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Full Length Research Paper

Economic importance and growth rate of broiler chickens served fluted pumpkin (*Telfaria occidentalis*) leaves extract

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An 8-week experiment was conducted to assess the weight gain and the economic importance of broiler chickens served fluted pumpkin leaf extract (FPLE) during the late dry season in Ibadan, Nigeria. One hundred and twenty day-old Anak 2000 broiler chicks were randomly distributed to 5 treatments which contained 0, 30, 60, 90 and 120 ml of FPLE per litre of water for A, B, C, D and E, respectively, in a completely randomized design. Each treatment was replicated three times. The birds were fed with the same starter and finisher diets. The feed and water were served *ad libitum.* The experiment lasted for 8 weeks. The FPLE is rich in protein (21.31%), ash (10.92%) and low in crude fibre, oxalate and tannin. Results of average body weight gain was significantly (P<0.05) different, which was least in control (1676.19 g/bird) compared to the birds served 30-120 ml of FPLE (1833.09-2089.70 g/bird). The cost of feed out of the total cost of production was least on the birds served 30- 120 ml of FPLE (61.79%) unlike control (66.21%). Benefit cost ratio (BCR) was best on the birds served 30-120 ml FPLE/l of water (1.91:1-2.06:1) compared to control (1.76:1). The net profit (NP) and cost of feed per kilogramme live weight gain were ₦307.13 and N87.50 /kg for the birds served 120 ml FPLE/litre of water compared to control (₦208.17 and ₦96.52/kg), respectively. An average NP of ₦273.56 was made for the broiler chickens served 30-120 ml FPLE/l of water with reference to control (₦208.17), which was a difference of N64.39 per bird. For improved growth rate and higher profit margin, it is advisable to serve broiler chickens 120 ml FPLE/litre of water during the late dry season. This is a simple, affordable and available technology for poultry farmers most especially during the harsh climatic period of the year.

Key words: Economic importance, broiler chickens, fluted pumpkin leaf extract, weight gain, profitability ratio.

INTRODUCTION

Livestock industry in Nigeria is ridden with myriad of problems, which have resulted to a gross shortage of meat and other animal products (Nworgu, 2002). The growth rate of agricultural sector in Nigeria is still below the potentials of the country natural and human resources due to high cost of agricultural inputs, poor funding of agriculture, inadequate functional infrastructural facilities, inconsistencies of government agricultural policies, inadequate private section participation, poor mechanized farming and little or no adoption of some simple agricultural technologies developed by scientists (Nworgu, 2006). In spite of her numerous hu-man and natural resources, Nigeria still remains among the least consumers of animal protein in Africa. The pro-tein intake of an average Nigerian is about 53.8 g with only 6.0-8.4 g/head/day of animal origin (Egbunike, 1997). CBN (1993) revealed that North America, Western and Eastern European countries consume 66, 39 and 33 g of animal protein per head per day respectively, while an average Nigerian consums 7.5 g which is below the recommended level of 27 g/head/day. To increase protein intake in Nigeria, there is urgent need to increase broiler production at household and commercial holdings. The per capita consumption of broiler meat in Nigeria

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was below 2.0 kg (1kpi and Akinwunmi, 1981) as against 12.0 kg to 15.5 kg between 1985 and 1990 in South Africa (Viljoem, 1997). Nigeria presently is food in secured. Food insecurity is a critical variable for understanding the nutritional status of low-income populations in the world. The problem of undernourishment is worst in African countries where 32% (one out of every three Africans) of the population was under-nourished during 1983-1985 period compaired to 22% in far East, 14% in Latin America and 11% in near East (FAO, 1990). This problem still remains the same presently in Nigeria. The WHO (2002) noted that at least 50% of all deaths among the under-age are attributed to malnutrition, while lucky survivors cannot run away from the stark realities of poor health and overall indigent lifestyle.

Efficiency of feed and labour utilization is a very important means of increasing profit in any poultry enterprise. Nworgu and Egbunike (2000) revealed that profit margin in poultry production depended mainly on feed utilization, cost of day old chicks and efficient management of resources. These authors further stated that the economy of new technologies should be assessed to determine how much productivity needs to be increased or what risk needs to be reduced and that diet formulated must be directed towards profit maximization, which is accomplished by relating inputs to some economic measures of broiler performance. Poultry production is regarded as a means of sustainable livelihood and a way of achieving a certain level of economic independence. Oluyemi (1984) and Kekeocha (1985) noted that feed cost was over 70% for broiler production, while Nworgu et al. (1999) reported that feed utilization accounted 60-70% of the total cost of broiler production. The authors further stated that profit margin in broiler production in Ibadan ranged from N3.15 – N51.36 per bird compared to N30.80 in Zaria (Ogundipe, 1998) and N44.60 in Owerri (Nwajiuba, 1998). Profit margin in broiler production is sensitive to time of sales (Junaid, 1984).

Fluted pumpkin (*Telfaria occidentalis*) is a leafy vegetable called Ugu in Igbo and Iroko in Yoruba. Leafy vegetables supply minerals, proteins and vitamins, thereby complementing the inadequacies of most feedstuffs (Ifon and Basir, 1980). The protein from leaf may be recovered and fed as solution in form of protein concentrates (Farinu et al. 1992). In Nigeria, *T. occidentalis* leaf extract is regarded as blood tonic for both rich and the poor (Egbunike and Nworgu, 2005). Adedapo et al. (2002) used fluted pumpkin and *Sorghum bicolor* extracts as potent haematinics in domestic rabbits and concluded that the rabbits served these extracts had the highest values of packed cell volume, haemoglobin, red and white blood cells and faster responded to therapy. One of the ways of improving the standard of living of the poultry farmers is to increase their profit margin through the application of simple, affordable, easily available and sustainable technology such as the use of fluted pumpkin leaf extract (FPLE) in broiler nutrition and production during the dry season in Nigeria. In Nigeria, animals loose weight during the dry season, hence farmers net profit is reduced and cost of animal protein per unit is very high for the populace. The use of FPLE in broiler production is not common in Nigeria. Hence, this study was carried out to assess the growth rate, profit and benefit cost ratio of broiler chickens served FPLE.

MATERIALS AND METHODS

One hundred and twenty day-old Anak 2000 broiler chicks were randomly allotted to five treatments containing 0, 30, 60, 90 and 120 ml of fluted pumpkin leaves extract (FPLE) per one litre of water for A, B, C, D and E, respectively in a completely randomized design. The 0 ml (A) served as control. Each treatment was replicated three times. The experiment lasted for eight weeks (i.e four weeks for each phase). The broiler starters were fed the same diet, while broiler finishers were equally fed the same finisher diet (Table 1). Feed and water were served *ad libitum*. The FPLE was served at four days interval throughout the period of the experiment. Routine management practices were duly carried out. Data on feed and water intake were recorded daily, while weight gain was determined on weekly basis.

Preparation of fluted pumpkin leaves extract

One kilogramme of freshly cut fluted pumpkin leaf with leaf stalks were washed, drained, chopped and pounded in a mortar with pestle. This was then squeezed and filtered with a sieve to obtain the homogenous extract of the fluted pumpkin leaf.

Proximate and chemical analyses

The proximate composition of the experimental diet and that of FPLE were determined by AOAC (1990) methods. The minerals were determined by the procedures of Boehringer (1979). Sodium and calcium were read with PFP7 flame photometer and phosphorus was determined with spectrotometer (spectromic 21). Gross energy was determined using the bomb calorimeter method (Miler and Payner, 1959). Phytate was determined by the technique of Igbedion et al. (1994), while tannin was determined by the method of Hagerman and Ler (1983) and oxalate by the method of Talapatra and Price (1948).

Statistical analysis

Data collected were subjected to analysis of variance (ANOVA) in SPSS 10 computer programme and errors were calculated as standard errors of the mean (SEM), while Duncan's Multiple Range Test (DMRT) (Steel and Torrie, 1980) was used in assessing the significant differences among the treatment means. Significance was accepted at 0.5 level of probability.

Economic analysis

An economic appraisal of the study was done to highlight the efficiency of the FPLE in terms of profit margin. The cost of labour and

Table 1. Gross composition of broiler starter and finisher diets.

Ingredients (%)	Starter diet	Finisher diet
Maize	48.00	50.00
Corn bran	6.85	8.00
Palm kernel cake	5.00	8.05
Soya bean meal	20.00	17.00
Groundnut cake	12.00	9.00
Fish meal	4.20	3.50
Bone meal	3.00	0.35
Vitamin & mineral premix*	0.30	0.30
Lysine	0.25	0.20
Methionine	0.15	0.10
Salt	0.25	0.25
Calculated Analysis		
Crude protein (%)	23.07	21.00
Crude fibre (%)	3.42	4.07
Lysine	1.20	0.70
Methionine	0.71	0.50
Metabolizable energy (kcal/kg)	2906	3100

To provide the following per kg of diet: Vit A = 10,000 iu, vitamin D3 = 2000 iu, vitamin E = 5 iu, vitamin K = 2 mg, riboflavin = 4.20 mg, vitamin B12 – 0.01 mg, pantothenic acid = 5 mg, nicotinic acid = 20 mg, folic acid = 0.5 mg, choline = 3 mg; Mg = 5m g, Fe = 20 mg, Cu = 10 mg, Zn = 50 mg, Co = 125 mg and iodine = 0.5 mg.

and depression was calculated according to WBTP (1983). Some data were analyzed using descriptive and budgetary techniques (Akinsoye, 1989). The total cost of production, net profit and cost benefit ratio were determined as presented below:

TCP = TFC + TVC ……...(1)

Where TCP = total cost of production, TFC = total fixed cost of used resources whose quantities were fixed during the production period and TVC = total variable cost of used resources whose quantities varied during the production period.

NP = TR – TCP ……(2)

Where NP = net profit in naira and TR = total revenue.

NP = NR = NFI ……..(3)

Where NR = net return and NFI = net farm income.

GM = TR - TVC ……..(4)

Where GM = gross margin.

Profitability ratios

Profitability ratios were employed to explain vividly the extent to which the factors of production were used for profit maximization:

Benefit cost ratio (BCR) or capital turnover = TR / TCP ……(5)

Rate of returns on investment (RRI) (%) = NP / TCP x 100 ..(6)

Gross ratio (GR) = TCP / TR……(7)

Profitability index (PI) = NFI / GR …… (8)
= NP / TR

GR = gross revenue = total return

RESULTS AND DISCUSSION

The proximate chemical composition of the fluted pumpkin leaf extract (FPLE) indicated that it is rich in crude protein (21.31%), calcium (0.67%) and iron (18.50 mg/100 g) (Table 2). The leaf stalk is very rich in calcium (0.96%) and potassium (0.32%) and crude protein (20.00%). This reveals the reason why the Igbos from Eastern Nigeria eat the whole leaf and tender stems of fluted pumkin (FP). Hence, it is advisable to serve broilers the whole leaf extract of the plant at a recommended concentration. This indicates that FPLE is a valuable feed supplement for broiler production especially during the late dry season of the year. The value of crude protein of FPLE in this result is similar to the report of Okoli and Ngbeogba (1983) (23.50%), but lower than the values reported by Ladeji et al. (1995) (30.50%) and Akwaowo et al. (2000) (39.40%). Variations could be attributed to age of cutting, season of planting and cutting, agronomic practices adopted, method of processing and analysis. Mean final body weight (2133.70 g) and average weight gain (2089.70 g) in this study were highest in broiler chicken served 120 ml of FPLE per litre of water compared to control which had the least values of the parameters (Table 3). The final body weights of the birds reported here (1720.19 – 2133.70 g/bird) are slightly higher than the report of Ahmed et al. (2004) (1699.99 – 1814.58 g/bird) who fed broiler chickens phytase supplemented soyabean meal based diet and Jegede et al. (2006) (1536.70 – 1813.30 g/bird) when broilers were fed processed shrimp waste meal. The weight gain in this study is similar to that reported by Etuk and Udedibie (2006) (1737.00 – 2059.10 g/bird). Bashar and Abubakar (2001) reported that feed intake and weight gain of broiler chicken decreased with increased pumpkin seed meal (PSM) dietary inclusion and concluded that 30% PSM is too high for broiler chickens and that PSM should not be used as the only plant protein source. Adedapo et al. (2002) reported that *Sorghum bicolor* and FP leaf extracts as potent haematonics for domestic rabbits and concluded that they are good for blood formation in domestic rabbits. Achinewhu (1990) reported that albino rabbits fed diet containing fermented FP seed gained significantly ($P<0.05$) more weight than those fed unfermented FP seeds and casein. Achinewhu (1987) noted that most limiting amino acids in FP seeds are lysine, tryptophan and methonine. The mean final body weight and average weight gain were significantly ($P<0.05$) different among the treatments. Similar observations were made by Nworgu et al. (1999) when broilers were fed soyabean meal and groundnut cake based diet. Figure 1 shows the weekly weight gain of the broilers and

Table 2. Proximate chemical composition of fluted pumpkin leaf extract and broiler chickens diets (% DM Basis).

Fraction	Whole fluted pumpkin leaf extract	Leaf without leaf stalk	Leaf stalk only	Broiler stater diet	Broiler finisher diet
Crude protein	21.31	19.63	20.00	22.12	21.00
Crude fibre	6.41	6.28	6.11	3.50	3.48
Ether extract	5.50	5.20	5.00	3.46	3.84
Ash	10.92	7.00	6.11	10.87	10.97
Nitrogen free extract	55.56	58.02	57.92	62.92	65.57
Metabolsable energy(kcal/kg)*	3121	3111	3105	3072	3118
Gross energy (kcal/kg)	4420	4106	4002	-	-
Calcium	0.67	0.81	0.93	0.96	0.80
Phosphorous	0.40	0.45	0.30	0.40	0.34
Potassium	0.15	0.14	0.32	1.28	1.31
Nitrogen	3.41	3.04	3.20	3.70	3.36
Magnesium	0.43	0.47	0.38	0.26	0.21
Sodium	0.02	0.02	0.03	0.26	0.28
Zinc (mg/100gDM)	7.20	6.40	6.20	4.80	5.10
Iron (mg/100gDM)	18.50	16.60	15.94	1.14	1.20
Manganese(mg/100g/DM)	1.12	1.06	1.01	7.90	9.20
phytate(mg/100g/DM)	510.51	385.12	500.50	-	-
Tannin(mg/100gDM)	0.184	0.190	0.200	-	-
Oxalate(mg/100gDM)	0.0034	0.0039	0.0040	-	-

*Determined by Pazenga (1985)

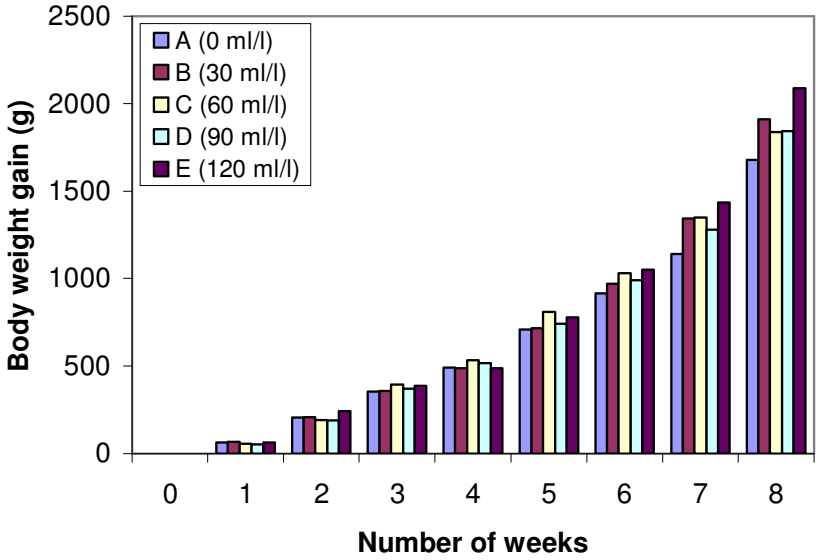

Figure 1. Effect of fluted pumpkin leaves extract on weekly body weight gain of broiler chicken.

it reveals that FPLE is a good supplement for broilers most especially from 5 weeks of age, as the birds served 30-120 ml FPLE/1 litre of water had better weight gain.

Total revenue (TR) and total cost of production (TCP) increased with increased concentration of FPLE. The TCP was very low because each broiler chick was bought at ₦50.00 in the month of December 2003, against ₦120 - ₦170 in the months of October and November 2003 (the exchange rate when the experiment was carried out was N140.00 to $1.00). Hence, increased profit margin. The profit varied from ₦215.06 per bird in control to ₦316.80 per bird for the broilers served 120 m/FPLE litre

Table 3. Average production cost and returns for intensive broiler production (₦ per bird).

Item	A	%	B	%	C	%	D	%	E	%
Revenue										
Sale of broilers ₦280/kg live weight	481.60		546.28		526.96		528.64		597.24	
Scale of manure (₦0.20/kg)	0.30		0.28		0.28		0.32		0.30	
Total revenue (TR)	481.90		546.56		527.24		528.96		597.94	
Variable cost of production										
Feed starter	45.64	18.37	45.58	17.03	44.28	16.17	44.33	16.45	45.98	16.37
Feed finisher	118.71	47.83	117.46	45.03	121.21	44.28	122.1	45.32	129.17	46.01
Total feed	164.35	66.21	163.04	62.51	165.49	60.46	166.43	61.78	175.17	62.39
Cost of fluted pumpkin leaf extract	0.00		2.60	0.99	5.20	1.89	7.80	2.89	10.40	3.70
Day old chick	45.00	18.13	45.00	17.25	45.00	16.44	45.00	16.70	45.00	16.03
Labour	6.00	2.42	6.00	2.30	6.00	2.19	6.00	2.22	6.00	2.13
Drugs	12.75	5.14	12.75	4.88	12.75	4.65	12.75	4.73	12.75	4.54
Vaccines	5.80	2.34	5.80	2.22	5.80	2.11	5.80	2.15	5.80	2.06
Medication	18.55	7.47	18.55	7.11	18.55	6.77	18.55	6.88	18.58	6.60
Maintenance and repair	0.30	0.12	0.30	0.11	0.30	0.10	0.30	0.11	0.30	1.40
Transport	0.20	0.08	0.20	0.07	0.20	0.07	0.20	0.07	0.20	0.07
Tax (3k/₦)	6.45	2.41	8.57	3.28	7.84	2.85	7.79	2.89	9.50	3.38
Miscellaneous	2.00	0.18	2.00	0.76	2.00	0.75	2.00	0.74	2.00	0.71
Total Variable Cost (TVC)	268.3	98.10	264.81	98.26	269.13	98.34	272.62	98.31	285.65	98.38
Fixed cost of production										
Housing(depreciation over 10 years)	1.36	0.55	1.36	0.52	1.36	0.49	1.36	0.50	1.36	0.48
Interest on loan	3.00	1.23	3.00	1.15	3.00	1.09	3.00	1.11	3.00	1.06
Equipment(depreciation over 5 Years)	0.20	0.08	0.20	0.07	0.20	0.07	0.20	0.07	0.20	0.07
Total Fixed Cost (TFC)	4.56	1.84	4.56	1.74	4.56	1.66	4.56	1.69	4.56	1.62
Total cost of production	273.19	100	269.40	100	277.18	100	269.39	100	290.21	100
Net profit	208.17		277.16		253.55		251.78		316.83	
Mean final body weight (g/bird)	1720.19^{e}		1951.14^{b}		1882.09^{d}		1888.70^{c}		2133.70^{a}	2.6^{+}

Table 3. contd.

Mean weight gain(g/bird)	1676.19^{e}		1907.14^{b}		1833.09^{d}		1844.70^{c}		2089.70^{a}	1.78^{+}
Daily weight gain (g/bird)	29.93^{e}		34.06^{b}		32.73^{d}		32.94^{c}		37.32^{a}	0.20^{+}
Cost of feed per kilogramme										
Live weight gain (₦/kg)	96.52^{a}		88.31^{c}		89.24^{c}		90.02^{b}		87.50^{c}	0.661^{+}
Survivability (%)	100		100		100		95.3		95.3	-

Means with different superscripts are significant (P<0.05).
₦ = Naria. Exchange rate was ₦140.00 = $1.00, + = standard error of mean (SEM).

Table 4. Effect of fluted pumpkin leaves extract (FPLE) supplement served to broiler chickens on profitability ratios.

Parameters	A (0m/l)	B (30m/l)	C (60m/l)	D (90m/l)	E (120m/l)
Rate of return on investment (RRI) (%)	76.20	102.99	92.64	90.83	106.04
Benefit cost ratio (BCR)	1.76:1	2.02:1	1.93:1	1.91:1	2.06:1
Gross ratio (GR)	0.57:1	0.49:1	0.52:1	0.52:1	0.48:1
Profitability index (PI)	0.43	0.51	0.48	0.48	0.52

of water. The profit per bird in this study is higher than the submission of Nworgu et al. (1999) and Nwajiuba (1998). This result reveals that the level of profit in broiler production depends on the cost price of the day-old chicks and the concentration(s) of the FPLE used, season and price of feed stuffs which vary within the year. However, Nworgu and Egbunike (2000) reported a profit of N83.34 when broiler chickens were fed 75% soybean meal plus 25% groundnut cake and Nworgu (2004) reported a profit margin of ₦55.00–₦156.05 when broiler chickens were fed centrosema leaf meal supplement. The cost of feed, day-old chick, medication, labour and the FPLE out of the total cost of production ranged from 60.46 - 66.21, 16.03 - 18.13, 6.60 - 7.47, 2.13 - 2.42 and 0.99 - 3.70%, respectively. These values are similar to the reports of Nworgu et al. (1999), except the percentage cost of day-old chick, which is lower in the present study.

The benefit cost ratio (BCR) was best on the birds served 30-120 ml FPLE/litre of water (1.91:1 - 2.06:1) compared to control (1.76:1) (Table 4). The BCR in the present study is higher than that reported by Nworgu and Egbenike (2000). The cost of feed per kilogramme live weight gain (₦87.50 -₦96.52) was least for the broiler chickens served 120 ml FPLE/litre of water and these values are similar to the values reported by Nworgu et al. (1999) (₦81.27 - N, 93.91) and Nworgu (2002) (₦69.98 - ₦97.82), but lower than the values reported by Jegede (2006) (₦137.48 - ₦151.62). Variation could be due to breed of broiler, test ingredients used, cost of feedstuffs and season of the year the experiment was carried out. The profitability index (PI) was best on the birds served 30-120 ml FPLE/l of water (0.48-0.52) as against 0.43 in control. The PI indicates that for every Naira earned as revenue on the birds served FPLE, about 48 to 52 Kobo retuned to the farmer as income compared to 43 kobo in control. The PI in this study for control (0.43) is in harmony with the report of Ajala and Alil-Balogun (2004) (0.43). The gross ratio was best (0.48:1) on the broilers served 120 ml FPLE/l of water whereby for every 48 kobo spent, the farmer gets 100 kobo return. The results of these parameters were similar to the findings of Nworgu et al (1999) and Nworgu (2000). High survivability recorded, indicates efficient management of the birds and that the FPLE was not toxic to the birds at the concentrations used. One bird each that died in treatments D and E was as a result of coccidiosis infection.

Conclusion

Broiler chickens can be served 30 to 120 ml of FPLE per litre of water at 4 days interval during the hot period of the year to stimulate feed intake, increase weight gain and profit margin. The birds served 120 ml of FPLE per litre of water for 8 weeks had the best performance in terms of weight gain, profit, cost benefit ratio and cost of feed per kilogramme live weight gain. The use of FPLE in broiler chickens production is most effective from five weeks of age.

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