ISSN 0189-0514
J. Anim. Prod. Res. (2018) 30(2):32-40

National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ng Url:journals.napri.gov.ng

PERFORMANCE AND PROFITABILITY ANALYSIS OF FINISHER BROILER CHICKENS FED GRADED LEVELS OF BAOBAB *(ADANSONIADIGITATA)* PULP MEAL

[*1]Lawan A., [1]Olugbemi, T. S., [1]Duru, S., [1]Onimisi, P.A. and [2]Maidala, A.
*[*1]Department of Animal Science Faculty of Agriculture Ahmadu Bello University Zaria, Nigeria*
[2]Department of Animal Science Faculty of Agriculture Federal University Gashua. P.M.B. 1005, Gashua, Yobe State, Nigeria
**Corresponding Author: melelawan@yahoo.com or lawanmele@gmail.com +2348032980124*

ABSTRACT

The experiment was conducted to evaluate the performance of broiler chickens fed graded levels of baobab (Adansoniadigitata) pulp meal (BPM) at the finisher phase. Three hundred broiler chickens (Anak) were allotted to five treatments replicated thrice with 20 birds per replicate in a completely randomized design (CRD). The inclusion levels of the BPM in the diets were 0, 5, 10, 15 and 20% for treatment 1 (Control), 2, 3, 4 and 5 respectively. The experiments lasted for four weeks. The total daily intake recorded in this experiment were 103.37g, 104.64g, 104.69 and 107.88 while day weight were 47.35, 47.40, 47.21, 43.22g and 42.09g for the fed 0, 5, 10, 15 and 20% test ingredient respectively. The revealed a significantly lower feed intake ($P<0.05$) in birds fed 10, 15 and 20 % baobab pulp meal (BPM). Higher ($P<0.05$) daily weight gains were recorded in birds fed 0%, 5% and 10% BPM. Birds fed 0%, 5% and 10% BPM. Significantly lower total feed cost and total production cost were seen in birds fed test diets while significantly higher profit index and rate of return on investment were recorded in birds fed test ingredients except birds fed 20% BPM that found to be similar with 0% BPM. Birds on test diets were more efficient in feed utilization when compared with birds fed 0% PBM. It can be concluded that Baobab pulp can be included in finisher broiler chicken diets up to 20% for more weight gain and profit but 5% levels of inclusion was seem to be best for this study.

Keywords: Baobab pulp, Performance, Economics of production, Broiler chicks, Finisher phase

INTRODUCTION

The broiler industry in Nigeria is characterized by high production cost which is the major constraint resulting in low profit margins. Medugu *et al.* (2011) reported that the tremendous decrease in poultry production is as a result of high cost of protein and energy feedstuffs especially cereal grains (maize) which form the bulk of energy in poultry feeds and are in short supply as a result of industrial and human needs. This has resulted in competition between human and animals for the available feed resources coupled with constant drought. Hence, the high cost of poultry feed has continued to be the major problem in developing countries. Most often in an attempt for producers to break even, the broiler products become so expensive that they are always unaffordable to majority of the citizenry. It is therefore necessary to look for cheaper and simple ways of getting animal protein required for normal body growth and function (Ayanwale *et al.*, 2006). The prices of animal products are therefore beyond the reach of the average Nigerian owing to the increase in the production and maintenance cost of farm animals. This has necessitated the renewal of interest in exploring the feasibility of incorporating neglected or underutilized energy feedstuff. Several studies have emphasized the need for utilizing unconventional feedstuff as alternative feed ingredients (Durunna *et al*., 1990; Fanimo *et al*., 2007). Not much has been done in evaluating

the potential feed value of some multipurpose tree products such as baobab *(Adansoniadigitata).* The pulp and seeds are not only rich in energy and protein, but also provides some necessary fiber, vitamins, minerals and amino acids, particularly, lysine (5.0 – 11.2 mg/100g in seeds and 1.7 – 8.7mg/100g in pulp) and methionine (1.0 – 2.29mg/100g in seeds and 0.2 – 1.6mg/100g in pulp) (Magdi and Osman, 2004) which are limited in most cereals but essential for livestock growth and development (Murray *et al*., 2001). It is therefore capable of complementing the energy and protein of maize in poultry diets. Oyeleke *et al.* (2012) reported that the mature baobab fruit is starchy and rich in vitamin C, calcium, iron, magnesium and potassium in addition to high anti oxidant levels (Magdi and Osman, 2004). The pulp and fruit are highly digestible with low anti – nutritional factors (Adeosun *et al*, 2013) and the nutrient content is similar or higher than that of cereal grains (maize and sorghum). These necessitated the present study, in order to replace the expensive ingredients in livestock feeds especially for the monogastric animals. The objectives of the study is to; determine effect of feeding baobab (*Adansoniadigitata*) pulp on growth performance of broiler chickens and the cost effectiveness of including baobab (*Adansoniadigitata*) pulp in broiler chicken diets.

MATERIALS AND METHODS

Source of Baobab Fruit

Baobab fruit used for this experiment were harvested at mature stage which was indicated by the hard brown colour of the ectoderm from the trees using locally made equipment aroud Mamudo, Danchuwa, Alaraba and Mele in Potiskum Local Government area of Yobe State, Nigeria.

Processing

Dried baobab fruits were processed by cracking open the hard shell of the baobab fruits using a small hammer to remove the inner contents (epicarp), and pounded using a mortar and pestle while the seed and pulp were separated The pulp were slightly milled and separated from the unwanted coarse material

Experimental Site

The study was conducted at the poultry unit of Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria. Zaria is located within the Northern Guinea Savannah of Nigeria with an average annual rainfall, relative humidity and temperature of 1,100 mm, 75% and 24.4^{O} C respectively, on Latitude 11^{o} 12'N and Longitude 7^{o} 33'E at an altitude of 610m above sea level (Ovimap, 2014).

Experimental design and management

Three hundred (300) day old broiler chicks (Anak) were purchased from Zarm Farm. The birds were vaccinated against Newcastle disease (intra ocular) on the day of arrival and brooded together for three days using kerosene stoves and electricity bulbs as sources of heat and light. They were fed a common diet during this period. The birds were subsequently weighed and allotted to five dietary treatments. The birds were housed in a deep litter system throughout the period of the research. The treatments were replicated three times with twenty chicks per replicate. The feeding trial lasted for eight weeks. Feed and water were provided *adlibitum.*

Experimental diets

The composition and calculated analysis of the experimental diets are presented in Table 1. The test ingredient was included at 0, 5, 10, 15 and 20% representing 1 (control), 2, 3, 4 and 5 respectively for broiler finisher (28 days old). The diets were isonitrogenous and isocaloric and met the recommended crude protein and metabolisable energy requirements as stated by NRC (1994).

Table 1: Proximate composition and anti-nutritional content of test ingredients

Nutrients	Pulp	Seed	Pulp-Seed
Crude protein	5.85	17.27	9.29
Crude fibre	6.50	23.50	10.85
Ether extract	7.45	19.07	12.25
Ash	6.50	4.89	4.40
NFE	73.78	52.82	63.21
Anti-nutrients			
TIA (IU/mg)	0.011	0.26	0.10
Saponin (%)	0.41	0.95	0.57
Phytate (mg/100g)	1.11	1.72	1.17
Tannin (mg/100g)	0.018	7.26	0.031
Oxalate (mg/100g)	0.007	2.93	0.112
Alkaloid (%)	2.82	5.54	3.32
Flavonoid (%)	1.26	13.62	3.34

TIA = Trypsin inhibitor activity,
NFE = Nitrogen Free Extract

Parameters determined in data collection

Performance

The birds performance such as feed intake, weight gain, feed conversion ratio were measured weekly while mortality was recorded as it occurred and the cost of experimental diets were calculated based on the prevailing market price at the time of the experiment.

Profitability of Production

The profitability of broiler production was estimated using budget analysis and profitability ratios (Adeoti and Olawumi, 2013). The budget analysis involves the deduction of the total variable cost (Naira) from the total revenue of live birds (in Naira) to obtain the gross margin for each bird. The total variable costs of production are the cost of day old chicks, labour, feed, veterinary service, medication and other miscellaneous expenses. That is Gross margin is equal to Gross revenue minus Total variable cost. It was calculated by the given formula as follows:

$$GM = \sum_{i..1}^{n} PiYi - Ci$$

Where: GM = Gross margin

Pi = Price per Kg of meat

Yi = Total live weight in kilogram of meat

Ci = Total variable cost incurred on bird

I…n = Total number of birds.

The profitability ratios include the benefit cost ratio (BCR), the profitability index (PI) and the rate of return on investment (ROI). Calculated as follows

Benefit cost ratio (BCR) = $\frac{TR}{TC}$

Profitability index (P1) = $\frac{NP}{TR} = \frac{GM}{TR}$

Rate of return on investment (ROI) = $\frac{NPX\ 100}{TC}$ = $\frac{GMX\ 100}{TC}$

Where: TR = Total revenue (value of the total live weight of a broiler), TC = Total cost of production of a broiler, NP = Net profit of a broiler production

Data analysis

All data collected were subjected to analysis of variance (ANOVA) using the General Linear Model Procedure of SAS 9.2 (2002). Significant differences among treatment means were compared using Dunett multiple ranged in the SAS Package.

RESULTS AND DISCUSSION

The effects of feeding graded levels of baobab (*Adansoniadigitata*) pulp on finisher birds is shown in Table 2. The average daily feed intake ranged from 103.37 – 109.80g. Significantly (P<0.05) higher values of 107.88g and 109.80g for daily feed intake were recorded in birds fed 15% and 20% BPM . The increase in feed intake observed was due to sweetness of the pulp. Pulp is very sweet depending on the species and geographical location and the pulp sweetness is provided by fructose, sucrose and maltose contents of the pulp. According to Murray *et al.* (2001), sugars in the baobab pulp account for about 35.60% of the total carbohydrate content, which explained the noticeable sweet taste of the pulp and definitely increased feed intake of the birds. The values recorded in this study for final weight and daily weight gain ranged from 1928.50 – 2080.50g and 42.09 – 47.55g respectively. Significantly (P<0.05) higher values 2080.50g, 2076.40g and 2071.00g final weight were recorded in birds fed 0%, 5% and 10% respectively while significantly (P<0.05) lower values 1959.40g and 1928.50g final weight were recorded in birds fed 15% and 20% BPM respectively this was as the result of very low fibre content of BPM . Insignificant (P>0.05) differences were observed across the treatment groups except birds fed 15% BPM (43.22g) and 20% BPM (42.09g) for daily weight gain. The result of this study agreed with the finding of Bolu and Olutunde (2009) who reported proportionate increase in weight gain when birds were fed with increased levels of baobab fruit pulp. This finding disagree the work of Adeosun *et al.* (2013) who reported significant (P<0.05) decrease in final, total and daily weight gain when baobab pulp fed to layers beyond 10.5%. Sola-Ojo *et al.* (2013) who reported insignificant (P>0.05) effects of diets was observed in the final weight, total weight gain and average daily gain of broilers fed dietary levels of Baobab pulp. Feed conversion ratio (FCR) recorded ranged from 2.17 – 2.62. Significant (P<0.0) higher values 2.55 and 2.62 were recorded in birds fed 15% and 20% BPM while significantly (P<0.05) lower values 2.17, 2.22 and 2.12 were recorded in birds fed 0%, 5% and 10% BPM. This implies that feed utilization efficiency was better at 0% BPM, 5% BPM and 10% BPM, inclusion level, while poor utilization of feed was observed at 20% BPM and 15%BPM inclusion. The insignificant (P>0.05) difference observed between birds fed 0% BPM , 5% and 10% BPM revealed the efficiencies of BPM to replace conventional feed stuff in broiler diets up to 10% BPM as FCR is a good indicator of how well livestock utilize feed intake for weight gain. This agreed with the work of Egbewande *et al.* (2012) who reported non-significant (P>0.05) differences among layers fed diets containing baobab pulp. The feed cost per kilogram of feed, total feed cost, cost reduction and cost per Kilogram gain ranged from ₦71.62 - ₦89.70, ₦220.24 - ₦257.36, ₦0.00 – ₦37.12 and ₦173.42 – ₦193.29 respectively. Higher feed cost/kg (₦89.70), total feed cost (₦257.36). The cost of feed was proportionally related to the BPM inclusion level, this showed that the cost of producing one kilogram of feed reduced as the inclusion level of BPM increased. This is also in line with the main objectives of usage of unconventional feed stuffs (Bawa *et al.*, 2003 and Abeke *et al.*, 2008). This result also agreed with

the value₦81.27 – ₦93.91 reported by Nworgu *et al.* (1999) and ₦69.90 – ₦97.82 Nworgu (2002), but lower than the values₦137.48 – ₦157.62 reported by Jegede (2006). The variation could be due to test ingredients used, cost of feed stuff and season of the year the experiment was carried out. The mortality recorded in this study ranged from 0.63 – 1.27%. The total feed cost for this study ranged from 52.07-56.10% of the total cost of production and this was lower than 75 - 80% reported by the previous workers (Nworgu *et al.*, 1999; opera, 1999). The reduction in the total feed cost recorded in this study was as a result of the drop in the cost of maize and baobab pulp used in feed formulation. The cost of day-old chicks constituted 19.13-20.48% of the total cost of production which is lower than 24-25% of the total cost of production reportedbin the literature (Adeoti and olawumi, 2013). The difference might be due to differences in the source of day-old chicks and time of the purchase. The cost of medication was 2.10-2.25% of the total cost which was lower than 4% of the total cost of production (Khan *et al*., 2004). The benefit cost ratio ranged from 1.82 to 1.93 which is higher than 1.34 reported by Mohsin*et al*. (2008) for broiler production and the profitability index ranged from 0.45-0.48 which was within the range of 0.48-0.52 reported by Nworgu (2007).The rate of return on investment (81.57-93.01%) fell within the range of 76.2-106.04% reported in literature(Ngworgu,2007). Higher total revenue gross margin, benefit cost ratio, profit index and rate of return on investment was found in birds fed 5% BPM and lower in bird fed 20% BPM but insignificant ($P>0.05$) differences were observed , this implies that profitability was higher at most level of BPM inclusion compared to 0% BPM.

CONCLUSION

The inclusion of BPM in broiler chicken diets significantly ($P<0.05$) increased feed intake and weight gain by 3.88% while feed cost and mortality were decreased by 20.37%. Higher profit margin (8.08%) was recorded in birds fed test diets. It can be concluded that Baobab pulp can be included in broiler chickens diets up to 20% but the optimum levels of inclusion was 5%, It has the advantage of increased performance and reduced feed cost of broiler chickens thereby increasing profitability and protein supply to the greater populace especially in the developing countries like ours in which feed cost is a major constraint in poultry production.

Table 2: Gross composition of the experimental diet (4-8 Weeks)

	Inclusion levels of baobab pulp meal (% BPM)				
Ingredient (%)	**0**	**5**	**10**	**15**	**20**
Maize	55.50	50.50	45.45	39.15	33.95
Baobab Pulp Meal	0.00	5.00	10.00	15.00	20.00
Groundnut cake	15.15	15.25	16.00	16.80	17.00
Soybeans meal	15.00	15.00	15.00	15.00	15.00
Maize offal	10.00	10.00	10.00	10.00	10.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	0.30	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.30	0.20	0.00	0.00	0.00
*Pre-mix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated					
ME (Kcal/Kg	2952.55	2956.25	2955.76	2955.67	2960.14
Crude protein	20.28	20.23	20.14	20.24	20.16
Crude fibre	3.55	3.79	4.07	4.35	4.59
Ether extract	4.07	4.27	4.50	4.73	4.93
Calcium	1.10	1.12	1.14	1.16	1.18
Av. Phosphorus	0.63	0.63	0.63	0.63	0.63
Lysine	1.11	1.12	1.17	1.18	1.24
Methionine	0.51	0.53	0.56	0.58	0.60
Cost (₦/Kg)	89.70	79.56	76.49	75.40	74.62

*Bio-mix finisher supplied/kg: Vit.A = 2125IU, Vit.D3 = 375IU, Vit.E = 2.50mg, Vit.K_3 = 0.375mg, Vit.B_1 = 0.400mg, Vit.B_2 = 1.00mg, Niacin = 5.00mg, Panthothenic Acid = 1.25mg, Vit.B_6 = 0.375mg, Vit.B_{12} = 0.003mg, Folic Acid = 0.125mg, Biotin H2 = 0.188mg, Choline 0.225mg chloride = 43.75mg, Cobalt = 0.05mg, Copper = 0.75mg, iodine = 0.25mg, Iron = 5.00mg, Manganese = 10.00mg, Zinc = 7.50mg, Selenium = 0.05mg, Anti-oxidant= 0.313mg, BPSM = Baobab pulp-seed meal, Av. = Available

Table 3: Growth performance of finisher broiler chickens fed graded levels of baobab pulp meal.

	Inclusion levels of baobab pulp meal (% BPM)					
Parameter	**0**	**5**	**10**	**15**	**20**	**SEM**
Live weight (g)	749.20	749.21	749.24	749.18	750.00	4.70
F /I/Day (g)	103.37^{b}	104.64^{b}	104.69^{b}	107.88^{a}	109.80^{a}	1.92
Final Weight (g)	2080.50^{a}	2076.40^{a}	2071.00^{a}	1959.40^{b}	1928.50^{b}	38.46
W/G//Day (g)	47.55^{a}	47.40^{a}	47.21^{a}	43.22^{b}	42.09^{b}	2.72
FCR	2.17^{a}	2.22^{a}	2.22^{a}	2.55^{b}	2.62^{b}	0.07
Feed Cost (₦)	89.70	78.56	76.49	73.40	71.62	
T/Feed Cost (₦)	257.36	230.14	224.11	221.63	220.24	
C/Red. (₦)	0.00	27.05	33.25	35.40	37.12	
Cost/Gain (₦/g)	0.19	0.17	0.18	0.18	0.19	
Mortality (%)	1.27^{a}	0.63^{c}	0.95^{b}	1.25^{a}	1.27^{a}	0.02

^{abcd} = Means within row with different superscript differ significantly (P<0.05).
F/I = Feed intake; FCR = Feed conversion ratio; T = Total; C/Red = Cost Reduction; W = Weight; G = Gain

Table 4: Profitability analysis of broiler chickens fed graded level of baobab pulp meal

	Inclusion levels of baobab pulp meal (% BPM)					
Parameter	**0**	**5**	**10**	**15**	**20**	**SEM**
L/W (g)	2052.40^{a}	2076.40^{a}	2071.00^{a}	1959.40^{b}	1928.50^{b}	40.66
T/F/C (₦)	381.21^{a}	347.07^{b}	339.03^{c}	336.40^{c}	337.40^{c}	3.38
T/P/C (₦)	679.54^{a}	645.40^{b}	637.42^{c}	634.73^{c}	635.73^{c}	3.38
TR (₦)	1,231.40	1,245.80	1,200.50	1,175.60	1,157.10	76.78
GM (₦)	551.90^{b}	600.41^{a}	563.16^{b}	540.91^{bc}	521.37^{c}	23.53
BCR	1.82^{c}	1.93^{a}	1.88^{b}	1.85^{b}	1.82^{c}	0.04
PI	0.45^{b}	0.48^{a}	0.47^{a}	0.45^{b}	0.45^{b}	0.01
ROI (%)	81.51^{c}	93.01^{a}	88.31^{b}	85.14^{b}	81.97^{c}	3.61

^{abc} = Means within row with different superscript differ significantly (P<0.05).L/W = Live weight; T/F/C = Total feed Cost; T/P/C = Total Production Cost; TR = Total revenue; GM = Gross magin; BCR = Benefit cost ratio; PI = Profit index; ROI = Rate of return on investment.

REFERENCES

Abeke, F. O. and Otu, M. (2008). Anti-nutrients in poultry feeds; concern opinions. *Proceeding of 13th Annual Conference of the Animal Science Association of Nigeria* (ASAN), 15th-19th September 2008 A.B.U. Zaria Nigeria Pp 376–378.

Adebayo, O.O. and Adeola, R. G. (2005). Socio economic factors affecting poultry producers in Ejigbo Local Government area of Osun State.*Journal of Human Ecology*. 18(1): 39 – 41**.**

Adeosun, S. I., Ogundipe. S. O. and Omage, J. J. (2013). Effects of synthetic ascorbic acid and baobab fruit pulp meal supplementation as source of ascorbic acid for layers diets during cool wet season (Livestock

improvement and health management). *Journal of Advances in Agricultural Science and Technology*. 1(2): 24 – 27.

Adeoti A. and Olawumi, S. (2013). Economic Assessment of Raising Different Broiler strains.*Asian Journal of Poultry Science*. pp. 1-8**.**

Ayanwale, B. A., Adebimpe, O.M. and Kudu, Y.S. (2006).An evaluation of feather meal as a protein source in Rabbit diets: *proceeding 31st Annual conference Nigeria Society for Animal Production* (ASAN). 12th – 15th March 2006, Kano. Nigeria Pp. 234 -238.

Bawa, G.S., Tegbe, T.S.B. and Ogundipe, S.O. (2003). Effects of Feeding graded Levels of Lablab seed as a replacement for soya bean on the performance characteristic of young pig. *In: Proceeding of 28th NSAP Conference. Ibadan, Nigeria* Pp. 230-232.

Bolu, S.A. and Olatunde, A. A. (2009). Response of broilers to different sources of vitamin C. *Journal of Agricultural Resources and Development*. 2(1): 7-13.

Durunna, C.S., Udedibre, A.B.I. and Anyanwu, G.A. (1990). Contribution of maize/sorghum dried brewers grain, cocoyam cob and cassava tuber meal as substitute for maize in the diets of laying hens. *Journal of Agriculture, Biochemistry and Environment*. 2: 1 – 7.

Egbewande, O.O., Olorede, B.R., Maigandi, S.A. and Hassan, W.A. (2012). Cambaring heat stress in layers withbaobab pulp, amarantus leaves and tiger nut in Sokoto metropolis. *In proceeding 17th Annual Conference of NIAS–ASAN joint meeting held on* 9 - 13 September 2012 Abuja.

Fanimo, A.O., Adebayo, A.J., Oduguwa, O.O. and Biobaku, W.O. (2007). Feeding value of cashew testa for broiler chickens. Nigerian *Journal of Animal Production*, 34(1): 83 – 93.

Jegede, A.V., Oduguwa, O.O., Fanimo, A.O., Bamgbose, A.M. and Agunbiade, J.A. (2006). Effect of processing methods on the utilization of shrimp waste by broiler chickens. *Nigerian Journal of Animal Production.* 33(1): 23-34.

Khan, S., Farooq, M. and Durrani, F.R. (2004). Economic Analysis of broilers farms in the arid zone (Pakistan) *Sarhad Journal of Agriculture.* 20: 337-341.

Magdi, A and Osman, M.A. (2004). Chemical and Nutrient Analysis of Baobab (*adansonia digitata*) Fruit and Seed Protein solubility. *Plant Foods for Human Nutrition*. 59: 29 – 33.

Medugu, C.I., Raji, A.O., Igwebuike, J.U. and Barwa, A. (2011). Alternative cereal grains and cereal by – products as sources of energy in poultry diets – *A review Research Opinion in Animal and Veterinary Science* Pp.530 – 542.

Moshin, A.Q..,Riaz, S. Asad, R and Mushtag, A. (2008). Profitability analysis of broiler production in Rawanlpindi district. *Journal of Agriculture Science* 45:514-519.

Murray, S.S., Schoeninger, M.J., Bann, H.T., Pickering, T, R. and Marlent, J,A. (2001).

Nutritional Composition of some Wild Plant Food and Honey Used by Hadza Foragers of Tanzania *Journal of Food Composition Analysis.* (14): 3 – 13.

Oyeleke, G.O., Salam, M.A. and Adetoro, R.O. (2012). Some Aspects of Nutrient Analysis of Seed, Pulp and Oil of Baobab (*Adansonia digitata*). *Journal of Enviromental Science, Toxicology and Food Technology.* (1): 32 – 35.

Sola-Ojo, F.E.,Toye, A.A.,Bolu,S.A.O.,Ojo, V.,Okukpe, K.M.,Alli, O.I., Adeyemi, K.D. and Garba, S.O. (2013). Effects of Baobab (*Adansoniadigita*) seed meal on growth and Morphometric Traits in Broiler Chickens *MSEB Journal.* 13 (1&2): 29-32.

NRC(1994). Nutrient requirements of poultry 9th revised edition.Nutritional Academic Press. Washington D.C. USA.

Nworgu, F.C., Adebowale, E.A., Oredein, O.A. and Oni, A. (1999). Prospects and economics of broiler chicken production using two plant protein sources *Tropical Journal of Animal Science*. 2(1): 159 – 166.

Nworgu, F.C., Ogungbenro, S.A. and Solesi, K.S. (2007). Performance and some Blood Chemistry indices of Broiler Chicken served fluted pumpkin (*Telferiaoccidentalis*) leaves Extract supplement. *American-Eurasian Journal of Agricultural and Environmental Science*, 2(1) 90-98.

Nworgu, B.I. (2002). Production and management of indigenous poultry species. Training manual on national training workshop on poultry production in Nigeria. September, 1 – 6. Pp 15 – 26

Opara, C.C. (1999). Studies on the use of *Alconiacondiofolia* leaf meal as feed ingredients in poultry diets. Msc. Thesis Federal University of Technology, Oweri. Pp. 115 – 118.

Ovimaps (2014). Ovilocation map; Google earth imaginary. Date 6th march 2014.

SAS (2002). Statistical Analysis System, Inc. User`s Guide. Statistic version for windows SAS Software, version 9.2 Cary, North Carolina USA.