CARCASS EVALUATION OF WEST AFRICAN DWARF (WAD) GOATS FED BIODEGRADED CASSAVA PEELS BASED DIETS.

***BARDE, R. E., AKINFEMI, A[1]., OKPANACHI, U[2]. AND SALEH, G[3].**

*Animal Science Department, College of Agriculture, Lafia.
[1]Animal Science Department, Nasarawa State University, Keffi.
[2]Animal Production Department, Kogi State University, Ayangba.
[3]Agriculture Education Department, Federal College of Education (Tech.) Bichi, Kano.
***Corresponding author: rowebarde@yahoo.com**
Article received: 23rd April, 2015; Article accepted: 15th August, 2015.

ABSTRACT
Twenty intact WAD bucks of age between 7-9 months and weighing on the average 6.17±0.96kg were randomly allocated to five fungi (Pleurotus tuber- regium) based diets in a completely randomized experiment. The diets are T1 (100% untreated cassava peel) while T2, T3, T4 and T5 contained 100, 25, 50 and 75% biodegraded cassava peel respectively. The study which lasted 84 days was designed to evaluate carcass yield and characteristics. Slaughter weight of bucks fed 100% Pleurotus tuber- regium biodegraded cassava peels based diet (PT-CPS) was the highest(12.07kg) and differed significantly(P<0.05) from 7.77kg recorded for bucks fed 100% untreated cassava (UCPS) control diet. Similar trend was observed for hot carcass weight and dressing percentage with values of 6.2, 3.7kg and 51.3, 47.3% recorded for 100% PT-CPS (T2) and 100% UCPS (T1) fed bucks, respectively. Percent whole sale cuts for shoulder, rack, breast, loin, and leg showed significantly (P<0.05) better values for 100% PT-CPS fed bucks followed by bucks fed diets T5, then T4,T3 and subsequently 100% UCPS (T1). Relatively, T2 (100% PT-CPS) supported superior (P<0.05) growth and carcass characteristics in bucks, suggesting therefore that Pleurotus tuber regium biodegraded cassava peels is a potential feed resource for goats and indeed ruminants and can be exploited for WAD goat production.
Keywords: *Pleurotus tuber regium,* cassava peels, carcass, West African Dwarf (WAD) goats

INTRODUCTION

Cassava peels (*Manihot esculenta*) are lignocellulosic in nature, consisting varying proportions of fibre fractions namely: cellulose, hemicelluloses and lignin. Lignin, a heterogeneous polymer structure of the vascular plants is reported to be most abundant renewable organic material next to cellulose (Ohkuma *et al*., 2001). Lignin plays a key role in the carbon cycle as the most abundant aromatic compound in nature, providing the protective matrix surrounding the cellulose micro fibrils of plant cell walls (Mshandete and Mgonja, 2009). This phenylpropanoid polymer resists chemical or enzymatic degradation of cellulose which is known to be the most abundant of all naturally occurring organic compounds. Substantial proportions of nutrients in feedstuff for ruminants remain unavailable due to the resistance of the fibre polymers to microbial and enzymatic digestion *in vivo*. For cassava peels to make substantial contribution to ruminant nutrition, it must be treated prior to feeding in some way to improve its nutritional potentials. Pre-feeding treatments could rectify nutritional short comings of the feed material and make it easier for rumen microbes to attack the fibres (Oboh , 2006).

Many workers (Ohkuma *et al*., 2001; Shah and Nerud, 2002; Mshandete and Mgonja, 2009) have reported that amongst the various groups of microorganisms that have the capacity to degrade lignin, rotting fungi are the most efficient lignin degraders in nature. Current research development must look at technologies that are cheap, safe and adaptable in communities or regions where production and processing of cassava is pronounced in order to explore the nutritive value of cassava waste optimally.

The biodegradation of agricultural waste provides a cheap and safe process in which the wastes like cassava peels are decomposed by mono or mixed cultures of microorganisms under controlled environmental conditions to improve the quality of the wastes. Thus, the use of microbial enzymes to cleave the complex carbohydrates bonds through the process of biodegradation, can be used to improve the nutritional value of non-conventional feed ingredients that are readily available. This would lead to increased utilization of such products in livestock feeding. This process will also invariably reduce the cost of ruminant production. Barde *et al*. (2015) have reported *Pleurotus tuber- regium* being more efficient in achieving this purpose in cassava peels. It is against this backdrop that this study was designed to determine the potential of edible *Pleurotus tuber-regium* biodegraded cassava peel based diets to improve carcass characteristics of West African Dwarf (WAD) goats.

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Farm Unit of the College of Agriculture, Lafia, Nigeria located within Latitude 08^{0}N29′8.66″ and Longitude 08^{0}E 29′ 49.10″ on altitude of 164.5m above sea level; in the Guinea savannah vegetation zone nourished predominantly on, sandy loam soil texture as described by Akwa *et al*. (2007).

Processing of Cassava Peel

Fresh cassava peel was obtained from the Family Support Programme's Gari Processing Industry, Shabu – Lafia and sun dried for six days as describe by Uza *et al*. (2005). Treatment of cassava peels with *Pleurotus tuber- regium* was by inoculation of composted cassava peels with slices of the tuber on a concrete floor at room temperature covered with polythene sheet and allowed to ferment for 21 days as described by Barde *et al*.(2015)

Preparation of Diets

Five diets containing untreated and biodegraded cassava peels were mixed at varying proportions separately incorporated in compounded dietary treatments as reported by Barde *et al.* (2014). The proportion of mixed and unmixed diets before compounding is as follows:

T1 – 100% untreated cassava peels (UCPS)

T2 – 100% *Pleurotus tuber regium* treated Cassava Peels (PT-CPS)

T3 – 75% UCPS + 25% PT-CPS

T4 – 50% UCPS + 50% PT-CPS

T5 – 25% UCPS + 75% PT-CPS

Other feed ingredients were purchased from open market, livestock feed retailers and veterinary service providers within Lafia.

Animal Management

Twenty West African Dwarf (WAD) intact bucks of age between 7-9 months and having an average weight of 6.17±0.96kg from the Small Ruminant section of the College Farm were allocated to five dietary treatments denoted as T1, T2, T3, T4 and T5 diets in a completely randomized experimental design (Steel and Torrie, 1980). The bucks were housed in individual pens measuring 1.5m^2 each provided with feeding and watering troughs. The animals, four per treatment were allowed access to water, mineral salt lick and fed *ad libitum.* Proximate composition of the diets is presented in Table 2. The animals were weighed at the beginning of the trial and weekly thereafter for twelve weeks, to assess weight changes. Feed intake was determined by subtracting feed remnant from quantity offered daily at 0800 hours. Fourteen days was allowed for the animals to get accustomed the diets prior to data collection.

Two goats from each treatment group were randomly picked, starved of feed for 24hrs and slaughtered for carcass evaluation at the end of the experiment following the procedure of USDA (1982). The bodies were skinned; the heads and feet were removed. The carcass was eviscerated and the internal organs were weighed.

Data Collected

i. Full live weight, hot carcass weight and hot dressed percentage were determined.
ii. Body components: head, feet, skin, blood, kidneys, liver, lungs, gut were weighed and their percentages with respect to the empty body weight of the animal were determined.
iii. One half of the carcass was separated along the dorsal mid-line into whole sale cuts of shoulder, rack, loin, leg , breast and flank and their weights determined.

Statistical Analysis

All data collected obtained were subjected to analysis of variance. Where significant differences occurred, the means were separated using Duncan's Multiple Range Test (SPSS, 2007).

RESULTS AND DISCUSSION

Performance of WAD Bucks Fed Treatment Diets

Table 3 shows performance of WAD bucks fed untreated and biodegraded cassava peel-based Bucks on 100%PT-CPS diet (T2) with significantly ($P<0.05$) the highest final mean weight of 13.25kg while bucks on UCPS diet (T1) had the lowest final mean weight of 8.00kg. A corresponding significant ($P<0.05$) total weight gain was recorded for T2 (7.08kg) followed closely by bucks on 75% PT-CPS, T5 (6.10kg); 50%PT-CPS, T4 (5.53kg); 25%PT-CPS, T3 (3.75) while the lowest was by bucks on control diet, T1 (1.73kg). It is imperative that nutritive value of feed expresses itself not only by chemical assay but by evidence of improved gain (David, 2012).

Carcass characteristics of bucks fed untreated and bio-degraded cassava peel-based diets are presented in table 4. Significant ($P<0.05$) differences were recorded for all parameters except for the heart organ. Slaughter weight (Kg) showed T1, 7.77kg; T2, 12.07kg; T3, 10.00kg; T4, 11.07kg and T5, 11.20kg. The highest hot carcass weight value of 6.2kg was recorded for T2, followed by T5 (5.60kg), T4 (5.20kg) then T3 (4.89kg) and T1 (3.7kg). Dressing per cent showed a similar trend indicating highest value for diet T2 containing biodegraded cassava peel compare with diet (T1) 100% untreated cassava peel (51.37 vs 47.73%).

The wholesale cuts of shoulder, rack, breast, loin, flank and leg all showed significant (P<0.05) difference among treatment groups. The pattern here indicates a similar trend in results of T2 values, being the highest for all the wholesale cuts, closely followed by values of T5, then T4, T3 and T1 in that order.

Offal's parts analysed in this study also showed significant (P<0.05) differences among treatment groups for all the parts except for heart. However, none of the treatments showed presence of any abdominal fat.

Slaughter weight of bucks showed significant (P<0.05) difference among treatment groups (Table 3), the highest (P<0.05) slaughter weight of 12.07kg and the lowest 7.77kg were recorded for T2 and T1, respectively. Similarly, bled weights, hot carcass weights and dressing per cent values recorded also showed significance (P<0.05). The superior (P<0.05) dressing per cent of bucks of T2 (51.37%) and T5 (50.00%) is a reflection of the efficiency of utilization of these diets consisting 100 and 75% inclusion of the biodegraded cassava peel, respectively. This observation corroborates the findings of some investigators (Hassan and Idris, 2002;

Table 1: Gross Composition of untreated and Biodegraded cassava peel-based Diets (g/100g)

Ingredients (%)	T1	T2	T3	T4	T5
UCPS	45	-	33.75	22.50	11.25
PT-CPS	-	45	11.25	22.50	33.75
BDG	30	30	30	30	30
SBM	10	10	10	10	10
PKC	12	12	12	12	12
Bone meal	2	2	2	2	2
Premix*	0.5	0.5	0.5	0.5	0.5
Salt	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100

*Pfizer Premix : Vit A 10,000,000 IU; Vit D3 2,000,000 IU; Vit E 8,000 IU; Vit K 2,000mg;Vit B1 2,000 mg; Vit B2 5,500mg; Vit B6 1,200 mg; Vit B12 12 mg; Biotin 30 mg; Folic Acid 600 mg; Niacin 10,000 mg; Pantothenic Acid 7,000mg; Choline chloride 500,000 mg; Vit C 10,000mg; Iron 60,000 mg; Mn 80,000 mg; Cu 8,00mg; Zn 50,000 mg; Iodine 2,000 mg; Cobalt 450 mg; Selenium 100 mg; Mg 100,000 mg; Anti Oxidant 6,000 mg.

Table 2: Chemical Composition of Diets

%	T1	T2	T3	T4	T5	SEM
DM	89.91^{e}	90.17^{b}	90.06^{c}	89.97^{d}	90.23^{a}	0.33
CP	21.72^{e}	23.21^{a}	22.05^{d}	22.53^{c}	22.74^{b}	0.14
CF	10.77^{a}	9.91^{d}	10.53^{b}	9.85^{e}	9.94^{c}	0.10
EE	3.90^{a}	3.70^{d}	3.67^{e}	3.78^{b}	3.73^{c}	0.22
Ash	6.23^{c}	6.29^{b}	6.28^{b}	6.17^{d}	6.41^{a}	0.22
ME (MJ/Kg DM)	5.87^{a}	7.90^{a}	6.52^{a}	6.96^{a}	7.14^{a}	0.19

a,b,c,d - Means on the same row with different superscript are significantly (P<0.05) different
SEM - Standard error mean

Table 3: Performance of WAD Bucks Fed Untreated and Bio-degraded Cassava peel-based Diets.

Parameter	T1	T2	T3	T4	T5	SEM
No. Of bucks	4	4	4	4	4	-
Feeding period (days)	84	84	84	84	84	-
Initial Mean LWt (kg)	6.28	6.25	5.57	6.13	5.60	0.15
Final Mean LWt (kg)	8.00^{d}	13.25^{a}	10.00^{c}	11.50^{b}	11.68^{b}	0.42*
Total Mean LWt gain (kg)	1.73^{c}	7.08^{a}	3.75^{b}	5.53^{a}	6.10^{a}	0.49*

SEM - Standard error mean
a,b,c,d - Means on the same row with different superscript are significantly (P<0.05) different

Table 4: Carcass Characteristics of WAD Bucks

Parameter	T1	T2	T3	T4	T5	SEM
Slaughter Weight (Kg)	7.77^{d}	12.07^{a}	10.00^{c}	11.07^{b}	11.20^{b}	0.41
Bled Weight (Kg)	7.42^{d}	11.87^{a}	9.8^{c}	10.80^{b}	10.90^{b}	0.42
Hot Carcass Weight (Kg)	3.7^{e}	6.2^{a}	4.89^{d}	5.20^{c}	5.60^{b}	0.22
Dressing Percent (%)	47.73^{d}	51.37^{a}	48.70^{c}	46.97^{e}	50.00^{b}	0.43
Wholesale cuts (% of hot carcass weight)						
Shoulder	10.07^{e}	16.87^{a}	13.28^{d}	14.15^{c}	15.26^{b}	0.61
Rack	6.27^{e}	10.50^{a}	8.27^{d}	8.81^{c}	9.49^{b}	0.38
Breast	3.70^{e}	4.53^{a}	3.57^{d}	5.80^{c}	4.09^{b}	0.17
Loin	6.04^{e}	10.12^{a}	7.97^{d}	8.49^{c}	9.14^{b}	0.36
Flank	1.72^{c}	2.89^{a}	2.27^{d}	2.42^{c}	2.61^{b}	0.11
Leg	8.77^{e}	14.70^{a}	11.57^{d}	12.33^{c}	13.28^{b}	0.53
Other Organs ((% of hot carcass weight)						
Head	19.01^{a}	13.00^{c}	14.39^{b}	12.60^{d}	12.58^{d}	1.76*
Feet	7.81^{a}	6.75^{d}	7.16^{b}	6.98^{c}	6.66^{d}	11.84*
Skin	19.05^{a}	11.52^{e}	15.05^{b}	15.19^{c}	14.59^{d}	12.45*
Kidney	0.95^{a}	0.87^{c}	0.94^{b}	0.92^{b}	0.79^{d}	1.77*
Liver	4.15^{a}	3.63^{b}	3.68^{b}	3.69^{b}	3.57^{c}	6.61*
Lungs	4.15^{c}	3.37^{e}	3.54^{d}	4.44^{b}	4.63^{a}	10.20*
Heart	0.95	1.02	0.98^{d}	0.94	0.96	2.42*
Spleen	0.75^{a}	0.31^{c}	0.35^{b}	0.37^{b}	0.32^{c}	0.62*
Gut (g)	17.94^{a}	11.42^{d}	14.53^{b}	12.89^{c}	12.93^{c}	6.44*
Testicle	2.22^{b}	1.57^{b}	2.72^{a}	2.52^{a}	2.38^{a}	6.76*

a,b,c,d - Means on the same row with different superscript are significantly ($P<0.05$) different
SEM - Standard error mean

Ahamefule, 2005; Ukanwoko *et al.,* 2009). Meat production evaluated in terms of live weight gain or (performance and carcass characteristics is dependent on genetic and environmental variables. Among the environmental factors, dietary influence has been shown in this study to be one of the main factors influencing carcass yield (Momani - Shaker *et al.*, 2003; Wood *et al*., 2008).

The whole sale cuts of shoulder, rack, breast loin, flank and leg obtained are influenced significantly ($P<0.05$) by the relative proportion of biodegraded cassava peel and superiority of these cuts are in the order of T2> T5>T4>T3>T1. In order to promote use of biodegraded residues like cassava peels for economic gains, a high dressing percentage and superior wholesale cuts are desirable, which this study seems to indicate.

Organ weights of the experimental goats differed significantly ($P<0.05$) showing the effect of different diets. These observations do not agree with the findings of Ukanwoko *et al*. (2009) that suggested age of stock could be responsible. Abdominal fat was absent in all the treatments suggesting that animal are within actively growing age. The absence of abdominal fat could be assumed to be due to a higher growth arising from protein muscles accretion, commonly characteristics of goats not too advanced in physiological age or maturity.

CONCLUSION

Results showed carcass characteristics of the WAD bucks fed biodegraded cassava peel or 100%PT-CPS diet (T2) recorded the highest hot carcass weight (6.2kg) and dressing percentage (51.37%). The lowest hot carcass weight (3.7kg) and dressing percentage (47.73%) were observed in bucks fed untreated or 100%UCPS treatment diet (T1). The trend of superiority in performance for whole sale cuts in this study was in the order: T2>T5>T4.T3>T1 showing decreasing proportion of biodegraded cassava peel diets. The trend underscores the place of good nutrition in carcass yield. Abdominal fat was absent in all the treatments. The absence of abdominal fat could be assumed to be due to the less physiologically matured bucks or a higher growth and consequently carcass due to protein muscles accretion.

REFERENCES

Ahamefule, F. O. (2005). Evaluation of pigeon pea – cassava peel based diets for goat production in South – Eastern Nigeria. Ph.D. Thesis. Michael Okpara University of Agriculture,Umudike. Nigeria.

Akwa, V.L., Binbol, N.L., Samaila K.I and Marcus N.D. (2007). Geographic Perspective of Nasarawa State. Department of Geography Nasarawa State University. Onavi Printing and Pub. Co. LTD Keffi, Nigeria.157p

Barde RE, Ayoade JA, Attah S, Wuanor A (2015). *In vitro* Rumen Fermentation Characteristics of White Rot Fungi Biodegraded Cassava (*Manihot esculenta*) peels. Journal of Agriculture and Ecology Research International. 4(4): 166-174; Article no.JAERI.2015.062 www.sciencedomain.org

Barde RE, Ayoade JA, Attah S, Musa IS.(2014). Effect of *Pleurotus tuber regium* treated cassava peel based diets on haematological and serum biochemical parameters of WAD bucks; 2014:10(1). Available: http://patnsukjournal.net/Vol10No1/p11.pdf

David, L. (2012). Nutritive Value of Feeds for Beef Cattle. Oklahoma Cooperative Extension Fact Sheets. http://osufacts.okstate.edu

Hassan, W. A. and Idriss, A. (2002). A rapid assessment of dressing out percentage for Red Sokoto goats. Ed. Bamgbose, A M,Akuinwumi, T. M. and Olusunde, A.A)Proceeding of the Annual Conference of Animal Science Association of Nigeria. ASAN. IART, OAU, Ibadan, Nigeria. 7:265-266.

Momani- Shaker, M., Abdullah,A.Y., Kridli,R.T., Bláha, J. And Šáda,I. (2003). Influence of the Nutrition level on Fattening and Carcass Characteristics of Awassi Ram Lambs. Czech J. Anim. Sci., 48, 2003 (11): 466–474

Mshandete,A. M. and Mgonja J.R.(2009). Submerged Liquid Fermentation of some Tanzanian Blasidiomycetes for the production of Mycelial Biomass, Exopolysaccharides and Mycelium Proteining wastes peels media. ARPN J. Agric. and Bio. Sci.4 (6)

Oboh,G .(2006). Nutrient Enrichment of Cassava Peels Using a Mixed culture of Saccharomces cerevisae and Lactobaccillus spp Solid Media fermentation Technique. Electronic J. Biotechnol., 9:46-49

Ohkuma, M., Maeda,Y., Johjima,T., and Kudo,T. (2001). Lignin degradation and roles of white rot fungi: Study on an efficient symbiotic system in fungus-growing termites and its application to bioremediation. RIKEN Review No. 42 : *Focused on* Ecomolecular Science Research.

Shah,V. and Nerud, F.(2002). Lignin degrading system of white-rot fungi and its exploitation for dye decolorization. Can. J. Microbiol. 48: 857–870 (2002).

SPSS (2007). Statistical Package for Social Science.16.0 version for Windows. www.spss.com Steel, R. G. D. and Torrie, J. H. (1980). Principles and procedure of statistics. A biometrics approach. 2nd edition McGraw Hill Boo co. Inc. New York. 632pp.

Ukanwoko, A.I. , Ahamefule, F.O. and Ukachukwu, S.N. (2009). Nutrient Intake and Digestibility of West African Dwarf Bucks Fed Cassava Peel-Cassava Leaf Meal Based Diets in South Eastern Nigeria. Pakistan J.Nutr. 8 (7): 983-987.

USDA (1982). Official united state standards for grades of lamb, yearling mutton and mutton carcass. Agricultural marketing service USDA,Washington, DC, 1.

Uza, D.V., Barde, R.E. and Ayoade, J.A.(2005). Effect of Urea treated Cassava peels as Supplement to WAD Goats Grazing Natural Pasture. Nig. Journal of Vet. Med. Pp 1-4

Wood, J.D., Enser, M., Fisher, A.V., Nute, G.R., Sheard, P.R., Richardson, R.I., Huges, S.T. and Whittinson, F.M. (2008). Fat deposition, Fatty Acid Composition and Meat Quality: A Review. Meat Sci.78:343 – 358

.