CHEMICAL COMPOSITION, MINERAL PROFILE AND PHYTOCHEMICAL PROPERTIES OF COMMON FEED RESOURCES USED FOR SMALL RUMINANT ANIMAL PRODUCTION IN SOUTH-WEST, NIGERIA

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ABSTRACT
Chemical composition, mineral profile and phytochemical properties of common feed resources used for small ruminant animal production in South-west, Nigeria were analysed. Thirty (30) farmers were randomly visited in 15 villages, 5 in each 3 Local Government Areas in Ogun and Lagos State South west, Nigeria the identified common feedstuffs were used for sheep and goat production through interview and observational methods. Panicum maximum, Gliricidia sepium, Gmelina arborea, cassava peel, wheat offal and Ruminant mineral premix. Results shows that there is a significant (P<0.05) variation in the dry matter (DM) of the feed materials, CP content is significantly (P<0.05) higher in Gliricidia sepium (GLS) (15.68%) followed by Gmelina arborea (GMA), wheat offal (WTO) and Panicum maximum (PAM), while cassava peel (CAP) had the lowest (5.32%) CP. Cassava peel had the least significant value of NDF and ADF while the ADF value recorded were similar (P>0.05) for PAM, GLS, GMA and WTO. Ash contents varied across the feedstuffs with PAM having the highest significant (P<0.05) contents. Ruminant Mineral Premix (RMP) was significantly higher (P<0.05) in all the minerals than other feedstuffs except K. phytate content of the feedstuffs varied while PAM and GLS phytate contents were significantly (P<0.05) higher than other feedstuffs. The hydrocyanic acid (HCN) was detected only in CAP and WTO while there was no trace in other feedstuffs. Alkaloid value was significantly higher in PAM, GLS and CAP respectively. The least of alkaloid concentration was observed in WTO. Conclusively, all the feedstuffs analysed has a great potential for supporting ruminant production in the region and Nigeria at large.

KEY WORDS: Chemical composition, minerals, phytochemicals, feedstuffs and small ruminant.

INTRODUCTION
Small ruminant animal were referred to sheep and goat, these animals play a crucial roles in socio-economic development of the nation, and their production were basically traditional which is characterised with low production and poor products in terms of quantity and quality. Sheep and goat production in the tropics were usually smaller than this (Jensen, 1995). Previous records reaching up to 40 m tall and 140 cm in diameter, but usually smaller than this (Jensen, 1995). Previous records have been reported to remain green to larger part of dry season and have been fed to ruminants with appreciable results (Lamidi et al., 2009). Gmelina arborea Roxb, (family verbenanceae) is a fast growing deciduous tree reaching up to 40 m tall and 140cm in diameter, but usually smaller than this (Jensen, 1995). Previous records have shown that the leaves contained as much as 10.01-38.4 % crude protein and 3.10-30.46 % crude fibre. Agro industrial by products (AIBPs) are waste products arising from the processing of crop or animal products usually by an agricultural firm. (Alhassan et al., 1985). The use of these by-products for supplementary livestock feeding is justified when the forage supply is inadequate for animal needs either in terms of quantity or quality, (Aina, 2012). However, most of these material has been in used through trial and error, much has not been done in the area of chemical and phytochemical assessment of these important and common feedstuffs such as crop residue (Cassava peel), AIBP (Wheat offal), grass (Panicum maximum), browse (Gmelina arborea), legume browse (Gliricidia sepium) and ruminant mineral premix for effective small ruminant animal production. There is need for continuous screening of both the forages and crop residues to identify those with good potentials as feed resources which could serve as alternatives or to complement to those feedstuffs which have already being tested and trusted. Mtenge and Mhelela (2006) reported that any method used to screen potential browse species must take into consideration both the preference of browsing animals and laboratory analyses to verify the nutritional quality of the browse plants. D’Mello (1992) stated that results of proximate analyses are extensively employed in research and industry for quick estimation of nutrient potentials of feedstuffs; although such results may not give a true indication of the...
Feed resources used for small ruminant animal production in South-West, Nigeria

nutritive value of a feed, they supply clues in research to plants of potential value for further in vitro or in vivo studies. Buttressing this assertion, Okoli et al. (2003) stated that proximate analysis is specifically useful in screening the array of tropical browse plants. In lieu of this, the present study intends to establish the chemical composition, mineral profile and phytochemical properties of common feed resources used for small ruminant animal production in South-west, Nigeria. So as to improve their utilization for effective and efficient production of sheep and goat in the area and country at large.

MATERIALS & METHODS

**Study area:** Thirty (30) farmers were randomly visited in 15 towns/villages, 5 in each 3 Local Government Areas in Ogun State (Sagamu, Yewa South and Odeda) and Lagos State (Badagry, Ojo and Ikorodu) South west, Nigeria to identify the common feedstuffs used for sheep and goat production through interview and observational methods.

**Samples collection:** Samples of cassava peel were collected from cottage cassava processing firm in Lusada Area, Ado-Odo/Ota Local Government Area, Ogun State, sundried for 4-6 days. Panicum maximum, Gliricidia sepium, Gmelina arborea were harvested within the campus of Adeniran Ogunsanya College of Education, Otto/Ijankin, Lagos State, sundried for 3-4 days. Wheat offal was purchased from the feed mill. Ruminant minerals premix was formulated as 20% salt, 40% bone meal and 40% egg shell. Samples were replicated.

**Chemical Analysis:** Samples of the Panicum maximum, Gmelina arborea, Gliricidia sepium, cassava peels, wheat offal were prepared for chemical analysis. Proximate analysis was carried out using the methods recommended (AOAC, 1990). The following parameters were determined; dry matter, crude protein, crude fiber, ether extract and total ash. Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were analyzed as recommended (Goering and Van Soest, 1970). Mineral elements were determined by atomic absorption spectrophotometer (AAS) model 490 Gallenkamp, London

**Phytochemical Analysis:** The following anti-nutritional factors were determined; tannin, phytate, oxalate and saponin. Quantitative estimation of tannins in the samples was carried out using vanillin-HCl methanol (Price and Buttlar, 1977). A standard curve of tannic acid was prepared (AOAC, 1990) for measurement of the concentration of tannins in the samples. Phytic acid was determined according to the method (Wheeler and Ferrel, 1971). Oxalate was determined by acid digestion, using 15uH2SO followed by filtration using a Whatman No.1 filter paper. The filtrate was titrated hot (80-90°C) against an O/NK MnO solution to a faint pink colour that persists for 30 seconds. Saponin was determined by extraction in 50% aqueous methanol followed by transfer to a test tube with constant vigorous agitation. Formation of persistent foam at the surface was taken as an indication of the presence of saponin.

**Statistical Analysis**

Data collected were subjected to One way Analysis of Variance and significant differences among means were compared using Duncan multiple Range test (SAS, 1990).

RESULTS

The proximate composition of the common feed materials used for small ruminant farmers in south west of Nigeria is shown in Table 1. There is a significant (P<0.05) variation in the dry matter (DM) of the feed materials. Wheat offal (WTO) had highest value of 89.88% followed by cassava peel (CAP) (89.82%), Gmelina arborea (GMA) (89.26%). Panicum maximum (PAM) (89.67%) least DM is recorded in Gliricidia sepium (GLS) (89.26%). The CP content is significantly (P<0.05) higher in GLS (15.68%) followed by GMA, WTO and PAM, while CAP had the lowest (5.32%) CP.

Cassava peel had the highest (P<0.05) value of ether extract (EE) followed by WTO, PAM and GMA with GLS indicating the least (P<0.05) value. The WTO has the highest (17.96%) content of CF followed by PAM, GLS, CAP and GMA with 17.89, 16.92, 16.84 and 13.49 %DM respectively. Cassava peel had the least significant value of NDF and ADF while the ADF value recorded were similar for PAM, GLS, GMA and WTO. The gross energy of CAP, WTO and PAM were similar (P>0.05). Ash contents varied across the experimental feedstuffs with PAM having the highest significant (P<0.05) contents followed by GMA, GLS, WTO and CAP, in that other.

**TABLE 1:** Proximate composition (%DM) of the common feed for small ruminant production in south west Nigeria

<table>
<thead>
<tr>
<th>Feedstuff</th>
<th>Parameters</th>
<th>Panicum maximum*</th>
<th>Gliricidia sepium*</th>
<th>Gmelina arborea*</th>
<th>Cassava peel*</th>
<th>Wheat offal**</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>89.67a</td>
<td>89.26c</td>
<td>89.82b</td>
<td>89.82b</td>
<td>89.88±</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Crude protein</td>
<td>12.26c</td>
<td>15.68a</td>
<td>14.51b</td>
<td>5.32d</td>
<td>12.38c</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>Ether extract</td>
<td>1.87c</td>
<td>1.14e</td>
<td>1.62d</td>
<td>4.12e</td>
<td>3.04b</td>
<td>1.83</td>
<td></td>
</tr>
<tr>
<td>Crude fibre</td>
<td>17.89b</td>
<td>16.92c</td>
<td>13.49e</td>
<td>16.84d</td>
<td>17.96e</td>
<td>1.66</td>
<td></td>
</tr>
<tr>
<td>Ash</td>
<td>13.09c</td>
<td>11.97e</td>
<td>12.89b</td>
<td>8.94e</td>
<td>11.92d</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>NFE</td>
<td>54.89c</td>
<td>54.29a</td>
<td>57.49b</td>
<td>64.78a</td>
<td>54.72c</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>NDF</td>
<td>69.87a</td>
<td>64.89c</td>
<td>65.86c</td>
<td>47.84c</td>
<td>64.28c</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>ADF</td>
<td>41.36c</td>
<td>41.37c</td>
<td>42.38c</td>
<td>21.32b</td>
<td>43.37a</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Gross energy (Kcal/g)</td>
<td>3.15a</td>
<td>3.01c</td>
<td>2.98e</td>
<td>3.07b</td>
<td>3.10b</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

a, b, c, d, e means with different superscript on the same row are significantly different (P < 0.05)  
*Sunried samples were used for analysis; ** Analyzed as purchased from the feed supplier; NFE= Nitrogen free extract; NDF= Neutral Detergent Fiber; ADF= Acid Detergent Fiber; SEM= Standard Error of Mean
Table 2 depicts the mineral profile of the feedstuffs used for the experiment. Ruminant Mineral Premix (RMP) was significantly higher (P<0.05) in Ca than other feedstuffs. Similar contents were recorded for GMA and WTO, GLS and PAM, PAM and GLS, GLS and CAP. The phosphorus (P) was higher (P<0.05) in RMP than in other feedstuffs. Similar values were recorded in WOT and GMA, GLS and PAM. The least P content was noticed in CAP.

**TABLE 2: Mineral profile of common feedstuffs for small ruminant animal production in South west Nigeria**

<table>
<thead>
<tr>
<th>Feedstuffs</th>
<th>Minerals</th>
<th>Panicum maximum*</th>
<th>Gliricidia sepium*</th>
<th>Gmelina arborea*</th>
<th>Cassava peel*</th>
<th>Wheat offfal**</th>
<th>Ruminant Mineral Premix***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ca (%)</td>
<td>0.24&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.22&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.28&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.17&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.33&lt;sup&gt;b&lt;/sup&gt;</td>
<td>35.89&lt;sup&gt;de&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>P (%)</td>
<td>0.38&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.35&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.42&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.08&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.49&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.03&lt;sup&gt;de&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>K (%)</td>
<td>0.17&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.16&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.13&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.03&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.21&lt;sup&gt;e&lt;/sup&gt;</td>
<td>0.14&lt;sup&gt;bc&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Na (%)</td>
<td>0.12&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.09&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.15&lt;sup&gt;cd&lt;/sup&gt;</td>
<td>0.05&lt;sup&gt;e&lt;/sup&gt;</td>
<td>0.22&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.53&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Mg (%)</td>
<td>0.30&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.29&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.23&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.12&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.34&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.66&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Zn (ppm)</td>
<td>760&lt;sup&gt;b&lt;/sup&gt;</td>
<td>790&lt;sup&gt;b&lt;/sup&gt;</td>
<td>680&lt;sup&gt;c&lt;/sup&gt;</td>
<td>340&lt;sup&gt;c&lt;/sup&gt;</td>
<td>850&lt;sup&gt;b&lt;/sup&gt;</td>
<td>940&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Fe (ppm)</td>
<td>330&lt;sup&gt;b&lt;/sup&gt;</td>
<td>250&lt;sup&gt;c&lt;/sup&gt;</td>
<td>230&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>130&lt;sup&gt;c&lt;/sup&gt;</td>
<td>630&lt;sup&gt;b&lt;/sup&gt;</td>
<td>860&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*Means with different superscript on the same row are significantly different (P < 0.05)    **Sundried samples were used for analysis; ***Mixture of 20% Salt + 40% Bone meal + 40% Egg shell meal; SEM= Standard Error of Mean

The potassium (K) content was significantly (P<0.05) higher in WOT than others followed by PAM. Similar mineral contents were recorded for PAM, GLS and RMP. Ruminant mineral premix, GLS, and GMA were also similar in K contents. CAP had the least (P<0.05) K content. Ruminant mineral premix had the highest (P<0.05) content of sodium (Na) followed by WOT. Similar Na level was noticed in GMA and PAM, GLS and GMA, and GLS and CAP. Magnesium (Mg) was higher (P<0.05) in RMP compared to other experimental feedstuffs. PAM, GLS, and WTO had similar contents of Mg while Mg was significantly lower in CAP. Zinc was significantly (P<0.05) higher in RMP, while the lowest (P<0.05) value was recorded in CAP. Iron was also (P<0.05) higher in RMP than in other feedstuffs this is followed by WTO and PAM, GLS and GMA with similar values, while CAP had the lowest content of iron. The antinutritional factors (ANF) of the experimental feedstuffs are shown in Table 3. The phytate content of the feedstuffs varied while PAM and GLS phytate contents were significantly (P<0.05) higher than other feedstuffs. These were followed by GMA and WTO. The least value of phytate was recorded in CAP. The oxalate was higher (P<0.05) in GMA compared with others, followed by PAM, GLS respectively. Wheat offfal and CAP had the least values. Tannin content was higher (P<0.05) in PAM and GMA, followed by GLS, WTO and CAP. Hydro cyanide was detected only in CAP and WTO while there were no traces in other feedstuffs. Alkaloid value was significantly higher in PAM, GLS and CAP respectively. The least of alkaloid concentration was observed in WTO.

**TABLE 3: Antinutritional factors of common feedstuffs for small ruminant animal production in South west Nigeria**

<table>
<thead>
<tr>
<th>Feedstuffs</th>
<th>ANF</th>
<th>Panicum maximum*</th>
<th>Gliricidia sepium*</th>
<th>Gmelina arborea*</th>
<th>Cassava peel*</th>
<th>Wheat offfal**</th>
<th>± SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phytate (mg/g)</td>
<td>1.78&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.74&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.32&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.01&lt;sup&gt;d&lt;/sup&gt;</td>
<td>1.18&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.34&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Oxalate (%DM)</td>
<td>0.72&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.71&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.85&lt;sup&gt;e&lt;/sup&gt;</td>
<td>0.49&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.51&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.15&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Tannin (%DM)</td>
<td>0.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.47&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.61&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.21&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.25&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.03&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Saponin (%DM)</td>
<td>0.57&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.42&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.49&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.26&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.27&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.14&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>HCN (mg/kg)</td>
<td>0.00&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.00&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.00&lt;sup&gt;c&lt;/sup&gt;</td>
<td>38.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>13.28&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.62&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Alkaloid (%DM)</td>
<td>0.24&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.12c</td>
<td>0.21&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.08&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.05&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.82&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*a, b, c, d, e means with different superscript on the same row are significantly different (P < 0.05)    **Sundried samples were used for analysis; ** Analyzed as purchased from the feed supplier

**DISCUSSION**

The chemical composition recorded for *Panicum maximum* in the present study different from what was reported by Hamzat et al. (2003) who reported DM (26.04), CP (13.13), CF (20.50), and EE (2.50) this might be attributed to the fact that samples used for this experiment were sundried before the laboratory analysis. The CP (12.26) recorded in the present study for *Panicum maximum* was higher than the value 9.74% reported by Bamikole and Ikhatua (2006), favourably compared with those reported in preserved elephant grass by Sowande, (2004). Aina and Onwukwe (1997) reported DM, CP, CF, ash and EE contents of 15.2%, 12.2%, 28.5%, 11.9% and 1.4% respectively for *Panicum maximum* which are close values to the present study. The nutrient values for *Gliricidia sepium* were similar to those reported by Aye (2002) except the CP with slight difference (19.72 vs. 15.68). The 15.68% CP recorded in the present study was in agreement with the value of 15.60% CP reported by Smith (1995) for dried *G sepium*, also higher than CP (10.94%) reported by Ifut and Inyang (2007). The *G melina arborea* proximate composition used in the present study was still within the
range reported by Ojo (2005), while the chemical composition reported for wheat offal in the present varied slightly from that reported by Maigandu and Hadeija (2003). Cassava peel used in the present study can be compared favorably with the report of Osei et al. (1990), and Baah et al. (1999). The higher DM value recorded in the wheat offal against the other experimental feedstuffs could have resulted from the mechanical processing undergone during the production of the wheat offal. The highest CP recorded in the Gliricidia sepium in present study indicated that the forage is rich in crude protein been leguminous plant as observed by Aye (2002) and Carew (1983). All the experimental feedstuffs shows appreciable content of protein for ruminant nutrition except cassava peel which needs a supplementation with other sources of nitrogen as recommended by Adeloye et al. (1993). Gatenby (2002) indicated 10–12% CP as moderate level for ruminant production. The ash content of the forages was higher compared to crop residues. These findings are in line with those of Animashahun et al. (2006) who observed higher values of Ash for the forage compared to the value of concentrate fed to rabbits. The high level of ash content is an indicative of high mineral content inherent in forages, which are essential in the formation and function of blood and bones. (Animashahun et al., 2006). Ruminant Mineral Premix (RMP) had the higher value of all the minerals analysed except K. This shows that RMP is a source of minerals which can be enhanced for better performance of the animals in the area. In respect of the value obtained in the present study, Panicum maximum Ca 0.24, P 0.38, Mg 0.30, K 0.17, slightly varied from the value reported by Ogunbosoye et al. (2006) who reported Ca 0.24, Mg 0.36, K 0.26, P 0.27 for the same plant. Aye et al. (2006) reported Ca 0.44, Na 0.70, P 0.60, and Mg 0.83 for Gliricidia sepium which slightly varied from what obtained in the present study Ca 0.22, Na 0.09, P 0.42, Mg 0.29 for the same plant. The variation observed in the two studies might be due to the age, soil and time as factors affecting the nutrients and minerals of forages (Lamidi, 2004). The mineral profile of the majority feedstuffs was within the recommendation of (NRC, 1980). The phytate (mg/g) contents reported in the present study (1.01 to 1.78mg/g) were lower than those recorded by Aletor and Omodara (1994) (5.007 to 82.28mg/g), Ologboho (1989) (89.2 to 316.4mg/g), Ogunbosoye et al. (2005) (2.29 to 3.68mg/g). The oxalate contents (%DM) of the experimental feedstuffs (0.49 to 0.85%DM) was higher than those catalogued in Tephrosia bracteolata (0.20 to 0.56%DM) by Ogunbosoye et al. (2005) and favourably compared with the reports of Ologboho (1989) (0.54 to 0.82% DM) in some Nigerian browse plants. Tanning content (%DM) of the forages in the present study (0.47 to 0.62% DM) were still within the range 0.03% DM in Cobretum paniculatum, 4.000% in Dialium guinensis reported by Onwuka, (1992), favorably compared with the contents reported by Ogunbosoye et al. (2005) (0.12-0.58% DM), Oduguwa et al. (1998) (0.17 to 1.36 % DM). Saponin content (% DM) in the present study (0.26 to 0.57% DM) is in concourse with that of Onwuka (1992) (0.002 to 0.87% DM) in browse species who successfully fed West Africa Dwarf goats. However, the HCN content (mg/kg) of cassava peel used for small ruminant animal production (38.62mg/kg) is still below the 50mg/kg lethal dose which can induce cyanide toxicity (Bolhuis, 1954 and Taiwo et al., 2003). The least value of ANF obtained in the present study for cassava peel indicated that cassava peel had no significant value of other ANF except HCN, this assertion is supported by the reports of Ogbonna (1991) and Taiwo et al. (2003) who reported that cassava peels do not contain any chelating agents (such as phytate, tannin, silica or lignin) that can bind the nutrients in strong chemical binding thereby hindering their easy solubility in water.

CONCLUSIONS & RECOMMENDATIONS

Conclusively, all the feed stuffs assed in this study has a great potential as for feeds and feeding small ruminant animals in the South-west, Nigeria and Nigeria at large except cassava peel which has low CP consequently which will required fortification with other protein feedstuffs in other to meet the requirement of the animals. The RMP shows an appreciable level of minerals for effective and efficient production of small ruminants which will available in quantity and quality at low cost because it is made of locally available materials.

The following recommendations were made based on the findings of this study:  

i. Simple collection and processing techniques of the crop residues, forages and AIBPs should be designs for small ruminant animal farmers.

ii. Livestock extension services should be intensified towards utilization of these feedstuffs for sustainable production of small ruminant animal.

REFERENCES


