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Carcass and organ characteristics of broiler finisher chickens fed matured sun-dried nypa palm fruit (*Nypa fruticans*) nut meal

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***Target Audience:** Poultry farmers, Researchers and Scientists*

Abstract

Graded levels of matured sun-dried nypa palm fruit nut meal (Nypa fruiticans) as replacement for maize in the diet of finisher broiler chicken was carried out in a feeding trial that lasted for 56 days. One hundred and eighty (180) eight weeks old broilers were used. The birds were assigned to six dietary treatments of three replicates each. The experiment was conducted using the Completely Randomized Design (CRD). Each diet represented a treatment. Diet I served as the control free of the test component. The remaining five (5) diets were formulated on 20, 40, 60, 80 and 100 percent substitution levels of matured sun-dried nypa palm fruit nut meal for maize. The diets and water were provided ad libitum throughout the experimental period. Data generated on carcass and visceral organs were analyzed using Analysis of Variance (ANOVA). Results revealed that dressing percentage decreased with increasing level of nypa palm fruit meal substitution. Carcass mean for the drumstick, breast, back and thigh were significantly ($P<0.05$) different, while the relative weights of the neck and wings were not significantly ($P>0.05$) different from each other. Weights of the visceral organs for the gizzard, heart, liver, proventriculus, abdominal fats and intestinal weights were significantly ($P<0.05$) different. However, the relative organs of the kidney, lungs and crop were not significantly ($P>0.05$) different. Conclusively, the low abdominal fat associated with increase substitution level of nypa palm fruit nut meal for maize is an assurance of good benefit for people with heart related problems.

***Keywords:** Carcass and organs, characteristics, broiler finisher, matured sun-dried, nypa fruit meal*

Description of problem

The growth and development of the poultry enterprise in Nigeria greatly lies on the availability of good quality feeds. The cost of feed is the main cause of high cost of production of broiler chicken for human consumption. Feed cost accounts for about 70-80% of the total cost of animal production [1,2]. Conventional energy sources for livestock feeds like maize are equally consumed by man and utilized for other industrial activities, which has made its demand too high with an eventful rise in price resulting in high cost of production [3]. This has led to sourcing for alternative sources with no competition for human consumption such as nypa palm fruit nut.

Nypa palm (*Nypa fruitican*), popularly called Ayamatang (Ibibio) and (Nfri-nybakara)., is a monoecious palm that grows well in estuaries and brackish swampy areas and may extend upstream into fresh water areas where tidal influenced waves may carry and deposit the seed. The plant does not require salty conditions but salt water tides are necessary for seed dispersal and deposit of silt. They may equally grow under shrub. Nypa grow in clusters, without visible stems above the ground. The underground stem (rhizome) lies horizontally under the ground, while the leaves called fronds are large and featherlike in appearance, often 7-

9 metres long [4,5]. The fruit of nypa are in clusters similar to the oil palm fruit.

The plant is indo-pacific in origin and exists as part of the mangrove ecosystem. However, nypa is equally found in Nigeria as an introduced plant. It was brought into Nigeria's coastal mangrove first in Calabar in 1906 from Singapore botanical garden and later in Oron, Akwa lbom State in 1912 to check stream bank erosion [6,7]. Since its introduction, nypa has established itself successfully and rapidly through vegetative propagation by rhizomes and sexually by the spread of its seeds along the coastal and riverine estuarine of southern Nigeria. Due to its fast spreading westwards, seedlings and stands of nypa can be sighted as far as Bayelsa, Rivers, Delta and Ondo States occupying an estimated land area of 821km^2 earlier dominated by mangrove swamps [8].

Nypa palm plant provides various products which are essential to man and livestock. In its native environment and where it has been introduced, nypa fronds is used in making thatch, basket, hat, fire-wood and raincoat: the nuts is used to produce ear-ring necklace and buttons, its tapped, sap is used in the production of vinegar, alcoholic drinks, as well as feed to fattened pigs [6.9.10]. The young shoots are edible while the immature seeds are eaten as food [11]. Medically, the shoots are utilized as vermicides, bloom petals in the production of sweet smelling fragrance called tisane, while burnt residues from nypa products are used as pain reliever against toothache and cerebral pain [12, 13]. Although various parts of the plant provide numerous benefits, the seed which constitute its main means of propagation lay waste along the coastal fringes of the Calabar estuary. Chemical evaluation of the matured sun-dried seeds revealed they contain favourable amount of energy and can be utilized to replace conventional sources in monogastrics nutrition [14,15].

The objective of the study are to determine the effects of graded levels of matured sun-dried nypa palm fruit nut meal on carcass and organ characteristics of broiler chicken.

Materials and Methods

Location of the experiment

The experiment was conducted in the Faculty of Agriculture Teaching and Research Farm, University of Calabar, Calabar. The experimental unit is located at latitude 4°58"N of the equator and longitude 8°17"E of the Greenwich meridian. It has an annual temperature range of 25°C-30°C, rainfall range of 1260-1280mm and a relative humidity of 53-93 percent respectively [16].

Extraction of experimental materials

Matured nypa palm fruits were harvested from the mangrove swamp forest of the Cross River Estuary at Esuk Mba Village in Akpabuyo Local Government Area of Cross River State, Nigeria. The fruits were dehusked and sliced into halves using a cutlass and the nuts removed from the fruit using a kitchen knife. The nuts were cracked roughly using kernel cracker and the products milled using harmer mill to give a fine texture. The milled nypa palm fruit nut meal were spread on tarpaulin to sun-dry.

Formulation of experimental diets

Six experimental diets were formulated for each starter and finisher phase such that the control diet contained no nypa meal (0%), diets 2,3,4,5&6 contained 20%, 40%, 60% & 100% sun-dried matured nypa fruit nut meal as shown in Tables 1&2

Table 1: Composition of experimental diet for broiler chicken at starter phase

.Ingredients	Replacement levels (%)					
	0	20	40	60	80	100
Maize	45.00	35.00	25.00	15.00	5.00	-
Nypa palm fruit nut meal	-	10.00	20.00	30.00	40.00	45.00
Soya bean meal	38.00	38.00	38.00	38.00	38.00	38.00
Fish meal	5.90	5.90	5.90	5.90	5.90	5.90
Wheat offal	5.90	5.90	5.90	5.90	5.90	5.90
Palm oil	2.00	2.00	2.00	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Common salt	0.03	0.03	0.03	0.03	0.03	0.03
Methionine	0.02	0.02	0.02	0.02	0.02	0.02
Lysine	0.02	0.02	0.02	0.02	0.02	0.02
Vitamin/mineral premix	0.02	0.02	0.02	0.02	0.02	0.02
Total	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis						
Crude protein (%)	23.20	22.86	22.52	22.18	21.84	21.67
Crude fibre (%)	3.79	4.61	5.39	6.19	6.99	7.39
M.E (kcal/kg)	280.50	2707.00	2651.70	2499.60	2420.20	2386.30

Table 2: Composition of experimental diet for broiler chicken at finisher phase

Ingredients	Replacement levels (%)					
	0	20	40	60	80	100
Maize	54.00	44.00	34.00	24.00	14.00	-
Nypa palm fruit nut meal	-	10.00	20.00	30.00	40.00	54.00
Soya bean meal	31.20	31.20	31.20	31.20	31.20	31.20
Fish meal	4.90	4.90	4.90	4.90	4.90	4.90
Wheat offal	7.00	7.00	7.00	7.00	7.00	7.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Common salt	0.30	0.30	0.30	0.30	0.30	0.30
Methionine	0.05	0.05	0.05	0.05	0.05	0.05
Lysine	0.05	0.05	0.05	0.05	0.05	0.05
Vitamin/mineral premix	0.05	0.05	0.05	0.05	0.05	0.05
Total	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis						
Crude protein (%)	20.95	20.61	20.27	19.93	19.59	19.11
Crude fibre (%)	3.77	4.51	5.40	6.22	7.03	8.17
M.E (kcal/kg)	2784.18	2708.68	2633.38	2557.99	2482.58	2377.80

Management of experimental birds

One hundred and ninety eight (198) day old Fidan chicks were balanced for weight and randomly assigned to the six dietary treatments in a Completely Randomized Design (CRD). Each treatment group of thirty three (33) birds were further sub-divided into three replicates of eleven (11) chicks each and kept in pens measuring 3mx4m. At the finisher phase, the birds were weighed, re-randomized and re-distributed on treatment basis into six groups of thirty birds on weight equalization. Each group was sub-divided into three with ten (10) birds per group and placed on six finisher treatment diets. Feed and water were provided *ad libitum* and the birds subjected to standard management procedure. Feed intake was recorded weekly while body weights were recorded weekly. At the end of the 56 days feeding trial, 2 birds per treatment replicates were randomly selected, fasted for 12hours, slaughtered, dressed and eviscerated according to the procedure by [17].

Data analysis

Carcass weight, relative cut parts and organ weights were determined. The relative weights were calculated by expressing the weight of the cut carcass parts and organs as percentage of the live weight. Mathematically represented:

i. Dressing percentage (%)

$$= \frac{Warm\ weight}{Live\ weight} \text{ x } \frac{100}{1}$$

ii. Carcass weight $= \frac{Cut\ carcass}{Live\ weight} \text{ x } \frac{100}{1}$

iii. Relative organ weight

$$= \frac{Fresh\ organ\ weight}{Live\ weight} \text{ x } \frac{100}{1}$$

Data collected were subjected to analysis of variance [18] and where significant differences were observed between treatments, the means were compared using the Least Significant Difference (LSD).

Results and Discussion

Dressed weight, dressing percentage, carcass and internal organ characteristics of birds fed graded levels of matured sun-dried nypa palm fruit nut meal are shown in Table 3. The study showed a decreased in dressed weight and dressing percentage with increasing level of nypa palm fruit meal substitution. The lower eviscerated and dressed weight of birds fed increased substitution of nypa fruit meal could have been caused by dietary treatments. It has been reported that carcass yield and dressing percentage are found to be affected by dietary quality [19]. The results of the mean cut parts as a percentage of the live weight were significantly ($P<0.05$) different for the drumstick, breast, back, thigh and chest. The relative weights of the neck and wings were not significantly ($P>0.05$) different from each other. The result of the mean weight of internal organs as percentage of live weight were significantly ($P<0.05$) different for the gizzard, heart, liver, proventriculus, abdominal fat and intestinal weight. However, the relative organs of the kidney, lungs and crop were not significantly ($P>0.05$) different among the groups. Birds fed 40 percent sun-dried nypa palm fruit nut meal replacement had the highest percentage weight of heart and intestinal weight (0.76, 3.71 percent), while those fed the control diet had the least value for the gizzard, liver, lungs, proventriculus and intestinal weight (1.39, 0.50, 0.32, 2.15 percent).

Birds fed diets containing 100 percent nypa palm fruit nut meal replacement had the highest weight of gizzard, liver, lungs, proventriculus and crop (2.52, 3.57, 0.77, 0.61, 0.79 percent). The increase in sizes of the gizzard, intestine, crop and proventriculus with high fibre level could be explained by the fact that these organs directly handle the churning, maceration and digestion of feed. The higher the fibre, the longer these works are done. Unlike the less fibrous feed, it takes a longer

time and more work before the digestion process of high fibre feed is completed, hence the increase in sizes of these organs. It had been reported that the presence of fibre in diets tend to lower absorption of nutrients while the non-absorbed portions would add to the weight of the gastrointestinal tract [20]. Therefore, the increase in the weight of the gizzard, proventriculus and crop at increased levels of replacement of nypa palm fruit nut meal in this study are similar to results for broiler chickens fed graded level of bread fruit and sun-dried wild cocoyam meals [21,22].

The abdominal fat weight was highest for birds fed the control diet and 20 percent (1.30 percent) nypa fruit nut meal replacement and lowest on birds fed 100 percent level of replacement (0.01 percent). The weight of abdominal fat decrease with increase nypa fruit nut meal substitution in the diet. The study is consistent with the findings that chicken produces less body fat with increased fibre content in the diet [23]. Therefore, the study suggested that birds raised with matured sun-dried nypa palm fruit nut meal could be of benefit to people suffering from heart related problems due to its low fat content.

Table 3: Carcass and organ parameters of slaughtered broiler chickens fed graded levels of matured sun-dried nypa palm fruit nut meal (% live weight)

Parameters	Replacement levels (%)						
	0	20	40	60	80	100	LSD
Live weight (kg)	2.82^{a}	3.00^{a}	2.20^{c}	2.52^{b}	1.48^{d}	1.45^{d}	0.28
Dressed weight (kg)	2.37^{a}	2.49^{a}	1.58^{c}	1.95^{b}	1.06^{b}	0.90^{e}	0.14
Dressing percentage (%)	84.26^{a}	83.13^{ab}	73.44^{bc}	77.31^{abc}	71.28^{cd}	61.45^{d}	10.26
Carcass (% live weight)							
Head	2.22^{b}	1.96^{b}	2.41^{b}	2.08^{b}	3.14^{a}	2.97^{a}	0.46
Neck	2.96	3.18	3.93	3.67	3.01	3.33	NS
Drumstick	9.64^{bc}	8.17^{c}	10.56^{ab}	10.44^{ab}	10.86^{a}	10.33	1.56
Wings	9.14	7.47	8.84	8.66	8.80	8.11	NS
Breast	23.63^{b}	21.65^{bc}	22.85^{b}	27.75^{a}	17.77^{c}	20.61^{bc}	4.05
Back	8.41^{a}	6.76^{a}	6.51^{ab}	4.52^{b}	6.38^{ab}	7.38^{a}	2.21
Thigh	11.36^{ab}	8.32^{d}	12.02^{a}	10.15^{bc}	10.37^{abc}	9.15^{cd}	1.72
Shank	3.27^{b}	2.42^{b}	4.90^{a}	2.87^{b}	3.89^{ab}	3.14^{b}	1.52
Chest	7.36^{a}	5.35^{e}	6.24^{c}	5.90^{cd}	5.59^{de}	6.82^{b}	0.42
Internal organs (% live weight)							
Kidney	0.43	0.48	0.41	0.46	0.39	0.37	NS
Gizzard	1.36^{c}	1.67^{bc}	2.43^{a}	1.51^{bc}	2.52^{a}	2.07^{ab}	0.64
Heart	0.40^{cd}	0.34^{d}	0.76^{a}	0.33^{d}	0.45^{bc}	0.48^{b}	0.08
Liver	1.39^{d}	1.74^{c}	2.39^{b}	2.23^{b}	3.57^{a}	1.90^{c}	0.20
Lungs	0.50	0.65	0.52	0.56	0.77	0.76	NS
Proventriculus	0.32^{d}	0.27^{c}	0.53^{b}	0.42^{c}	0.61^{a}	0.53^{b}	0.05
Crop	0.46	0.51	0.62	0.41	0.79	0.65	NS
Abdominal fat	1.12^{a}	1.30^{a}	0.22^{cd}	0.47^{b}	0.09^{cd}	0.01^{d}	0.42
Intestinal weight	2.15^{d}	2.40^{cd}	3.71^{a}	2.93^{bc}	3.36^{ab}	3.46^{ab}	0.56

Means on the same row with different superscripts are significantly different (P<.05)
LSD: Least significant difference
NS: Not significant

Conclusion and Applications

The result of the study showed that:

1. Dressed weight and dressing percentage of broiler birds decrease with increasing level of nypa fruit meal in the diet.
2. Mean carcass cuts for the drumstick, breast, thigh and chest of birds fed the test-diets were significantly ($P<0.05$) different.
3. Inclusion of higher levels of nypa supported higher weights of internal organs like gizzard, liver, lungs and proventriculus.
4. Increase in nypa meal greatly reduced abdominal fat and meat fat. Therefore, the low abdominal fat associated with increase substitution level of nypa palm fruit meal for maize is an assurance of good benefit for people with heart related issues.

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