. and Sanni, S.A. (2002). *Economics of broiler production in Nigeria. Poultry Production in Nigeria*. A training manual on National training Workshop on poultry held 1-6 September, 2002, Shika, Zaria, Nigeria. Pp 27-45.

Oladunjoye, I.O. Ojo A.J. and Jamiu B.A. (2014). Evaluation of baobab seed meal as feed for growing rabbits. *Int.J.Curr.Microbiol.App.Sci*, 3(6), 971-977.

Osman, M.A. (2004). Chemical and nutrient analysis of baobab (*Adansonia digitata*) fruit and seed protein solubility. *Plant. Food. Human. Nutr*., 59(1), 29-33.

Reddy, D.V. (2012). *Principle of Animal Nutrition and Technology*. 2nd edition. Delhi: Oxford and IBH Publishing CO. PVT Ltd.

Saulawa, L.A. Yaradua, A.I and Shuaibu, L. (2014a). Effect of Different Processing Methods on Proximate, Mineral and Anti Nutritional Factors Content of Baobab (*Adansonia digitata*) Seeds. *Pakistan Journal of Nutrition*, 13 (6), 314-318.

Sola-Ojo1, F.E. Adeyemi1, K.D. Toye1, A.A. Bolu1, S.A. Fayeye1, T.R. Annongu, A. A. Garba, S.O. and Karim, R.O. (2013). Performance, Carcass Profile and Oxidative Stability of Broiler chickens fed Processed Baobab Seed Meal. *Bull. Env. Pharmacol. Life Sci*., 2 (11), 94-99.

SPSS (2010). Statistical Package for Social Science. Release 19.0.User Manual. Microsoft Corp. U. S.

Table 1: Composition and calculated analysis of broiler finisher containing different processing methods of baobab seed meal

Ingredient	Different processing methods at 10% inclusion levels of baobab seed meal					
	T_1 Control	T_2 RBSM	T_3 CBSM	T_4 TBSM	T_5 FBSM	T_6 SBSM
SBFF	17.76	7.32	13.24	10.84	13.24	9.24
Maize	52.56	53.00	47.04	49.48	47.04	51.04
BSM	00.00	10.00	10.00	10.00	10.00	10.00
Fish meal	0.52	0.52	0.52	0.52	0.52	0.52
GNC	15.00	15.00	15.00	15.00	15.00	15.00
Rice offal	3.00	3.00	3.00	3.00	3.00	3.00
Wheat Offals	6.00	6.00	6.00	6.00	6.00	6.00
Palm Oil	1.00	1.00	1.00	1.00	1.00	1.00
Bone meal	2.20	2.20	2.20	2.20	2.20	2.20
Limestone	0.92	0.92	0.92	0.92	0.92	0.92
Salt	0.35	0.35	0.35	0.35	0.35	0.35
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25
TOTAL				**100Kg**	**100Kg**	**100Kg**
Calculated nutrients						
M.E Kcal/kg	2935.56	2810.58	2731.15	2800.42	2731.15	2662.19
CP (%)	20.00	20.00	20.00	20.00	20.00	20.00
Calcium (%)	1.28	1.25	1.25	1.25	1.25	1.25
CF (%)	4.92	6.73	5.71	6.78	5.71	6.05
EE (%)	6.34	4.21	5.46	4.18	5.46	6.83
Phophous (%)	0.81	1.15	0.78	0.76	0.78	0.76
Lysine (%)	1.56	1.02	1.37	1.28	1.37	1.23
Methionine (%)	0.69	0.62	0.64	0.63	0.64	0.62

CBSM = cooked baobab seed meal, TBSM = toasted baobab seed meal, RBSM = raw baobab seed meal, FBSM = fermented baobab seed meal, BSM = baobab seed meal, SBSM = sprouted baobab seed meal, SBFF = soy bean full fat, CP = crude protein, CF = crude fiber, EE = ether extract

Table 2: Feed cost of broiler production using differently processed boabab seed meal.

Cost parameters	Different processing methods at 10% inclusion levels of baobab seed meal						SEM
	T_1 Control	T_2 RBSM	T_3 CBSM	T_4 TBSM	T_5 FBSM	T_6 SBSM	
Starter cost of feed consumed ₦/bird	299.38^{a}	270.71^{a}	283.94^{a}	285.37^{a}	230.48^{b}	268.62^{a}	6.19*
Finisher cost of feed consumed ₦/bird	263.35^{a}	199.51^{c}	219.94^{bc}	213.78^{bc}	219.94^{bc}	230.96^{b}	5.40*
Total cost of feed consumed ₦/bird	563.73^{a}	470.22^{bc}	503.88^{b}	499.05^{b}	450.41^{c}	499.57^{b}	9.29*
Cost saved ₦/bird	-	91.50	56.85	63.68	98.98	63.16	8.93^{NS}
Fixed cost ₦/bird	186.67	186.67	186.67	186.67	186.67	186.67	0.00^{NS}
Operating cost ₦/bird	788.40	788.40	788.40	788.40	788.40	788.40	0.00^{NS}
Total cost of production (0-7weeks) ₦/bird	1537.80^{a}	1445.29^{bc}	1478.94^{b}	1474.11^{b}	1424.48^{c}	1474.36^{b}	9.35*
Final live weight(kg)	3.47^{a}	3.33^{ab}	3.17^{ab}	3.12^{b}	3.20^{ab}	3.29^{ab}	0.04*
Prevailing market price ₦/Kg	800.00	800.00	800.00	800.00	800.00	800.00	0.00^{NS}
Revenue ₦/Bird	2826.66^{a}	2713.33^{ab}	2533.33^{b}	2493.33^{b}	2560.00^{ab}	2634.66^{ab}	39.37*
Net income ₦/bird	1288.87^{a}	1288.04^{a}	1054.37^{ab}	1019.22^{b}	1135.52^{ab}	1178.31^{ab}	35.73*
Net income ratio	1.20^{ab}	1.14^{b}	1.40^{ab}	1.47^{a}	1.26^{ab}	1.27^{ab}	0.04*
Return to naira invested	0.84^{ab}	0.89^{a}	0.71^{b}	0.69^{b}	0.80^{ab}	0.80^{ab}	0.02*

$^{*\ a,\ b,\ c}$ Means on the same row with different superscripts are significantly different (P< 0.05), ns Not significant (P> 0.05), SEM = Standard error of mean, % LW = Percent live weight, *CBSM = cooked baobab seed meal, TBSM = toasted baobab seed meal, RBSM = raw baobab seed meal, FBSM = fermented baobab seed meal, BSM = baobab seed meal, SBSM = sprouted baobab seed meal.*