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Growth Performance of West African Dwarf Bucks Fed Fermented Orange Fleshed Sweet Potato Peel Meal

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ABSTRACT

The feed intake and growth performance of West African Dwarf (WAD) bucks fed fermented orange fleshed sweet potato (Ipomea batatas L.) peels meal was conducted. Sixteen bucks averaging 7.02kg live weights were randomly selected into different pens and fed four dietary treatments designated T_1, T_2, T_3 and T_4, which were formulated to contain 0, 10, 20 and 30 % of orange fleshed sweet potato peel meal (OFSPPM).The study revealed no significant differences ($P > 0.05$) in dry matter intake in all the dietary treatments. There was significant differences ($P<0.05$) in the total weight gain in all the groups. Average daily Weight Gain (ADWG) differed significantly ($P<0.05$) among treatment groups, 25.81 g/d, 30.65 g/d, 47.05 g/d and 58.60 g/d for T_1, T_2, T_3 and T_4 respectively. The higher weight gain observed in animals offered diet 4 (30 % OFSPPM) revealed that the bucks utilized the diet better than others, suggesting that the higher the inclusion level of orange fleshed sweet potato peels meal in diet for West African Dwarf (WAD) goats, the higher the weight gain. The study revealed no significant difference ($P>0.05$) in average daily feed intake though the highest intake was observed in diet 4 (253.27 g/d) and lowest in diet I (223.96 g/d). Feed conversion ratio of goats were significantly ($P<0.05$) varied across the diets, 8.88, 7.52, 5.33 and 4.36 for T_1, T_2, T_3 and T_4 respectively with goats on diets 4 and 3 (4.36 and 5.33) lower than those on diets I (8.88) and 2 (7.52).

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KEYWORDS: West African dwarf goats, fermented sweet potato peel, feed intake, growth performance.

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INTRODUCTION

Livestock has an important role both in farming and in rural life in developing countries by providing food and income to many farmers. They also play a vital socio-economic role and cultural life system for many people(Anaeto*et al*., 2009**;**Ajala, 2004).
Goats are raised for their meat, milk, skin and hairs and in which meat is the most important used products in Nigeria and even rank higher in market price than beef and other animal species because of its flavour, tenderness and palatability(Alikwe *et al*., 2011;Idiong and Orok, 2008and Odeyinka, 2000). In southern Nigeria, West African Dwarf (WAD) goats are the indigenous breed and also used to establish relationship and for restoring peace in a community (Idiong and Udom, 2011; Odeyinka, 2000).
In dry season when the natural vegetation is of poor nutritive value, goats suffer from feed supply and pasture quality in the humid region (Aye, 2007; Ahamefuleand Elendu,2010).
In Nigeria, the intake of animal protein is low due to high cost of livestock product resulting from increase in the cost of most ingredients (Sobayo *et al*., 2013). However, to reduce the cost, livestock nutrition has to be improved in order to increase in meat production and this practice has been used to supplement livestock diets with protein rich ingredients such as groundnut cake (GNC), soybean meal (SBM) and cotton seed cake (CSC). According to Bangani *et al*. (2002),
concentrate mixtures like cereal grains, cereal bran and oil seed meals have resulted in increased intake in intensive production systems and are often not fed due to their unavailability and high costs (Nouala *et al*., 2006 and Olomola *et al*., 2008).
The expansion of ruminant animal production in Nigeria is been limited by feed availability thereby causing many livestock farmers in Nigeria to used agro industrial by-products as feeds to their animals due to high cost of conventional feed ingredients (Iyayi *et*

al., 2003). Alternative feedstuffs like agro industrial by-products are however of low nutritive value, and non-conventional feed stuffs such as potato peels can be used to replace agro industrial by-products which have low nutritive value and these have enhanced the availability of potato by-products for livestock feeds since it has no human use at the moment and as such can be incorporated into goat feeding due to its high energy and fibre density, local availability and not affected by seasonality. It is therefore necessary for ruminant nutritionists to still research more on the alternative feedstuffs with no direct nutritional value or consumption competition by man (Aderolu*et al*., 2011 and Ojebiyi*et al.*, 2002).

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at an out station Government Teaching and Research Farm located at Ikot Enwang and is about three kilometers from the city centre of Ikot Ekpene. Ikot Ekpene also known as "The Raffia City, is a historic town in the South – South State of AkwaIbom, Nigeria. Ikot Ekpene is an upland area that lies between latitude $05^{0}11^{'}22.39^{"}$N ; and longitude $07^{0}42^{'}53.32^{"}$E ; with an elevation of 89.01 meter above sea level (Nigeria Meteorological Society, 2023).

Sourcing and Processing of Orange Fleshed Sweet Potato Peels (*Ipomea batatas L*)

Tubers of orange fleshed sweet potato used for this study were harvested from the farmland at Ikot Enwang Livestock Office, Akwa Ibom State Ministry of Agriculture located at Ikot Ekpene Local government area of Akwa Ibom State.

The tubers of the sweet potato were washed and peeled, the peels were sun dried for about 2-3 days to obtain 5-10% moisture and were then put into an airtight container for seven (7) days to obtain the solid state fermentation process. At the expiration of the fermentation day, they were then grounded to have a meal used in the diet formulation.

Procurement and management of experimental animal

Sixteen West African Dwarf (WAD) bucks of about 6 -8 months of age and averaged 7.02 kg were purchased from goat farmers in Akwa Ibom State with healthy stock for this study and the animals were weighed to determine their initial body weight. The animals were properly treated by a Veterinary Doctor against caprine contagious pleura pneumonia(CCPP), helminths, infections and anaemia and vaccinated against *Pestes de Petit Ruminantes* (PPR) before using them for the experiment to ensure accurate result. They were housed in a pen within the ruminant house which has been constructed to achieve good ventilation.

Experimental diets

The experimental diets designated as T_1, T_2, T_3, T_4 was formulated from orange fleshed sweet potato peels meal (OFSPPM), wheat offal, brewers dried grain, palm kernel cake, molasses, bone meal, salt to contain 0, 10, 20 and 30% orange fleshed sweet potato peels meal (Table 2).

The supplements were offered to experimental animals at 3 % of their body weight and *ad libitum*.

Experimental design and Statistical analysis

The experimental design that was used was completely randomized design (CRD). The statistical model for the design is:

$$\mathbf{Y_{ij} = \mu + T_i + e_{ij}}$$

Where:

Y_{ij} = Single observation

μ = Overall mean

T_i = Treatment effect

e_{ij} = random error (iind($0\delta^2$))(independent and identically distributed with zero error and standard deviation).

Statistical Analysis

All data obtained was subjected to a one-way Analysis of Variance (ANOVA) using SPSS version 22.0 (2013) statistical software. Differences between treatment means was separated using Duncan's Multiple Range Test option of the same software (SPSS, 2013).

RESULTS AND DISCUSSION

The performance of West African Dwarf (WAD) bucks fed experimental diets is summarized in Table 3. Dry Matter Intake (DMI) was not influenced by dietary treatment. Table 3 results showed that intake of diets containing orange fleshed sweet potato peels meal (OFSPPM) influenced better live weight in West African Dwarf bucks. Bucks fed diets containing orange fleshed sweet potato peels meal (2, 3 and 4) showed significantly ($P<0.05$) higher weight gains, relative to the control, throughout the duration of the experiment. Weight changes of bucks in control group was significantly ($P<0.05$) lower than those in group 2, 3 and 4 with group 4 having higher ($P<0.05$) weight gain relative to group 3. In total weight gain, the higher weight obtained from groups fed diets containing orange fleshed sweet potato peels meal point out the potentials and feed value of orange fleshed sweet potato peels meal as feedstuff for West African Dwarf goats. This is in line with Okoruwa *et al*. (2013) who reported that an efficient utilization of nutrients that supply adequate energy and protein is required for optimum growth performance in livestock.

Average daily Weight Gain (ADWG) differed significantly (P<0.05) among treatment groups but followed the trend as the total weight gain. Highest ADWG (58.60 g/d) was recorded in bucks given diet 4 followed by (47.05 g/d) for bucks fed diet C, followed by (30.65 g/d) for bucks fed diet 2 and least (25.81 g/d) for those in control group (1). The higher weight gain observed in animals offered diet 4 (30 % OFSPPM) revealed that the bucks utilized the diet better than others. This suggested that the higher the inclusion level of orange fleshed sweet potato peels meal in diet for West African Dwarf goats, the higher the weight gain. The findings of the present study agreed with Animashaun *et al.* (2006) who in their studies said that goat gained more weight when fed with formulated feeds. Weight of goats can also be influenced by factors like hereditary, environment, health status of the animal, palatability of feed, microbial activity in the rumen, etc. Average daily feed intake that was highest in diet 4 (253.27 g/d) and lowest in diet I (223.96 g/d) were influenced by the dietary treatments. This observation could probably be due to factors such as nature of ingredients, sub-limiting or excessive levels of some nutrients and environmental condition of the animals. This agreed with what Fatufe *et al*. (2007) reported that physical and chemical composition of a diet and environmental condition of an animal influenced their average feed intake. Feed conversion ratio of goats were significantly (P<0.05) varied across the diets with goats on diets 4 and 3 (4.36 and 5.33) lower than those on diets I (8.88) and 2 (7.52). The result revealed the ability of goats on diets 4 and 3 to convert their feeds consumed to weight gain well than either of the two other diets. A zero percent mortality occurred over the study period.

CONCLUSION AND APPLICATIONS

1.Replacing orange fleshed sweet potato peels meal with wheat offal produced significant variations in the growth weight of the West African Dwarf goats meaning that they were able to utilized and convert the diet for body use.

2. The improved growth weight of the animals as the inclusion level increases suggested that orange fleshed sweet potato peels meal can be included at a more higher concentration without any adverse effects.

3. The findings therefore suggested that orange fleshed sweet potato meal could be harnessed in place of wheat offal to improve goat production.

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Table 1: Proximate Composition of peels of fresh, sun- dried and fermented *Ipomea batatas L*

Proximate Analysis(%)	Fresh	Sun-dried	Fermented	SEM
Dry matter	29.31^{c}	87.12^{a}	52.81^{b}	8.39
Ash	3.1^{c}	13.8^{a}	9.78^{b}	1.56
Crude Protein	4.55^{c}	7.18^{b}	18.12^{a}	2.08
Ether Extract	1.24^{c}	4.38^{a}	4.24^{b}	0.51
Crude Fibre	2.51^{c}	9.95^{a}	6.68^{b}	1.08
Nitrogen Free Extract	88.60^{a}	64.69^{b}	61.18^{c}	4.31
MetabolizableEnergy (Kcal/gDM)	3702.23^{b}	3507.42^{c}	3751.42^{a}	37.25

^{a,b,c} means across rows with different superscripts differ significantly at p<0.05, SEM= Standard Error of Mean

Table 2 shows the Gross composition of experimental diets that was fed to the goats

Table 2: Gross composition of experimental diets that was be fed to the goats

Ingredients	Treatment 1	Treatment 2	Treatment 3	Treatment 4
OFSP Peels meal*	0.00	10.00	20.00	30.00
Wheat offal	50	40	30	20
Brewers dried grain (BDG)	27	27	27	27
Molasses	2	2	2	2

Palm kernel cake(PKC)	18	18	18	18
Salt	1.00	1.00	1.00	1.00
Bone	2.00	2.00	2.00	2.00
TOTAL	100.00	100.00	100.00	100.00
Calculated Analysis				
CP %	15.30	15.62	15.92	16.24
CF %	11.00	10.82	10.64	10.45
ME Kcal/gDM	1957.46	2145.60	2333.74	2521.89

*OFSP = orange fleshed sweet potato

Table 3 shows the Growth performance of West African Dwarf (WAD) bucks fed experimental diets.

Parameter	T_1	T_2	T_3	T_4	S.E.M
Initial Body Weight (kg)	7.05	7.20	6.95	6.88	0.20
Final Body Weight (kg)	9.45^{b}	10.05^{ab}	11.33^{ab}	12.33^{a}	0.46
Total Weight Gain (kg)	2.40^{b}	2.85^{b}	4.38^{a}	5.45^{a}	0.37
Average Daily Weight Gain (g/d)	25.81^{b}	30.65^{b}	47.05^{a}	58.60^{a}	3.92
Total Feed Intake (g)	20827.75	21035.00	22849.00	23554.00	664.72
Average daily feed intake (g/d)	223.96	226.18	245.69	253.27	7.15
Total dry matter Intake (g/d)	68657.61	70726.23	75129.71	77019.97	2445.88
Average DMI (g/d)	738.26	760.50	807.85	828.17	26.30
Feed Conversion Ratio	8.88^{a}	7.52^{a}	5.33^{b}	4.36^{b}	0.52
% Mortality	0.00	0.00	0.00	0.00	0.00

^{a,b} means across rows with different superscripts differ significantly at $p<0.05$, SEM= Standard Error of Mean, DMI =Drymatter Intake, T_1=Control (0 % OFSPPM), T_2=Bucks fed Diet containing 10 % OFSPPM, T_3= Bucks fed Diet containing 20 % OFSPPM, T_4= Bucks fed Diet containing 30 % OFSPPM, DMI=Dry Matter Intake

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