THE PERFORMANCE TRAITS OF WHITE FULANI YEARLING BULLS FATTENED WITH *PANICUM MAXIMUM* AND WHEAT OFFAL WITH OR WITHOUT CASSAVA STARCH RESIDUES OR CASSAVA PEELS

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ABSTRACT

Twelve male White Fulani cattle aged 1 – 1 ½ years with initial body weight of 84.50±5.7kg were allotted to three experimental concentrate diets at four yearling per diet. Each animal represented a replicate. Dried cassava starch residues (CSR) and cassava peel were used to replace 50% wheat offals in diets 2 and 3 respectively while diet 1 had 100% wheat offal and served as the control. Wilted Panicum maximum at early stage of regrowth, experimental concentrate diets and water were supplied ad libitum for 180 days.

Wheat offal had the highest crude protein-CP (16.95%) and ash (7.65%), neutral detergent fibre (39.10%), acid detergent fibre (34.11%) and cellulose (33.01%). Panicum maximum had the highest value for crude fibre – CF (35.21%), Ether extract – EE (5.32%), acid detergent lignin (2.97%) and hemicellulose (8.97%). The CSR had the least value for CP (2.70%), CF (3.89%), EE (1.75%) and ADL (1.10%). Cattle fed cassava peel-based diet had significantly ($p<0.05$) higher concentrate intake (403.63g/cattle/day) and total feed intake (736.49g/cattle/day) than those on control diet (301.79 and 571.85g/cattle/day respectively) and cassava starch-based-diet (256.90 and 529.70g/cattle/day). Significantly ($p<0.05$) higher weight gain and final body weight were obtained for cattle on diet 1 (147.95g/cattle/day and 122.80kg/cattle respectively) and diet 3 (175.59g/cattle/day and 136.17kg/cattle) than those fed wheat offal and CSR (diet 2). Digestibility of nutrients varied significantly ($P<0.05$), and the highest digestibility of dry matter (66.22%), EE (81.83%) and NFE (96.93%) were obtained for diet 1 while diet 3 had the highest digestibility of CF (77.39%) and CP (76.38%) among diets.

Cassava peels favourably replaced 50% wheat offal than cassava starch residue in the diet of White Fulani yearling bulls without any adverse effect on their growth and performance characteristics.

Keywords: White Fulani cattle, Cassava starch residue, Cassava peel, Wheat offal, Growth.

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INTRODUCTION

Cattle, sheep and goats were among the first animals to be domesticated. The ruminants grazed the fields and convert the herbage to valuable human food. The major obstacle to the development of livestock industry especially cattle production in Nigeria is that of

inadequate and unbalanced feeding with regards to energy and protein constituent of the diet (Okorie, 1983). Traditional diets for cattle and other ruminants in developing countries consist of grasses and agricultural by products. However, because of the high cost and irregular supply of these feedstuffs throughout the year, farmers have to search for the alternatives and this has directed the interest of farmers to the use of industrial by products. Many small-scale farmers are increasingly relying on browse, crop residues and by products to supplement grazing during the dry season.

Cassava peel is abundant in Nigeria and when compared to the whole tuber, the peel accounts for 10 to 13% of the tuber weight. About 4 million tonnes of cassava peels had been estimated to be produced annually in Nigeria (Lucas, 1987). Cassava starch residue is a by-product of starch extraction from cassava tuber or chips. Wheat offal is a flaky brown material obtained as a by-product in the process of commercial dry milling of whole wheat kernel.

The objectives of this study was to evaluate the performance of White Fulani yearling calves fed with *Panicum maximum* and wheat offal with or without cassava starch residue or cassava peels and the suitability of these feedstuffs as supplement in fattening White Fulani cattle.

MATERIALS AND METHODS

Experimental Animals and Management: Twelve yearling White Fulani bulls aged 1–1 ½ years with initial weight of 84.50±5.7kg were selected and kept inside the University Mission Research pen, Department of Animal Science, University of Ibadan, Ibadan, Nigeria which is in the tropical climate. Prior to the commencement of the experiment, the animals were kept on concrete floor pen using wood shavings as the bedding materials. The first two weeks of the experiment were used for bulls to adapt to the new environment and experimental diets. The bulls were vaccinated against rinderpest, foot and mouth disease and treated against internal and external parasites.

Experimental Diets: The composition of experimental concentrate diets fed to White Fulani yearling bulls is as shown in Table 1. The diets consisted of dried cassava peel, cassava starch residues (CSR) wheat offal, oyster shell, bone meal, vitamin-premix and table salt. *Panicum maximum* at early stage of regrowth was cut daily from the pasture, wilted for some hours and put in feed rack for cattle consumption. Fresh *Panicum maximum* were supplied daily at the 8^{th} and 14^{th} hours on daily basis. Dried CSR and cassava peels were used to replace 50% wheat offals in diets 2 and 3 respectively. Diet 1 with 100% wheat offal serves as the control. Twelve male White Fulani cattle were allotted to three experimental concentrate diets at four yearlings per diet. Each animal represented a replicate. Fresh, cool and clean water and wilted *Panicum maximum* were offered *ad libitum* to all animals throughout the experimental period in order to allow for maximum voluntary intake. The leftover feed was weighed and discarded before giving fresh feed for the day. Animals were weighed weekly. The study lasted for 180 days.

Digestibility Studies: The apparent nutrient digestibility of the experimental diets and *Panicum maximum* was determined during the last two weeks of the experimental period. Faeces were collected for digestibility study using collection bags (harness bags) fitted on various animals. The quantity of feed consumed and faeces excreted daily during the 2 week period were weighed and dried in a forced drought oven at 80°C for 24 hours to a constant weight

before storing in a cellophane bag till required for analysis.

Chemical Analysis: The proximate compositions of CSR, cassava peel, wheat offal, *Panicum maximum*, experimental diets and faecal samples were determined by the procedure of AOAC (1990), and their fibre fractions separated according to Van Soest *et al.,* (1991).

Table 1:Composition of experimental concentrate fed to White Fulani yearling bulls

Diets/Treatments	1	2	3
Ingredients (%)			
Wheat offal	96.0	48.0	48.0
Cassava starch residue	-	48.0	-
Cassava peels	-	-	48.0
Oyster shell	0.50	0.50	0.50
Bone meal	2.50	2.50	2,50
*Ruminant Premix	0.50	0.50	0.50
Table Salt	0.50	0.50	0.50
Total	100	100	100

*Premix composition/kg: Vitamin A, 7,000,000mg; Vit D3, 700,000mg; Vit E_3, 30,000mg; Mn, 50,000mg; Fe, 50,000mg; Zn, 50,000mg; Cu, 10,000mg; I, 400mg; Co, 100mg; Se, 100mg.

Data Collection: Data were collected on the following parameters which include feed intake, body weight, weight gain, feed conversion ratio, feed efficiency, proximate composition of experimental diets and feed stuffs in terms of Dry Matter (DM), Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE), Ash and Nitrogen Free Extract (NFE), fibre fractions like Neutral Detergent Fibre (NDF), Acid Detergent Fibre (ADF), Acid Detergent Lignin (ADL), hemicellulose, cellulose, apparent nutrient digestibilities and the Total Digestible Nutrients (TDN).

The apparent nutrient digestibility for each of the nutrients was calculated as the nutrient digested or absorbed expressed as a percentage of the intake i.e.

$$\frac{\text{Intake} - \text{Output}}{\text{Intake}} \times \frac{100}{1}$$

Statistical Analysis: Data obtained were analyzed using ANOVA procedure of SAS (1999) and the contrasts between the means were evaluated by the Tukey test at a significance level of 5% ($p<0.05$).

RESULTS

The chemical compositions of CSR, cassava peel, wheat offal and *Panicum maximum* are as shown in Table 2. The Dry Matter (DM) ranged between 78.50% and 92.00% with cassava peel having the least value (78.50%DM). Wheat offal had the highest CP (16.95%) and Ash (7.65%), while CSR had the highest values for NFE (86.75%), NDF (39.10%), ADF (34.11%) and Cellulose (33.01%). *Panicum maximum* had the highest value for CF (35.21%), EE (5.32%), ADL (2.97%) and hemicellulose (8.97%).

The least value for CP (2.70%), CF (3.89%), EE (1.75%) and ADL (1.10%) were obtained for CSR while the least NDF (11.12%) and ADF (10.16%) were obtained for wheat offal.

Table 2: Chemical Composition of Wheat Offal, Cassava Starch residues, cassava peel and *Panicum maximum* (g/100gDM)

Feed stuffs	Wheat Offal	Cassava Starch residues	Cassava peels	*Panicum maximum*
Parameters (%)				
Dry Matter (DM)	86.50	92.00	78.50	91.47
Crude Protein(CP)	16.95	2.70	5.58	6.14
Crude Fibre (CF)	12.28	3.89	3.96	35.21
Ether Extract (EE)	5.00	1.75	2.19	5.32
Ash	7.65	4.91	4.61	7.24
Nitrogen Free Extract (NFE)	58.12	86.75	83.66	46.09
Fibre fractions				
Neural Detergent Fibre (NDF)	11.20	39.10	32.70	24.79
Acid Detergent Fibre (ADF)	10.16	34.11	29.91	15.82
Acid Detergent Lignin (ADL)	1.30	1.10	1.80	2.97
Hemicellulose	1.04	4.99	2.79	8.97
Cellulose	8.86	33.01	28.11	12.85

The performance traits of White Fulani yearling bulls fed *Panicum maximum* and wheat offal with or without cassava starch residues or cassava peel is as shown in Table 3. The animals were similar (p>0.05) for initial body weight (78.80 – 87.67kg), intake of *Panicum maximum* (270.06 – 273.33g/bull/day), feed efficiency (0.23 – 0.25) and FCR (3.86 – 4.19). Bulls on diets 1 and 2 had similar value for the intake of concentrate feed (301.79 and 256.90g/cattle/day respectively) which were significantly ($p<0.05$) lower than the value obtained for cattle on diet 3 (403.63g/bull/day). Also, cattle fed wheat offal and cassava peel (diet 3) were superior ($p<0.05$) for total feed intake (736.49g/bull/day) than those on diets 1 and 2 (571.85 and 529.70g/bull/day respectively).

Cattle on 100% wheat offal (diet 1) ad those on diet 3 had significantly ($p<0.05$) higher weight gain (147.95 and 175.59g/bull/day respectively), and final body weight 122.80 and 136.17kg/bull) than those fed wheat offal and CSR (diet 2). The least values for weight gain (38.63w 0.75/bull/day) and final body weight (98.50kg/bull) was obtained for cattle on diet 2.

Table 3: Performance traits of White Fulani yearling bulls fed *Panicum maximum* and wheat offal with or without cassava starch residues or cassava peel

Treatments/Diets	1	2	3	SEM
Parameters				
Initial Body weight (kg)	87.67	87.50	78.80	0.17
Concentrate intake (g/bull/d)	301.79^{b}	256.90^{b}	403.63^{a}	7.86
Panicum maximum intake (g/bull/day)	270.06	272.80	273.33	8.41
Total feed intake (g/bull/day)	571.85^{b}	529.70^{b}	736.49^{a}	11.76
Weight gain (g/bull/day)	147.95^{a}	130.75^{b}	175.59^{a}	26.11
Weight gain ($w^{0.75}$/bull/day)	92.71^{a}	38.63^{b}	117.19^{a}	4.09
Final body weight (kg/bull)	1222.80^{a}	98.50^{b}	136.17^{a}	2.35
Efficiency of feed utilization (EFU)	0.25	0.24	0.23	0.94
Feed conversion ratio (FCR)	3.86	4.04	4.19	0.07

^{ab}Means along the same row with different superscripts are significantly ($p<0.05$) different.

The apparent nutrient digestibility of White Fulani yearling bulls fed cassava starch residue, cassava peel, wheat offal and *Panicum maximum* is as shown in Table 4. The apparent nutrient digestibility of DM varied significantly ($p<0.05$) from 40.94% for cattle on diet 3 to 66.22% for those on diet 1, while 60.67%DM digestibility was obtained for cattle fed sole *Panicum maximum*.

The digestibility of CP varied significantly ($p<0.05$) from 42.07 to 78.38%. The highest value (78.38%) was obtained for cattle on *Panicum maximum* while the least value (42.07%) was obtained for those on diet 2.

The digestibility of CF significantly ($p<0.05$) decreased from 77.39% for cattle on diet 3 through 70.00 and 65.92% for those fed diet 2 and sole *Panicum maximum* respectively to 52.89% for calves on diet 1. Besides these cattle fed diet 1 had the highest digestibility for EE (81.83%) which was significantly ($p<0.05$) higher than wheat obtained for those on diets 2 and 3 while those on sole *Panicum maximum* had the least value (37.49% EE digestibility).

The digestibility of ash varied significantly ($p<0.05$) from 22.71% for cattle on diet 2 through 47.30 and 58.08% for those on diet 3 and 2 respectively to 73.72% for calves on *Panicum maximum*.

The highest digestibility of NFE (96.93%) was obtained for cattle fed diet 2 and the least value was obtained for those fed diet 2 (i.e. 50% of wheat offal and CSR).

The TDN decreased significantly ($p<0.05$) from 17.59 for cattle fed diet 1 through 11.26 and 8.33 for those fed diets 2 and 3 respectively to 5.67 for those fed *Panicum maximum*.

Table 4: Apparent nutrient digestibility of White Fulani yearling bulls fed cassava starch residue, cassava peel, wheat offal and *Panicum maximum*.

Diets	**1**	**2**	**3**	***Panicum maximum***	**SEM**
Parameters					
Dry matter (%)	66.22^{a}	59.75^{b}	40.94^{c}	60.67^{b}	0.10
Crude protein (%)	66.48^{c}	42.07^{d}	76.38^{b}	78.38^{a}	0.01
Crude fibre (%)	52.89^{c}	70.00^{b}	77.39^{a}	65.92^{b}	0.01
Ether extract (%)	81.83^{a}	66.28^{c}	70.74^{b}	37.49^{d}	1.06
Ash (%)	58.08^{b}	22.71^{d}	47.30^{c}	73.72^{a}	0.003
NFE (%)	96.93^{a}	66.65^{d}	89.41^{c}	97.32^{b}	0.01
TDN	17.59^{a}	11.26^{b}	8.83^{c}	5.67^{d}	0.01

^{abcd}Means along the same row with different superscripts are significantly ($p<0.05$) different.

DISCUSSION

Values obtained for chemical composition of wheat offal in this study were similar and within the range of values (18.40%CP, 8.20%CF and 4.90%EE) reported for wheat offal by NRC (1984). The chemical compositions of CSR obtained in this study were also within the range of values reported for CRS by Aro *et al.,* (2010), Khang and Wiktorsson (2004) and Wanapat *et al.,* (2001). The CP, CF and EE content of cassava peel used were also similar and within the range of values (3.50 – 5.61, 5.21 – 10.34 and 1.39 – 1.75% respectively) reported by Afolabi *et al.,* (2007) and Oyenuga (1968).

The proximate composition of *Panicum maximum* obtained in this study were also within the range of values (79.9 – 91.50%DM, 5.65 – 6.56%CP, 30 – 35%CF, 0.50 – 12.00%EE, 7.00 – 8.00%Ash and 36.09 – 58.44%NFE) earlier reported by Alasa

et al., (2010), Ogunsola and Agbede (2005) and Ebenebe (2005).

The concentrate intake (403.63g/bull/day) and total feed intake (736.49g/bull/day) of cattle fed diet containing wheat offal and cassava peels (diets) was superior or significantly higher ($p<0.05$) than what obtained for those fed diet 1 (control) and 2. This could be attributed to the appreciable level of NFE (83.66%), NDF 932.70%) and Cellulose (28.11%) contained in cassava peel which are good sources of energy in ruminant feed. Okeke (1992) and Oyenuga (1968) had noted that cassava peels are richer in carbohydrate than the edible cassava tuber. The intake of *Panicum maximum* by the animals were not significantly ($p>0.05$) different across diets just because the animals were offered the same feeding stuff.

The significantly ($p<0.05$) higher weight gain and final body weight observed in cattle on diets 1 and 3 than those on diet 2 (wheat offal + CSR) could be attributed to the low level of crude protein in these diets. Cassava starch residues had the least CP (92.70%) and this will have a complementary effect on the diets gross chemical composition and performance of animals that consume it. The trend could be explained by the fact that higher digestibility of CP, EE, Ash and NFE were obtained for cattle fed diets 1 and 3 than those on diet 2 (wheat offal and CSR) despite the fact that the TDN in diet 2 (11.26) was higher than what obtained for diet 3. Cattles fed diet 3 were superior in digesting CF (77.39%) than those on other diets and this could have enhanced their performance which was comparable with those on control diet.

Cattle fed control diet which had the highest EFU (0.25) and the least FCR (3.86) utilized their feed more efficiently than those on other diets. This was reflected in the highest digestibility of DM, EE and NFE obtained during the digestibility trial (Table 4) coupled with its highest value for TDN.

CONCLUSION

- The inherent nutritional quality of wheat offal, cassava starch residues and cassava peel as concentrate diet was revealed and they can be fed to cattle.
- Cassava peel favourably replaced 50% wheat offal than cassava starch residue in the diet of White Fulani yearling cattle without any adverse effect on weight gain, final body weight and the efficiency of feed utilization.

REFERENCES

Afolabi, K.D. Iyayi, E.A. and Abu, O.A. 2007. Effects of solid state fermentation by *Aspergillus niger* and *Rhizopus spp*. on the nutritional value of cassava peels. *Journal of Agriculture, Forestry and the Social Sciences* 5(2):171 – 177.

Alasa, M.C., Akinsola, S.O. and Babayemi, O.J. 2010. Chemical composition and In Vitro gas production of *Panicum maximum* intercropped with two cultivars of *Lablab purpureus*. In: *Proceedings of 35th Annual Conference of Nigerian Society for Animal Production (NSAP)*, 14 – 17 March, 2010, Ibadan, Nigeria. Babayemi, O. J. Abu, O. A. and Ewuola, E. O. (Eds) Pp 587 – 590.

AOAC. 1990. Official methods of analysis of the Association of official Analytical chemists, 15th Edition, Washington, DC. 1, 69 – 90.

Aro, S.O., Aletor, V.A. and Ajepe, O.A. 2010. Comparative study of Nutrient Enhancement of cassava starch residues fermented naturally and by microbial inoculation. In: *Proceedings of 35th Animal conference of Nigerian Society for Animal Promotion (NSAP)*, 14 – 17 March, 2010, Ibadan, Nigeria. Babayemi, O. J., Abu, O. A. and Ewuola, E. O. (Eds) Pp 779 – 782.

Ebenebe, C.I. 2005. Identification and Analysis of some plants utilized by

the Grasscutter (*Thryonomys swinderianus* Temminck) at Akpaka forest reserve, Onitsha. In: *Proceedings of 10th Annual Conference of Animal Science Association of Nigerian (ASAN)*, 12 – 15 September, 2005, Ado-Ekiti, Nigeria Dairo, F. A.S., Fajemilehin, S.O.K. and Onibi, G. E. (Eds) Pp. 251-254.

Khang, D.N. and Wiktorsson, H. 2004. Performance of growing heifers fed urea treated fresh rice straw supplemented with fresh, ensiled or pelleted cassava forage. In: Cassava forage as protein source for cattle in Vietnam. Doctoral thesis. Nong Lam University, Vietnam.

Lucas, B. 1987. Cassava stable food crop of prime importance in the tropics. The courier 101:72 – 63 ACP – EEC.

NRC. 1984. Nutrient Research Council. Nutrient requirement of poultry. 8th revised edition. National Academy of Sciences, Washington D.C.

Ogunsola, T.A. and Agbede, J.O. 2005. Nutrients and Anti-nutrient composition of *Panicum maximum*. In: *Proceedings of 10th Annual Conference of Animal ScienceAssociation of Nigeria (ASAN)*, 12 – 15 September 2005, Ado-Ekiti, Nigeria Pp. 152 – 154.

Okeke, J.E. 1992. Cassava varieties improvement for processing and utilization in livestock feeds. *Proceedings of the IITA/ILCA/University of Ibadan. Workshop on the potential utilization of cassava as livestock feed in Africa*. 14 – 18 (1988) S. K. Hahn, L. Reynolds and G. N. Egbunike (Eds).

Okorie, J.U. 1983. A guide to livestock production in Nigeria (Reprinted edition) P 17 – 28 and P 67 – 100.

Oyenuga, V. A. 1968. Nigerian's foods and feeding stuffs. Their chemistry and nutritive value. Ibadan University Press. 99pp.

SAS. 1999. Statistical Analysis System users guide, 8th Edition, SAS Institute, Inc. Carry, NC USA.

Van Soest, P. J., Robertson, J. B. and Lewis, B. A. 1991. Methods for dietary fibre, neutral detergent fiber, and non-starch polysaccharides in relation to animal nutrition. *Journal of Dairy Science* 74:3583 – 3597.

Wanapat, M. Petium, A. Poungchompu, O., Rowlinson, P. and Toburan, W. 2001. Effect of level of cassava hay supplementation and concentrate use on milk yield and composition. In: International workshop current research and development on use of cassava as animal feed. *Proceeding of a workshop held in the city of Khonkaen*. Thailand, July 23 – 24, 2001. P 65 – 68.