EFFECTS OF REPLACING DIETARY FISH MEAL WITH PERIWINKLE FLESH ON THE PERFORMANCE OF BROILER CHICKENS.

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ABSTRACT

Broiler chickens were fed varying levels of Palm Kernel Cake (PKC), fishmeal and dried Periwinkle flesh. The use of isocaloric and isonitrogenous rations showed that feeding of 6% periwinkle flesh or 2% fishmeal along with 25% PKC significantly improved live weight, ($P < 0.05$) weight gain and feed conversion ratio. The two groups of birds fed these rations performed better than those fed either 15% PKC with 2% fishmeal or 25% PKC along with a mixture of 2.5% periwinkle flesh and 1% fishmeal.

KEYWORDS: Periwinkles Flesh, Fishmeal, Broilers, Protein.

INTRODUCTION

Feed accounts for between 70 and 80% of the total costs of broiler production in Nigeria (Akinwunmi, *et al.*, 1979). Inexpensive substitutes for conventional feeding stuffs are therefore important. One of the by products of the industrial extraction of plam kernel oil from the oil palm nut is the palm kernel cake. Non-ruminants are said not to take readily to palm kernel cake because of its high fibre content, grittiness and dryness which render the cake not only unpalatable but also causing considerable salivation during chewing (Collingwood, 1958). However, Temperton and Dudley (1941), Babatunde *et al.* (1975) and Nwokolo *et al.* (1977) reported that palm kernel cake could be used in feeding monogastrics. The periwinkle, snail, crab, lizard and frog are lesser known protein sources that had hitherto had little attention. However, different strains of periwinkle *(Tympanotonus fuscatus, Pachymelania aurita, Pachymelania byronensis* and *Littorina littorea)* have been chemically analysed and shown to be of high nutritive value (Egwele, 1982; Mba, 1980 and Umoh *et al.* 1980).

The objectives of this study were to investigate the possible usage of a high level of palm kernel cake and the replacement of fishmeal with periwinkle flesh in broiler ration.

MATERIALS AND METHODS

Collection and Extraction of the Perinwinkle Flesh:

Perinwinkle *(Pachmelania aurita)* were purchased from a fresh water stream in Esuk - Itam, Akwa - Ibom State of Nigeria. They were extracted by first soaking them in cold water (at room temperature) for 15 minutes and then in hot water at 70^0C for 30 minutes. Sterilized injection needles were then used in extracting the flesh from the shells. The extracted flesh, oven-dried at 60^0C for 72 hours, was milled (Okon and Ogunmodede, 1987).

Animal Management and Diets.

A batch of 180 day-old Hyperco broiler chicks randomly assigned to five pens of three replicates with 12 chicks per replicate were raised on deep litter for eight weeks. Five isocaloric and isonitrogenous rations were formulated. There was a control ration (A) and four experimental rations containing either 15% of 25% palm kernel cake in addition to gradual replacement of fishmeal by dried periwinkle flesh (Table 1). Feed and water were given ad libitum. Weekly measurements of body weight, feed intake, weight gain and feed conversion rations were recorded.

Statistical Analysis

The feeding trial was based on the completely randomized block design and data collected were subjected to the analysis of variance (ANOVA) method of Steel and

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Torrie (1960). Significant values were separated using the Duncan's (1955) multiple range test. Where carcass qualities were expressed as a percentage of body weight, Arc sine values were also used in the analysis of variance.

RESULTS

Average weekly body weights of the experimental birds are given in Table 2. At the end of the first week, birds fed Diet A (control) performed better than those birds fed diet C,D and E. From the end of the 3rd week to the end of the experiment at the 8th week, birds fed diet E had significantly heavier body weights (271.11±7.70g to 1373.70 ±58.19g) when compared with birds feed diet B (225.00±16.67 g to 1159.37±32.36g) and those fed Dit D (239.90g±8.88g to 1190.71g ±33.64g). By the end of the first three weeks of study, there was no significant difference in the quantity of the experimental diets consumed by the Birds (table 3). From the end of the fourth week to the end of the eighth week, birds fed high levels of palm kernel cake and periwinkle flesh (Diet E) consistently consumed more feed than the control group (Diet A).

Between the 5th and the 7th weeks, birds fed high levels of palm kernel cake and periwinkle flesh (Diet E) consistently gained more weight (140.00g±1.67 to 246.32±39.37 g) (table 4) than those fed low level PKC and high level fishmeal (diet B) (100.00±12.02 to 182.55±12.08g) At the end of the third week (Table 5), birds fed diet E had a better feed conversion ratio (1.75±0.06) than those birds fed diet D (2.11±0.33) and B (2.48±0.46). Variations in rankings for feed conversion ratio occured in the different groups between the 5th and 7th weeks, however, birds fed high levels of palm kernel cake and periwinkle flesh were among the groups with the best feed conversion ratios in the last two weeks of the study.

DISCUSSION

Palm kernel cake (PKC) was fed to broiler chickens as a partial replacement of groundnut cake (GNC). A source of animal protein was needed to ensure acceptable performance of the birds. Fishmeal had been the conventional animal protein fed, but, this study showed that periwinkle flesh can replace fishmeal. Mean values for body weight of the eight weeks old broiler chickens were similar to those reported by Temperton and Cassidy (1964) but lower than that reported by Benoff and Hudspeth (1981), who reported mean live weights of 1.661kg to 1.881kg. Hayse *et al* (1973) who reported live weights of 1.494kg for the female broiler and 1.841kg for the male broiler, and Kiker (1976) who reported mean live weights of 1.5097kg for female broilers and 1.7552kg for male broliers.

The birds fed 25% PKC along with 2% fishmeal (Diet C) and 25% PKC along with 6% periwinkle flesh (diet E) weighed significantly more than birds fed the control ration (Diet A) those fed 15% PKC plus 2% fishmeal (Diet B) and Birds fed 25% PKC along with 2.5% periwinkle flesh and 1% fishmeal (Diet D). This finding is in agreement with the reports of Nwokolo *et al.* (1977) and Yeong (1980) who fed 20% to broilers but contrary to the report of Mohd (1982) who stated that the smallest amounts of PKC gave the best results. It would appear therefore, that feeding broiler chickens 25% PKC along with either 6% periwinkle flesh or 2% fishmeal significantly improved live weight.

Feeding birds 25% PKC along with 6% periwinkle flesh or 2% fishmeal increased feed intake when compared with the feeding of the control diet or 15% PKC along with 2% fishmeal. This may be due to the fact that diets containing high level PKC may not be as unpalatable as had earlier been reported in literature. Perhaps it could be suggested that the percentage availability of metabolisable energy from PKC was inadequate and birds had to increase their intake to make up their caloric intake.

The average feed intake observed in this study was higher than that reported by Oluyemi and Roberts (1979). This is probably due to the differences in the type of ration and the strain of birds used for the studies. The

TABLE 1: PERCENTAGE COMPOSITION OF EXPERIMENTAL DIETS.

INGREDIENTS	DIETS				
	A	B	C	D	E
	CONTROL				
Maize	50.00	43.68	40.20	40.95	42.39
Groundnut cake	18.62	15.07	11.95	12.30	10.78
Fish meal	2.00	2.00	2.00	1.00	0.00
Blood meal	5.00	5.00	5.50	5.00	5.00
Palm Kernel cake	0.00	15.00	25.00	25.00	25.00
Periwinkle flesh	0.00	0.00	0.00	2.47	6.00
Dried Brewer's grain	8.98	8.00	8.00	7.83	6.00
Wheat offals	11.55	8.30	4.40	2.47	1.88
Bone meal	3.00	2.10	2.10	2.10	1.70
Vit-min premix*	0.25	0.25	0.25	0.25	0.25
Dl-Methionine	0.20	0.20	0.20	0.20	0.20
L - lysine	0.00	0.00	0.00	0.03	0.40
Salt	0.40	0.40	0.40	0.40	0.40
Total	100.00	100.00	100.00	100.00	100.00
CALCULATED ANALYSIS					
M.E. Kcal/kg	2800.6	2800.13	2800.22	2799.81	2800.28
Crude Protein%	23.09	23.02	22.97	23.01	22.99
Crude Fibre%	4.30	5.38	6.02	6.11	4.73
Ether Extract	4.23	4.49	4.64	4.52	4.37
L -lysine	1.05	1.05	1.04	0.98	1.26
Dl - Methionine	1.52	0.53	0.54	0.50	0.49
Calcium	1.34	1.02	1.03	1.18	1.27
Phosphorus	0.66	0.53	0.52	0.46	0.43
Protein : Energy Ratio	121.27	121.64	121.91	121.68	121.80

*The following were present per kg: Vit A. 9,000.000 I.U., Vit. D. 1,280,000. I.U., Vit. E. 7,000 I.U., Riboflavin, 6,000 mg. Vit. B_3, 2,200 mg. Vit. B5 14,000 mg, Lysine, 120, 000mg, Methionine, 65,000 mg, Choline Chloride,240,000 mg, Mn, 60,000 mg, F_e 35,000 mg, Cu, 5,000 mg, Io, 1,100mg; Se, 100mg, Anti-Oxidant, 125, 00mg.

TABLE 2: AVERAGE WEEKLY BODY WEIGHT PER BIRD (g)*

Age in Weeks	DIETS				
	A	B	C	D	E
1.	$74.50 \pm 2.17_a$	$68.89 \pm 1.92_{ab}$	$64.87 \pm 1.68_b$	$65.78 \pm 4.02_b$	$64.44 \pm 3.47_b$
2.	141.28 ± 16.82	133.33 ± 0.01	136.75 ± 8.24	129.92 ± 6.66	135.35 ± 3.75
3.	$264.47 \pm 6.59_a$	$225.00 \pm 16.67_b$	$257.07 \pm 18.62_a$	$239.90 \pm 8.88_b$	$271.11 \pm 7.70a$
4.	$408.21 \pm 15.32_a$	$347.22 \pm 19.88_b$	$393.08 \pm 38.83a$	$374.65 \pm 11.06_{ab}$	$411.11 \pm 17.66_a$
5.	$546.63 \pm 25.94_a$	$447.22 \pm 7.88_c$	$542.88 \pm 37.14_a$	$486.11 \pm 17.35_b$	$551.11 \pm 18.36_a$
5.	$546.63 \pm 25.94_a$	$447.22 \pm 7.88_c$	$542.88 \pm 37.14_a$	$486.11 \pm 17.35_b$	$551.11 \pm 18.36_a$
6.	$745.85 \pm 20.67_a$	$622.78 \pm 22.63_c$	$709.65 \pm 101.34_{ab}$	$686.26 \pm 23.51_{bc}$	$795.91 \pm 65.52_a$
7.	$895.82 \pm 28.45_{bc}$	$805.33 \pm 33.10_d$	$956.37 \pm 37.68_b$	$871.63 \pm 7.39_{cd}$	$1042.22 \pm 53.93_a$
8.	$1201.45 \pm 89.70_b$	$1159.37 \pm 32.36_b$	$1325.61 \pm 61.71_a$	$1190.71 \pm 33.64_b$	$1373.70 \pm 58.19_a$

*Values denoted by different subscripts for a given week were significantly different ($p < 0.05$)

TABLE 3: AVERAGE WEEKLY FEED INTAKE PER BIRD (g)*

Age in Weeks	DIETS A	B	C	D	E
1.	81.58±8.08	83.33±0.01	81.19±3.70	83.33±16.67	83.33±0.01
2.	204.34±9.31	219.04±56.50	222.27±49.68	233.55±79.75	222.43±11.01
3.	218.37±26.18	222.22±0.01	228.95±11.66	228.95±11.66	237.04±25.66
4.	484.18±22.20	416.67±0.01b	$414.98±21.14_b$	$429.30±21.88_b$	$444.46±48.11_b$
5.	$566.24±59.56_b$	$500.00±0.01_c$	$515.15±26.24_c$	$601.01±30.62_b$	$711.11±76.98_a$
6.	$508.83±23.19_b$	$541.67±33.68_{ab}$	$538.05±27.41_a$	$553.87±27.41_a$	578.11± 60.54 a
7.	$620.00±0.01_b$	$620.00±0.01_b$	$665.93±39.77_a$	$685.93±39.77_a$	$688.89±0.01_a$
8.	$682.05±31.09_c$	703.26±58.81c	$767.88±70.10_{ab}$	$742.43±36.71_{bc}$	$814.55±44.09_a$
Total	3368.58±221.73	3306.19±218.41	3434.40±273.31	3538.37±237.80	3779.92± 267.83

*Values denoted by different subscripts for a given week were significantly different (P>0.05).

TABLE 4: AVERAGE WEEKLY WEIGHT GAINED PER BIRD (g)*

Age in Weeks	DIETARY TREATMENTS A	B	C	D	E
1.	33.94±4.06	29.45±2.55	26.54±1.68	27.44±5.17	27.78±1 93
2.	76.78±18.97	64.44±1.92	71.88± 9.90	64.15± 9.90	70.91±3.42
3.	$113.18±14.52_{abc}$	$91.67± 16.67_c$	$120.32±3.56_{ab}$	$109.97±13.50_{bc}$	$135.76± 9.45_a$
4.	143.74±19.88	122.22±5.85	136.01±37.11	134.74± 15.50	140.00±10.93
5.	$138.42±7.69_a$	100.00±12.02 b	$149.80±18.83_a$	111. 47± 10.89_b	$140.00±1.67_a$
6.	$199.23±27.66_{bc}$	$175.56± 14.94_{bc}$	$166.77±35.60_c$	200. 15± 26.24_b	$244.80±73.40_a$
7.	$149.96±12.49_c$	$182.55±12.08_b$	$246.72±52.00_a$	$185.37±29.26_b$	$246.32±39.37_a$
8.	$305.64±62.28_b$	$354.04±17.37_a$	$369.24±76.17_a$	$319.08±37.63_b$	$331.47±4.28_b$
Total	1160.89±81.78	1119.93±100.75	1287.28±106.35	1152.38±90.85	1337.04± 100.32

S.A

* Values denoted by different subscripts for a given week were significantly different (P<0.05)

TABLE 5: AVERAGE WEEKLY FEED CONVERSION RATIO PER BIRD*

			DIETARY TREATMENTS		
Age in Weeks	A	B	C	D	E
1.	2.44± 0.47	0.84 ±0.25	3.07± 0.23	3.09 ±0.76	3.02 ±0.21
2.	2.79±0.81	3.42 ±0.95	3.15 ±0.95	3.60± 0.84	3.14 ± 0.19
3.	$1.97\pm0.47_{ab}$	$2.48\pm0.46_{c}$	$1.90\pm0.06_{ab}$	$2.11\pm0.33_{b}$	1.75±0.06
4.	3.43 ±0.41	3.41 ±0.16	3.18±0.71	3.20±0.24	3.17 ±0.21
5.	$4.10\pm0.17_{b}$	$5.04\pm0.58_{bc}$	3.49±0.59a	$5.42\pm0.55_{c}$	$5.08\pm0.55_{bc}$
6.	$2.59\pm0.44_{a}$	$3.10\pm0.24_{bc}$	$3.64\pm 1.62_{c}$	$2.81\pm0.49_{ab}$	$2.56\pm 1.03_{a}$
7.	$4.16\pm0.36_{c}$	3.14±0.23 b	$2.95\pm0.92_{a}$	$3.51\pm0.56_{b}$	$2.85\pm 0.49_{a}$
8.	2.28 ±0.38	1.99 ±0.18	2.12 ±0.27	2.35±0.29	2.46 ± 0.10
Grand Mean	2.97±0.83	3.21±0.90	2.94±0.67	3.26 ± 1.02	3.00 ±0.96

*Values denoted by different subscripts for a given week were significantly different ($P < 0.05$)

TABLE 6: ECONOMIC ANALYSIS OF THE PERIWINKLE - BASED DIETS

PARAMETERS	DIETS				
	A	B	C	D	E
Average cost of feed kg (₦)	1.08	0.91	1.29	1.13	1.09
Average cost feed /Bird (₦)	4.01	3.32	4.81	4.42	4.12
Cost of feed/g body wt/bird (k)	0.30	0.26	0.37	0.34	0.33
Cost of feed/g body wt gain/Bird (k)	0.31	0.27	0.38	0.35	0.34
Cost of feed/g edible meat/ Bird (K)	0.79	0.68	0.95	0.83	0.75

average weight gains reported in this study are higher than those reported by Henry *et al.* (1986) and Yeong (1980). Birds fed 25% PKC along with 2% fishmeal or 6% periwinkle flesh (Diet C or E) gained more weight than those birds fed lower levels of PKC and 2% fishmeal. This is contrary to the reports of Mohd (1982) who had reported that lower levels of PKC gave the best results, but in agreement with the reports of Yeong (1980) and Nwokolo *et al.* (1977).

The feed conversion ratios reported in this study are better than those reported by Temperton and Cassidy (1964 b) but similar to the findings of Beigin (1967). The feed conversion ratios of birds fed 25% PKC along with 2 % fishmeal or 6% periwinkle flesh were similar to that of birds fed the control diet (A). The insignificant difference in efficiency of utilization due to the fact that the broiler chickens in each experimental group made use of the consumed feeds almost equally. It could also be due to the fact that the diets were isonitrogenous and isocaloric. Similarly, birds fed high level PKC either with fishmeal (Diet C) or periwinkle flesh (diet E) had similar feed conversion ratios indicating that broiler chickens utilize crude fibre more efficiently than they had hitherto been given credit for. Taking due cognizance of scarcity of fishmeal with its attendant high cost, the use of periwinkle flesh to replace fishmeal in broiler diets will, in the long run, produce less expensive feeds (table 6).

CONCLUSION

The current scarcity and high cost of livestock feeds especially poultry feeds calls for the search for local ingredients that could profitably be used in feeding poultry. The palm kernel cake and the periwinkle are locally available products that have not been fully exploited. Exploiting the possibility of utilizing periwinkle flesh in poultry feeds led to its being fed along with palm kernel cake to broiler chickens for eight weeks, Broiler chicks fed 25% PKC along with 6% periwinkle flesh had better performance traits when compared with broiler chickens fed 15% PKC along with 2% fishmeal or 25% PKC plus a mixture of 1% fishmeal and 2.5% periwinkle flesh. Industrial processing of periwinkle flesh with a view to increasing its availability and reducing cost should be explored. Use could be made of the centripetal force, sedimentation and drying techniques similar to what is used in the separation and processing of the palm kernel.

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