Assessment of the nutritional values of Dried Bread Fruit Peel Meal (DBPM) as a replacement for Maize in the Formulated Diet of Giant Africa Land Snail *Archachatina marginata (swainson)*

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Abstract- A twelve (12) weeks experiment was conducted to investigate the nutritional values of dried bread fruit peel meal as a dietary replacement for maize on the growth of seventy five (75) grower giant African land snail *(Archachatina marginata)* of weight rang 38-42g in a completely randomized design (CRD) feeding trial. Fresh breadfruit peels were collected from roadside breadfruit fryers in Owode- Yewa town washed and sundried for one (1) week after which it was milled to form dried breadfruit peel meal (DBPM) then used as a replacement for maize at the level of 0, 25, 50, 75 and 100% in a formulated diet for giant African land snail as an alternative source of carbohydrate to form the dietary treatments viz; T_A (control), T_B, T_C, T_D, T_E respectively. Each treatment was replicated three times with 5 snails per replicate. The formulated diets were supplied *ad-libitum*. Bi-weekly body weight gain (BWG), shell length (SL), aperture radius (AR) and shell width (SW) was measured. The results show that statistical significant different ($P < 0.05$) occurred among the treatments in term of body weight gain (BWG), shell length (SL) aperture radius (AR) and shell width (SW). Dietary treatment T_C (50%) dried breadfruit peel meal replacement was recorded to have influence more growth in all the parameters measured and recommended for use by animal feed industries and snail farmers mostly in the rural and peri-rural areas where fresh breadfruit is in abundant.

Index Terms- Acclimatized, Form utility, growth performance, rejuvenate, solarised, , wooden saucer.

I. INTRODUCTION

African giant land snail *Archachatina marginata* is a common gastropod mollusc found in the rain forest and derived guinea savannah region in West Africa. Maize has remained the major and common source of carbohydrate in the formulated diet of farm animals. The ingredient is posing a serious competition treat between human and farm animals as it is consumed by man and also used as feed ingredient 'carbohydrate' source in farm animal feed. The need to convert or add form utility to agricultural waste materials such as fruit and tuber peels to effective use in animal husbandry and animal bioresouses development cannot be over emphasised.

Fruit and tuber peels contain appreciable nutrient that are essential for growth and development. According to Ejidike and Ajileye, (2007), farmers usually discard various locally available feedstuffs with great potentials for animal feed annually. Among the feedstuffs include cocoa pod hull, cowpea seed husk, cowpea seed hull, African breadfruit bract, and African breadfruit seed hull. Akinnusi, (1998) stated that micro livestock are among the cheaper sources of animal proteins and this include the micro livestock such as snails, rabbits and cane rats. (Oji, 2000).

According to Ajayi *et al*., (1978), snail meat is particularly rich in protein. Imevbore and Ademosun (1988) indicated that snail meat has a protein content of 88.37% (on dry weight basis), low total fat (1.64%), saturated fatty acids (28.71%) and cholesterol (20.28mg/100g) (fresh sample). The nutritional quality of snail meat as reported by Kalio and Etela, (2011) is greatly influenced by the type and quality of diet supplied to the snail.

In a feed trial conducted by Omole *et al.*, (2013), weight gain, feed efficiency and dressing percentage were similar in the snails fed diet 0 and 50 percent yam peel as replacement for maize fraction of the diet. The parents and juveniles stock of *Achatina achatina* fed up to 50% sun-dried taro cocoyam meal diets has been reported to have performed very well in confinement without any adverse effects on reproductive traits.(Okon *et al*, 2012).

Babalola and Akinsoyinu (2010) opined that (*A. marginata)* could utilize lettuce waste as well as cabbage waste as sole feed ingredient to increase animal protein supply in Nigeria.

The position of prepared feed as farm animal diets cannot be overemphasised. Ejidike,(2007) maintained that formulated and prepared artificial diet would provide constant supply of the animal feed as well as high potential of mass production of African giant land snail *Archachatina marginata* in the tropic thereby overcoming the scarcity associated with the raw feed (plants and their waste) both in its availability and utilization.

Odo and Orji,(2010) maintain that during dry seasons when forages are generally not readily available, best growth performance of snail could be achieved in intensive rearing with the use of formulated mash during that season.

Akinnusi, (1998); Amusan and Omidiji, (1999) as cited in Ani *et al.*, (2013), maintained that the conventional feeds of snails are bread fruit, water leaf, pawpaw leaf, cabbage, carrot tops, ripe fruits (pawpaw, mango, plantain, banana, pineapple etc) . Breadfruit meal contains protein and energy that naturally endow it as a potential feed resource for poultry. Processing by

peeling, cooking or soaking in water can be used to reduce anti-nutritional factors in it.(Oladunjoye *et al*.,2010). Besides, Ejidike and Ajileye,2007 stated that breadfruit (*Telfaria african*) seed hull meal TASHM is a suitable substitute for maize in (*A. marginata)* diets. Presently there is no known competition in the usage of breadfruit (*Arthocarpus communis Forst*) wastages as ingredients in animal feed in term of usage unlike maize, which is staple food in this part of the world and is been competed for in terms of human consumsion, industirial and livestock industrial use making it quite costly for the use of an average snail farmer. In line with this, it is obvious that there is dearth of information on the utilization of dried breadfruit peel meal as a source of carbohydrate in the formulated diets of farm animals despite its availability as a waste product. This study therefore aimed at assessing the nutritional value of Dried Breadfruit Peel Meal (DBPM) as a replacement for maize in the formulated diet of African Giant Land snail *Archachatina marginata*.

II. MATERIALS AND METHODS

A. Location and duration of the experiment

The experiment was carried out under cocoa tree at a home garden 129, opposite new 192 Motorized Battalion barracks, Owode-Yewa South Local Government Area, Ogun State, Nigeria. Geographically, Owode - Yewa lies between latitude 6^0 48^1 N, 2^0 57^1 E and longitude 6.8^0 N 2.95^1 E (Wikipedia, 2014). Ecologically, the area lies in the rain forest zone with two raining seasons from February- July and September –November. The rest months are characterized by dry season.

B. Experimental diets

The experimental diet consisted of formulated feed with dried breadfruit peel meal as replacement for maize. Fresh bread fruit peels were collected from road side breadfruit fryers washed and sun-dried for one (1) week (Figure 1A) milled and used for the dietary treatment formulations. The formulated feeds were, T_A (0% control) , T_B (25%), T_C (50%),T_D (75%) and T_E (100%) dried breadfruit peel meal (DBPM) replacement for maize.(Table 1).

C. Experimental snail

One hundred and ten 110 grower snail (*A. marginata*) were purchased from Lusada Market along Agbara in Ado odo/ ota Local Government Area, Ogun State Nigeria. From these, seventy five (75) snail of weight ranging from (38 – 42g) were prudently sorted for the trial.

D. Cleaning and rejuvenation of the experimental snails

The snails were carefully packed in clean untreated water, washed softly with hand and allowed to stay in the water for 3-4 minutes so as to rejuvenate the snails prior to acclimatization for two weeks.

E. Experimental lay out

The experimental snails were housed in a pen (1.6 x 1.5 x 1.5m) made of bamboo, palm front and mosquito net under cocoa tree which provided shade cover for the pen with an opening for easy access. The surrounding was cleared and soaked with spent engine oil to prevent pest and predators attack on the snail.

F. Procedures and management

Fifteen (15) rounded weaving baskets with lid made of palm front each with dimension 30 cm in diameter and height of 35 cm were purchased from Owode –Yewa South market. New wood shavings was collected from a near- by saw mill industry, solarised following the procedure of (Ogunkunle and Lamidi, 2014) before used as bedding substrate on the floor and in each basket. The experimental snails were weighed individually to get the initial body weight , shell length (SL), aperture radius(AR) and shell width (SW) and randomly distributed into (5) baskets with five (5) snails per treatment (Figure 1B) replicated three time in a Completely Randomised Design (CRD). The formulated diets were moistened slightly to soften the feed mixtures and increase the water contents thus facilitate easy consumption by the experimental animals before fed to the snail at 13 – 14 hour daily in wooden saucer. The pen was sprinkled with water twice daily (morning and evening) to maintain and sustain cool and humid condition in the pen. Body weight gain (BWG), shell length (SL), aperture radius (AR) and shell width (SW) was taken fortnightly. Substrates were replaced every three weeks. Droppings were picked; the feeding troughs with leftovers were cleaned properly before fresh feed combinations were provided for the snails daily.

G. Data collection and statistical analysis

Parameters measured were body weight gain (BWG) of the snail, shell length (SL), aperture radius (AR) and shell width (SW). Body weights were measured with digital sensitive balance (CAMRY, Model EK 5055) in grammas (Figure 1 C). The shell lengths were measured along the axis, aperture radii were measured using measuring tape, shell widths were measured round along the largest side of the shell all with the aid of thread and ruler data were analysed electronically using one-way analysis of variance (ANOVA) via the use of SPSS 21.0 statistical package and the differences among means obtained were tested for significance ($P<0.05$) via the use fisher Least Significant Difference. (LSD).procedures.

III. RESULTS AND DISCUSSION

A. Body weight gain (BWG)

The mean Bi- weekly change in body weight (Table 2) showed that there was significant difference ($p< 0.05$) in body weight gain in snail fed with the formulated diet. The formulated diet 50% dried breadfruit peel meal replacement (T_C) replacement revealed the highest body weight gain of 45.56g followed by (T_D) 75% (DBPM) replacement with mean value of 44.59g while snail fed with 25% (DBPM) replacement (T_B) has the least growth rate of 43.06g. This result is in line with the finding of (Omole, 2003 and Kehinde, 2009) who also recorded highest weight gain in snail fed 50% yam peel (YP) as replacement for maize.

B. Shell length (SL)

There was significant ($P<0.05$) difference in shell length over the period of the experiment (Table 3). The mean Bi-weekly shell length was highest in ($T_{C,}$) 50% with 9.77cm value followed by (T_D) 75%; 9.44cm with the least 8.58cm recorded for treatment (T_A) 0% dried breadfruit peel meal replacement (DBPM) respectively.

C. Aperture radius (AR)

There was no significant difference ($P>0.05$) in aperture radius in weeks 2, 4 and 6 but significant difference ($P < 0.05$) was recorded in aperture radius in week 8, 10 and 12. Generally, the mean bi-weekly change in aperture radius (Table 4) showed

that snail fed with treatment (T_C) 50% dried breadfruit peel meal (DBPM) replacement had the highest value of 5.92cm, followed by treatment (T_D) 75% replacement with value of 5.81cm and least 5.28cm (T_A). This is in line with the findings of Ogunkunle and Lamidi, (2014) who recorded no significant increase in aperture radius on snails fed with the mixture of dried pawpaw leave meal and groundnut cake mixture in week 2, 4, 6 and 8 but notable statistical different occurred in week 10

D. Shell width (SW)

There was a significant difference ($P < 0.05$) in the response of the experimental snail to the formulated diets along the weeks (Table 5) the mean bi-weekly change in width showed that snail fed with 50% breadfruit replacement (T_B) had the highest width growth of 14.99, followed by snail fed with 75% breadfruit replacement (T_D), while those fed with 0% breadfruit replacement (T_A) had the least 13.82cm respectively.

IV. CONCLUSION AND RECOMMENDATION

In conclusion, the best growth performance could be achieved in snail fed with formulated diet with dried bread fruit peel meal inclusion as an alternative source of carbohydrate. The study revealed that growers snail *Achachatina marginata* (swainson) fed formulated diet with up to 50 to 75% dried breadfruit peel meal (DBPM) as a replacement for maize performed very well most importantly in terms of body weight gain and therefore recommended for use by small, medium and commercial snail farmers and all farmers most especially in the rural area where there is abundance of breadfruit.

FIGURES

A **B** **C**

Figure 1: (**A**) Dried bread fruit peel, (**B**) Experimental snails, (**C**) snail on measuring scale.

TABLES

Table 1: Formulated feed composition

INGREDIENTS	T_A 0%	T_B 25%	T_C 50%	T_D 75%	T_E 100%
Maize meal	55.70	41.77	27.85	13.93	0.00
*DBPM	0.00	13.93	27.85	41.77	55.70
Palm Karnel Cake	40.30	40.30	40.30	40.30	40.30
Bone meal	3.50	3.50	3.50	3.50	3.50
Premix/vit/min	0.50	0.50	0.50	0.50	0.50
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

*DBPM- Dried Breadfruit Peel Meal

Table 2: Mean body weight gain (BWG) of the snail (g)

Formulated feed (Treatments)								
Weeks	T_A 0%	T_B 25%	T_C 50%	T_D 75%	T_E 100%	Mean	P-value	SEM
Week 2	40.92^b	40.59^b	41.26^a	40.97^b	40.58^b	40.86	0.260	0.1103
Week 4	42.16^c	41.53^d	43.00^a	42.85^b	41.53^d	42.21	0.033	0.2132
Week 6	42.85^c	42.31^c	44.83^a	44.08^b	42.85^c	43.38	0.003	0.2818
Week 8	43.68^c	43.57^c	46.61^a	45.33^b	44.23^c	44.68	0.001	0.3404
Week 10	44.87^c	44.62^c	48.02^a	46.21^b	45.32^c	45.81	0.002	0.3706
Week 12	46.29^c	45.76^c	49.65^a	48.08^b	45.76^c	49.11	0.000	0.4394
Mean	43.46	4306	45.56	44.59	43.38			

Mean with same superscript along the same rows are not statistically difference at 0.05 level of confidence using Fisher's Least Significance Difference (LSD), SEM- Standard error of mean.

Table 3: Mean shell length (SL) of the snails (cm)

Formulated feed (treatments)								
	T_A	T_B	T_C	T_D	T_E			
Weeks	0%	25%	50%	75%	100%	Mean	P- value	SEM
Week 2	7.69^a	8.05^a	8.68^a	8.07^a	8.39^a	8.18	0.507	0.17507
Week 4	8.27^b	8.39^b	9.42^a	8.50^b	8.69^b	8.66	0.227	0.17148
Week 6	8.44^b	8.61^b	9.53^a	9.26^b	8.85^b	8.93	0.210	0.16729
Week 8	8.68^c	8.89^c	9.85^b	9.86^a	9.09^c	9.27	0.049	0.17252
Week 10	9.14^c	9.36^c	10.41^a	10.38^b	9.68^c	9.79	0.047	0.18147
Week 12	9.28^c	9.63^c	10.73^a	10.54^b	9.97^c	10.03	0.022	0.17953
Mean	8.58	8.82	9.77	9.44	9.11			

Mean with same superscript along the same rows are not statistically difference at 0.05 level of confidence using Fisher's Least Significance Difference (LSD), SEM- Standard error of mean.

Table 4: Mean aperture radius of the snails (AR) (cm)

Formulated feed (treatments)								
	T_A	T_B	T_C	T_D	T_E			
Week	0%	25%	50%	75%	100%	Mean	P-value	SEM
Week 2	4.86^a	4.92^a	5.03^a	4.94^a	4.92^a	4.94	0.970	0.06630
Week 4	5.01^a	5.21^a	5.48^a	5.49^a	5.24^a	5.29	0.518	0.09622
Week 6	5.21^a	5.45^a	5.83^a	$5,84^a$	5.58^a	5.58	0.226	0.10097
Week 8	5.32^c	5.57^c	6.07^a	5.96^b	5.69^c	5.73	0.136	0.10468
Week 10	5.55^c	5.86^c	6.43^a	6.18^b	5.87^c	5.98	0.011	0.09622
Week 12	5.75^c	6.01^c	6.68^a	6.47^b	6.09^c	6.20	0.006	0.10403
Mean	5.28	5.50	5.92	5.81	5.57			

Mean with same superscript along the same rows are not statistically difference at 0.05 level of confidence using Fisher's Least Significance Difference (LSD), SEM- Standard error of mean.

Table 5: Mean shell width (SW) of the snails (cm)

Formulated feed (Treatments)								
	T1	T2	T3	T4	T5			
Weeks	0%	25%	50%	75%	100%	Mean	P- value	SEM
Week 2	13.03^b	13.05^b	13.72^a	13.29^b	12.90^b	13.20	0.019	0.09447
Week 4	13.43^c	13.42^c	14.20^a	14.18^b	13.38^c	13.72	0.019	0.12540
Week 6	13.68^c	13.68^c	14.87^a	14.36^b	13.63^c	14.05	0.009	0.15662
Week 8	13.85^c	13.92^c	15.22^a	14.63^b	13.83^c	14.29	0.006	0.17194
Week 10	14.29^c	14.41^c	15.78^a	15.11^b	14.74^c	14.74	0 .009	0.19720
Week 12	14.45^c	14.64^c	16.16^a	15.40^b	14.43^c	15.02	0.004	0.20540
Mean	13.79	13.85	14.99	14.450	13.82			

Mean with same superscript along the same rows are not statistically difference at 0.05 level of confidence using Fisher's Least Significance Difference (LSD), SEM- Standard error of mean.

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