Effect of Supplementation with Concentrate and Groundnut Haulm in Diets on Milk Yield of Dairy Azawak Cows

Moumouni Ousseini¹, Muhammed Baba¹, Soumana Idrissa¹, Saleh Inusa Karkarna¹, Keiba Dar², Idrissa Allassane²

¹Bayero University, Kano (BUK), Centre of Dryland Agriculture (CDA), PMB: 3011. Garzo Road Kano Nigeria
²Bayero University, Kano (BUK), Faculty of Agriculture, Department of Animal Science PMB3011. Garzo Road Kano Nigeria

Abstract
An experiment was carried out to determine the effect of feeding diet containing concentrate and graded level of groundnut haulms (GH) on the milk yield of Azawak cattle. Five concentrate-groundnut mixed diets were formulated to contain on average 15% crude protein. The ratio concentrate to groundnut was 100:0; 67:33, 50:50, 33:67 and 0:100 respectively. Twenty Azawak multiparous lactating cow aged 5-6 years and averagely weighing 317-320 kg were randomly divided into five groups of four animals each and were allotted to the five experimental diets in a randomized complete block design. Data were collected for Dry Matter Intake (DMI), Average Daily Intake (ADI), Average Daily Weight Gain (ADWG), Total Milk Yield, Average Milk yield and Feed conversion efficiency in milk (FCEM) throughout the three months experimental period. Results indicated that the average daily weight gain was higher on diet containing 50% inclusion of groundnut haulm in concentrate diet fed to Azawak cattle. The DMI by cattle was significantly (P˂0.05) higher on diet containing 67 and 100% groundnut haulm. The ADWG of lactating cows fed concentrate mixture was significantly higher on diet containing 33 and 50% inclusion levels but the feed conversion ratio was significantly higher at 50% level of groundnut haulm inclusion level. The total milk yield, average daily milk yield, the body score condition and the feed conversion efficiency in milk were not affected by the level of Groundnut haulms in the concentrate diets, but the highest values of these parameters were obtained at 50% inclusion level. It can be recommended that concentrate diet for Azawak cattle should be supplemented with 50% legume haulm for, better body score condition, feed conversion, feed conversion efficiency of milk and enhanced milk production during the long dry season.

Keywords: Groundnut haulm, Sorghum Straw, Feed intake, weight gain, Milk yield, Lactating cows

Introduction
In Niger Republic, livestock production is carried out by 87% of the population either as a primary activity or as a secondary activity often associated with agriculture and trading (Ministère de l’Elevage et des Industries Animales, 2012). The country has a huge and diversified livestock population composed of large ruminants (Cattle and Camels), small ruminants (Sheep and Goat) as well as non-ruminants animals such as Equine Donkey well adapted to the arid environment (Recensement General de l’Agriculture et du Cheptel, 2008). The estimated livestock population in 2018 was 14,363,595 Cattle, 12,746,788 Sheep, 17,411,65goatsat, 1,811,395 camels, 253,189 horses, and 1,874,178 million donkeys representing 18,998,658 Tropical Livestock Unit (TLU)
With 21% of the national livestock population, Tahoua State is the second-ranked livestock population after Zinder State out of which Cattle represent 22.5%, Sheep 30.9%, Goats 32.6%, Camels 7.52%, Equine 0.45%, and Donkeys 5.91% (Recensement General de l’Agriculture et du Cheptel, 2008).

The disaggregation of the livestock population revealed the predominance of small ruminant accounting for 63.64% of the state animal population and was occasioned by the repetitive drought, the traditional ways of livestock reconstitution and the national livestock reconstitution policy undertaken after heavy animal loss from the big droughts of 1974-1975 and 1983-1984 which gave more preference to small ruminants (high prolificacy) than Cattle highly sensible to drought. The dominant animal husbandry systems are agro pastoral system, Nomadic system and transhumant pastoral system representing respectively 66%, 18%, and 16% of the national livestock population (RGAC, 2008).

The contribution of the livestock sector to the household income, and household budget for food security is estimated respectively at 15% and 25%. It constitutes the second source of Niger export revenue with 22% contribution to the total export value (MEIA, 2012.), and 10% to the national Gross Domestic Product (GDP) while the entire Agricultural Gross Domestic Product (GDP) was 30% in 2017 (Institut National de la Statistique INS, 2018). In addition livestock provide traction to cultivate fields, manure to improve soil fertility and nutritious food products meat and milk) for human consumption, and income generation (Sere et al., 2008, (Adamu, 2021).

Despite the large size of the livestock population, its economic importance and other advantages, the livestock sector is facing some challenges, mainly natural and human activities (degradation of natural resources as a result of both hydric and wind erosions, desertification, high cost of livestock veterinary drugs and feeds, non-rational distribution of boreholes and surface water across the pastoral zone to enable full exploitation of pasture especially during dry season when natural pastures are scarce, demographic pressure on the grazing land, and livestock corridors) which consequences include severe loss of vegetation cover, above ground plant productivity, soil erosion, elimination of soil seed bank, shift in species composition and conflict between farmers and pastoralists (RGAC, 2008; Bonnet, 2012; Ahmad et al., 2012). Feed therefore is the limiting problem to livestock production and productivity in the arid and semi-arid zone where livestock nutrition is essentially based on the exploitation naturally occurring herbaceous grasses and dicotyledonous species, ligneous plants and crop residues with less or no supplementation (Samiredypalle et al., 2014; International Fund for Agricultural Development IFAD 2015; Amole & Ayantunde, 2016). Protein, energy and minerals are therefore the most critical nutrients affecting milk and beef production in the semi-arid areas (Olawuye & Etuk, 2015; Kubkomawa, 2017).

Many researchers have directed their efforts toward the use of non-conventional feed source to overcome high production cost problem, quantity, quality of feed stuff for ruminants such as crop residues for use as livestock feeds., and at the same time ensuring the preservation of animal health, production yield and product quality (Aruwayo et al., 2011; Millam, 2016). Another reason for the use of non-conventional feeds is the competitive demand for these conventional feed resources as food between livestock and man on one hand and between monogastric animals and ruminants on the other hand which limits the quantity of these conventional feeds available for ruminant feeding.

In recent years, the use of forage legumes in ruminants livestock production systems in the tropics as alternative to oil seed cakes has increased (Finangwai, Ehoche, Jokthan & Barje, 2018) in order to provide high quality proteins as well as digestible cell wall carbohydrate. Groundnut (Arachis hypogaea) is an important legume.
crop grown for seed and forage in smallholder crop livestock farming systems in West Africa (Oloranju et al., 1996). The haulms after pod harvesting is fed to ruminants, mostly during the dry season and its supplementaion contributes fermentable energy to the rumen in the form of available cellulose and hemi cellulose which stimulate fibre digestion (Silva & Orskov 1988). Despite their availability in large quantities, they are high in ligno cellulose and low in readily available carbohydrate and nitrogen (Leng, 1990) and their utilization depends largely on their nutritive values, method of processing, feeding strategies and eating behaviour of the animal.

In Niger, groundnut is the second most important legume crop after cowpea (Vigna unguiculata L. Walp) (Hampson et al., 2001) and there is need to improve its production in terms of seed and forage, storage, and value addition through processing.(Ousmane et al., 2019). The production yearly production of the crop is about 453,577 tons per year (Food and Agricultural Organization FAO, 2016), and Niger is ranked 7th among the major groundnut producers in Africa after Nigeria, Sudan, Chad, Cameroon, Senegal, and Tanzania.

The study area is characterized by a long dry season of 9 months often marked by serious feed scarcity for maintaining milk production, the chief food of pastoralist. The maintenance of animal performance particularly milk is much more dependent on the quantity and quality of feed eaten rather than on the genetic make up of the animal (Khan et al., 2009). Therefore to overcome the shortages and seasonal fluctuation in terms of quantity and quality of feeding maerials there is need to search for better methods and optimal level of utilization of stored available crop residues. The present study therefore was designed to substitute graded levels groundnut haulms in the concentrate diet of lactating cows as feeding strategies and to assess the eating behaviour of the animal, the growth performance and the milk yield.

**Materials And Methods**

**The Study Location**

The study was conducted in the Secondary Livestock Multiplication or Breeding Centre of Ibecetan (SLMCI). The SLMCI is located between 5.78° and 6.04° East longitude and 15.26° and 15.52° North latitude in the middle of the pastoral zone (Repertoire National des Localités RENALOC, 2012). The Ibecetan Center is a livestock selection/breeding center of the dominant breed of the area (FAO, 2002) and was created in 1975, after the big drought of 1972-1973 the country faced during which Niger republic lost 47% of its Cattle population, 36% of Sheep herd, 15% for Goat and Donkey, 12% Equine and 17% Camels. The SLMCI (Figure 1) has a perimeter of 84.5 km and an area of 42,065 ha.

The climate is a Sahelo-Saharan type an average rainfall of 318.6 mm in 201. Three main types of soil are encountered and include sandy and sandy-loamy soils at the level of dune formations; Clay to clay-loamy soils in the valleys and lowlands and lastly Glacis and rocky soils on the slopes of the hills (PDC, 2018). The vegetation is steppe type, and the main herbaceous species encountered were: Cenchrus biflorus, Dactylocenium aegyptium, Cenchrus preurii, Aristida mutabilis, Alysicarpus ovalifolius, Zornia glochidiata, Eragrostis tremula and Tribulus terrestris. As for woody species, there are Balanites aegyiaca, Ziziphus mauritiana, Maerua crassifolia, Sclerocarya birrea, Acacia seyal, Acacia nilotica, Acacia senegal, Calotropis procera, Bauhinia rufescens and Boscia senegalensis (PDC, 2018).
Methodology
A basal concentrate mixture consisting of Sorghum grain, Wheat offal, cottonseed cake, Bone meal, Di-calcium Phosphate, and common was formulated to contain 15% crude protein. Intromin a mineral lick block of 10*2 kg ad libitum through oral administration was provided to the animal throughout the experimentation. The Intromin mineral lick block is composed of Vitamin A: 100 000 U, Vitamin D3:20 000UI, Vitamin E: 40UI, Sodium (Na):380g, Magnesium (mg):5 000mg, iron (Fe):2000mg, Cobalt (Co):50mg, Iodine (I): 50mg, Manganese (Mn): 2000mg, Zinc (Zn):1000mg, Selenium (Se):10mg. The GH replaced the basal concentrate mixture at 0, 33.0, 50.0, 67.0 and 100.0% levels (T1-T5) levels. Twenty Azawak multiparous cow aged 5-6 years and averagely weighing 317-320 kg were randomly divided into five groups of four animals each and were allotted to the five experimental diets in a randomized complete block design. During the trial, the lactating cows were fed sorghum straw ad libitum. Experimental animals were kept in individual pens and fed their respective diets for 120 days and only left pens for drinking water, during milking and on weighing days. The cows were fed individually in the mornings and afternoons. Feed was analyzed for proximate sample (AOAC, 2016), and cell wall constituents (Van Sorest and Roberson, 1985). Data collected were analyzed using the least square method of SAS (2004) package. The differences between means were separated using Least Significant Difference LSD.

Table 1: Crude protein and Energy values of concentrate feed.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Level of inclusion (kg)</th>
<th>CP %</th>
<th>Metabolizable Energy Kcal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum grain</td>
<td>32.12</td>
<td>3.5</td>
<td>1026</td>
</tr>
<tr>
<td>Wheat offal</td>
<td>47.53</td>
<td>11.88</td>
<td>1019.77</td>
</tr>
<tr>
<td>Cotton seed cake</td>
<td>15.84</td>
<td>2.69</td>
<td>296</td>
</tr>
<tr>
<td>Bone meal</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di-calcium Phosphate</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>99.98</strong></td>
<td><strong>18.07</strong></td>
<td><strong>2341.98</strong></td>
</tr>
</tbody>
</table>
The Unit contains/kg of the Intromin mineral lick bloc contained the following ingredients. Vitamin A: 100 000 U, Vitamin D3: 20 000UI, Vitamin E: 40UI, Sodium (Na): 380g, Magnesium (mg): 5 000mg, iron (Fe): 2000mg, Cobalt (Co): 50mg, Iodine (I): 50mg, Manganese (Mn): 2000mg, Zinc (Zn): 1000mg, Selenium (Se): 10mg.

Results

Chemical Composition of The Experimental Diets and Sorghum Straw

Results of the chemical composition of the experimental diets fed to the lactating Azawak breed and that of sorghum straw are shown in Table 2. The variables DM, Ash, CP, CF, EE, ADF, NFE, and lignin of sorghum straw were 91.06, 4.66, 12.21, 12.66, 2.05, 25.66, 45.55, 78.60 and 11.61% respectively. The results revealed that there was a significant difference (P<0.05) among the experimental diets for the parameters evaluated with exception of CP and Ash.

The Dry matter content values range from 87.2 to 90.19%. The highest value was recorded in diets containing 100% groundnut haulm whereas, the least value was recorded in treatment containing 33% level of groundnut haulms. The values ranged for (CP) was 14.75% -15.89%, (CF) 11.76% - 17.64%, (EE) 2.02% -2.20%, (Ash) 7.43% - 9.17%, and (NFE) 57.37% - 64.54%, (AD) 25.64% - 29.14%, (ADF) 38.83% - 47.81% and (Lignin) 9.92% - 12.66%. Dietary treatments with 33% level of groundnut haulm (GH) substitution had the highest CP among the treatments and the lowest was noticed for treatment one (1) containing 0% level of substitution or control treatment.

Control diet containing 0% level of GH had the highest CF values and the lowest value was obtained in treatment five with 67% groundnut inclusion level. The CF was statistically (P<0.05) higher in T1 (17.64%) containing no groundnut haulm whereas T4 (11.76%) containing 67% GH registered the least value.

ADF was greater (P<0.05) in treatments T1 (27.86%) containing 0% groundnut haulms and T4 containing 67% groundnut haulm while NDF was observed to be greater in T2 (47.81%) containing 33% groundnut haulms. Nitrogen Free Extract was significantly greater (P<0.05) in T1 (64.54%) containing no groundnut haulm whereas lignin in T3 (12.66%) containing 50% GH recorded the highest value. EE value was higher in treatment containing 33% substitution of GH and the smallest values was obtained in treatment five with 100% level of groundnut haulm. The values ranged for Ash were similar (P>0.05) among the treatments hence not significantly different. Similar trend was observed in the case of CP, however in absolute term Crude protein was observed to be higher in the treatment T2 (15.89%) containing 33% Groundnut Haulms.

Table 2 Chemical Composition of the Experimental Diets and Sorghum Straw (%/kg)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>DM</th>
<th>Ash</th>
<th>CP</th>
<th>CF</th>
<th>EE</th>
<th>ADF</th>
<th>NDF</th>
<th>NFE</th>
<th>LIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (0%)</td>
<td>88.41</td>
<td>8.07</td>
<td>14.75</td>
<td>17.64</td>
<td>2.02</td>
<td>27.86</td>
<td>42.77</td>
<td>64.54</td>
<td>9.92</td>
</tr>
<tr>
<td>T2 (33%)</td>
<td>87.24</td>
<td>9.17</td>
<td>15.89</td>
<td>15.54</td>
<td>2.20</td>
<td>26.60</td>
<td>47.81</td>
<td>57.37</td>
<td>12.02</td>
</tr>
<tr>
<td>T3 (50%)</td>
<td>87.59</td>
<td>8.53</td>
<td>15.61</td>
<td>13.49</td>
<td>2.04</td>
<td>25.64</td>
<td>38.83</td>
<td>63.96</td>
<td>12.66</td>
</tr>
<tr>
<td>T4 (67%)</td>
<td>88.86</td>
<td>7.43</td>
<td>15.45</td>
<td>11.76</td>
<td>1.99</td>
<td>29.14</td>
<td>43.28</td>
<td>61.96</td>
<td>11.09</td>
</tr>
<tr>
<td>T5 (100%)</td>
<td>90.19</td>
<td>7.86</td>
<td>14.79</td>
<td>16.6b</td>
<td>1.53</td>
<td>27.01</td>
<td>40.38</td>
<td>64.16</td>
<td>10.74</td>
</tr>
<tr>
<td>Sorghum straw</td>
<td>91.06</td>
<td>4.66</td>
<td>12.21</td>
<td>12.66</td>
<td>2.05</td>
<td>25.66</td>
<td>44.55</td>
<td>78.60</td>
<td>11.61</td>
</tr>
<tr>
<td>P-value</td>
<td>0.000</td>
<td>0.086</td>
<td>0.060</td>
<td>0.000</td>
<td>0.000</td>
<td>0.011</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>SEM</td>
<td>0.025</td>
<td>0.002</td>
<td>0.089</td>
<td>0.003</td>
<td>0.003</td>
<td>0.145</td>
<td>0.003</td>
<td>0.043</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Means with different superscript on the same column are significantly different (p<0.05). DM=dry matter, CP=crude protein, CF=crude fiber, EE=ether extract, NFE=nitrogen free extract, ADF=acid detergent fiber, NDF=neutral detergent fiber, LIG=lignin, SEM=standard error of means

Minerals Composition of The Experimental Diets and Sorghum Straw

Table 3 presents the inorganic mineral content of formulated experimental diets fed to lactating Azawak cattle breed. The results revealed value obtained for the Calcium (Ca) ranged from 0.004- to 0.02%. Highest Ca was obtained in concentrate containing 33% groundnut haulms inclusion level compared to other treatments. The mean phosphorus (P) values were similar (P>0.05) for all the treatments and T3 (50%) GH inclusion level
recorded the highest absolute value (2.96% g/kg). Treatments T1, T2, T3 and T4 with 0; 33, 50 and 67% inclusion of groundnut haulms had higher (P<0.05) Potassium (K) compared to T5 cows fed 100% legume inclusion level. The Magnesium (Mg) content was significantly (P<0.05) in T1, T2 and T5 with 0, 33 and 100% legume inclusion level. Similarly, Sodium (Na) was found to be significantly higher in diet containing 33% groundnut haulm inclusion level.

Table 3: Mineral Composition of the Experimental Diets and Sorghum Straw in percentage.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Ca (%g)</th>
<th>P (%)</th>
<th>K (%)</th>
<th>Mg (%)</th>
<th>Na (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (0%)</td>
<td>0.019</td>
<td>1.603</td>
<td>0.258</td>
<td>0.0037</td>
<td>0.166</td>
</tr>
<tr>
<td>T2 (33%)</td>
<td>0.020</td>
<td>2.153</td>
<td>0.268</td>
<td>0.0034</td>
<td>0.189</td>
</tr>
<tr>
<td>T3 (50%)</td>
<td>0.013</td>
<td>2.964</td>
<td>0.258</td>
<td>0.0023</td>
<td>0.141</td>
</tr>
<tr>
<td>T4 (67%)</td>
<td>0.003</td>
<td>2.082</td>
<td>0.212</td>
<td>0.0027</td>
<td>0.223</td>
</tr>
<tr>
<td>T5 (100%)</td>
<td>0.004</td>
<td>1.940</td>
<td>0.133</td>
<td>0.0036</td>
<td>0.058</td>
</tr>
<tr>
<td>Sorghum straw</td>
<td>0.004</td>
<td>0.004</td>
<td>0.003</td>
<td>0.004</td>
<td>0.018</td>
</tr>
</tbody>
</table>

Means with different superscript on the same column are significantly different (p<0.05). Ca=calcium, P=phosphorous, K=potassium, Mg =Magnesium, Na=Sodium, SEM=standard error of means; ns= not significant.

Growth Performance of Lactating Azawak Breed Supplemented with Graded Level of Groundnut Haulms Diets.

The mean initial body weights of the lactating cows were similar (P>0.05) for all the treatments, however final weight gain was significantly different among the treatments. Treatments T2, T3, T4 and T4 with 33; 50, 67 and 100% inclusion of groundnut haulms had higher (P<0.05) final weight compared to T1 cows fed 100% concentrate with no legume inclusion. Total weight gain was greater (P<0.05) in animals fed T2 (13.75kg) and T3 (14kg) feed intake. Average daily weight gains were similarly higher on these treatments (0.229kg) and 0.231kg). Total dry matter intake was greater (P<0.05) in treatments T1 (557.59kg), T2 (561.03kg), T4 (559.22kg) and T5 (559.37kg) compared to T3 (542.16kg). Similarly for the average daily dry matter intake, feed conversion ratio was better in T3 (39.07) that is animals fed feed containing 50% legume.

Table 4. Growth Performance of Lactating Cows Supplemented with Graded Level of Groundnut Haulms Diets.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>IBW (Kg)</th>
<th>FBW (Kg)</th>
<th>TWG (Kg)</th>
<th>ADWG (g/day)</th>
<th>TDMI (Kg)</th>
<th>ADDMI (kg)</th>
<th>FCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (0%)</td>
<td>316.50</td>
<td>327</td>
<td>10.50</td>
<td>0.175</td>
<td>557.591</td>
<td>9.29</td>
<td>58.47</td>
</tr>
<tr>
<td>T2 (33%)</td>
<td>317.75</td>
<td>331.5</td>
<td>13.75</td>
<td>0.229</td>
<td>561.03</td>
<td>9.35</td>
<td>40.84</td>
</tr>
<tr>
<td>T3 (50%)</td>
<td>318</td>
<td>332</td>
<td>14</td>
<td>0.231</td>
<td>542.16</td>
<td>9.04</td>
<td>39.07</td>
</tr>
<tr>
<td>T4 (67%)</td>
<td>319</td>
<td>332</td>
<td>13</td>
<td>0.215</td>
<td>559.22</td>
<td>9.32</td>
<td>43.50</td>
</tr>
<tr>
<td>T5 (100%)</td>
<td>319.75</td>
<td>332.25</td>
<td>12.50</td>
<td>0.206</td>
<td>559.37</td>
<td>9.32</td>
<td>45.40</td>
</tr>
<tr>
<td>P-value</td>
<td>0.0806</td>
<td>0.0024</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0050</td>
<td>0.005</td>
<td>0.0000</td>
</tr>
<tr>
<td>SEM</td>
<td>0.329</td>
<td>0.347</td>
<td>0.101</td>
<td>0.002</td>
<td>1.334</td>
<td>0.022</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Means with different superscript on the same column are significantly different (p<0.05). IBW=initial Body weight, FBW=final body weight, TWG=Total weight gain, ADWG =Average daily weight gain, TDMI=total dry matter intake, ADDMI = average daily dry matter intake, FCR =Feed conversion ratio, SEM=standard error of means, NS= not significant.

Milk Yield of Lactating Azawak Breed Supplemented with Graded Level of Groundnut Haulms Diets.
The milk yield of Azawak breed supplemented with graded level of groundnut haulms diets is presented in Table 5. No significant difference was observed among treatments in term of Total milk yield, however Treatment 3 recorded high value in absolute term (240.12kg). Daily milk yield was similarly not different ditto for feed conversion efficiency in milk.

Table 5: Milk Yield of Lactating Azawak breed Supplemented with Graded level of Groundnut haulms Diets.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>TMY (kg)</th>
<th>DMY (kg)</th>
<th>FCEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>230.61</td>
<td>3.84</td>
<td>2.472</td>
</tr>
<tr>
<td>T2</td>
<td>231.49</td>
<td>3.86</td>
<td>2.473</td>
</tr>
<tr>
<td>T3</td>
<td>240.12</td>
<td>4.00</td>
<td>2.36</td>
</tr>
<tr>
<td>T4</td>
<td>222.06</td>
<td>3.70</td>
<td>2.586</td>
</tr>
<tr>
<td>T5</td>
<td>220.88</td>
<td>3.68</td>
<td>2.589</td>
</tr>
<tr>
<td>P-value</td>
<td>0.8278ns</td>
<td>0.8278ns</td>
<td>0.1014ns</td>
</tr>
<tr>
<td>SEM</td>
<td>2.410</td>
<td>0.0402</td>
<td>0.005</td>
</tr>
</tbody>
</table>

ADDM=average daily dry matter, BSC=body score condition, TMY=total milk yield, DMY =Daily milk yield, FCEM= Feed conversion efficiency in milk, SEM=standard error of means; Ns=not significant.

Discussion
The nutrient content of sorghum straw is low and when fed alone is not sufficient enough to maintain an animal and favor the production of milk unless it is supplemented with feed sources of higher nutrient quality and quantity. Large quantities of crop residues including legumes roughages are available in Tahoua state, and are less costly compared to dairy concentrates imported from neighboring countries.

The dry matter content of the experimental diets was quite high (87.24-90.19%). High dry matter content of the diets is generally regarded as an indication of better retention of nutrients in the diets. This result is comparable to the finding reported by Mahabile, (1988) in Botswana who reported 91.6% in an experimental diet composing of sorghum bran and groundnut haulms in sorghum straw based diets for crossbred cows. However, this finding was closer to that of Finangwai et al (2018) who reported a range of (85.79 to 95.16%) in feeding concentrate diets containing graded levels of groundnut haulms on nutrient composition of diets and performance of Friesian x Bunaji heifers.

Low ash content of sorghum straw (4.66 %) when compared to the groundnut haulms agrees with the finding of Lafudeji et al., (1992) who reported that poor quality roughages have low ash content.

Fiber is a complex mixture of cellulose, hemicellulose and lignin that varies with plant species and maturity. ADF contains cellulose and lignin. NDF contains hemicellulose, cellulose, and lignin and can be a useful indicator of intake. The Crude fibre (CF) value of 11.6% obtained in this study for groundnut haulms was lower than the values of 48.66% reported by Finangwai et al (2018) and 39.5 % reported by (Ahmed and Pollot, 1977). The observed variations in groundnut haulms nutrient composition in this study could have been due to...
non-uniformity in the stage of harvesting and the purchasing sources of groundnut haulms used in this study (from farmers and markets). It was also observed that as the level of groundnut haulms increased in the concentrate, the CF also reduced.

The ADF range (25.64-29.14%) of the concentrate diets haulms is close to the finding of Finangwai et al (2018) who obtained a range of 29.8-33.02% in study to determine the effect of diets containing graded levels of groundnut haulms of 0, 25, 50 and 75% inclusion level on dry matter intake, nutrient digestibility and Nitrogen balance of Friesian x Bunaji Bulls. However, the NDF range of 38.83-47.81% obtained in this study was similar to the range of 37.71-47.42% reported by Fiangwai et al (2018). The Neutral detergent fiber (NDF) of the fiber fraction range of 57.87-64.54% obtained in this study was higher than the range of 37.71-47.42% reported by Finangwai et al. (2018).

Ca and P as reported by McDowell et al, (1993) play a vital functions in almost all the body tissue and need to be present in animal diet in a balance amount and ratio. These minerals made up of more than 70% of the total mineral in the body. Data in the present study revealed that the Calcium (Ca) content (%) of the dietary treatments does not meet the requirement of the cows and therefore need to be supplemented. The mean values (%) recorded is lower than the recommended range of 0.37 to 0.66% reported by the NRC, (2001). The phosphorus range values obtained (1.60 to 2.96%) were all above the recommended level range (0.28-0.49%) reported by the NRC, (2001). The results corroborate the results reported by Brodison et al., (1989); Brintrup et al., (1993), Dhiman et al., (1996), Wu and Satter, (2000), Wu et al, (2000), who reported that feeding values higher than such as 0.24 versus 0.32 or 0.42 percent dietary phosphorus to lactating cows observed that none of the concentration increased the milk yield significantly. The range values of Potassium (0.133 to 0.268%) and Sodium (0.003-0.020) recorded were all above the recommended requirement of (0.001-0.002%) for K and (0.002) for sodium reported by the NRC, (2001).

The highest final weight obtained in this study was in lactating Azawak breed of fed 100% inclusion of groundnut haulms diet. The result did not agree with the report of Finagwai et al (2018) who reported a final body weight on animals fed 50% groundnut haulms but agrees with their reports on lowest final body weight of higher fed the control diet or 0% groundnut inclusion level. The body weight gain was significantly (P<0.05) affected by the treatment diets. The body weight gain on 33% and 50% inclusion level of groundnut haulm were similar and significantly (P<0.05) greater than the body weight gain of the control, 67 and 100% inclusion level of groundnut. This finding contrasts with the finding of the Finangwai et al (2018) who reported that animals on control diet recorded the best body weight gain. However this finding is similar to the finding of (Berhe, 2018) who reported that buck feed groundnut haulms had higher final weight. Similarly, the body weight gain of lactating animals on 67 and 100% diets were statistically higher than, the control diets. The higher weight gains of lactating dams fed 67% and 100% GH over those fed the formulated control concentrates indicated that dams in the latter group converted more of their feed to milk rather than meat as evidenced by their higher milk yield values.

The total feed intake of animal on 33% groundnut inclusion level agreed with the finding of Finangwai et al, (2018) who reported that cattle on 25% inclusion level recorded the highest total feed intake. The inclusion level of groundnut affected the total feed intake of the lactating animals, as the mean total dry matter intake, of the control, 33%, 67% and 100% inclusion levels were significantly greater than the mean recorded by lactating cattle on diet 3 with 50% inclusion level. Similarly the average daily feed intake (g/day) was significantly influenced by the treatment diets. The diets seemed to have produced better intake in the animals probably due the ration composition. The diet contained sorghum straw a low fiber content (Aluwa & Umunna, 1993) and groundnut haulms which has been demonstrated to be better quality legume rouchages containing adequate protein to maintain ruminants without any form of supplementation during dry season when feeds are scarce (Ikatua & Adu, 1984). Reports of Ayaiy, Adeneye and ajaiy (2005) and Ososanya (2010) highlighted that feed intake is an important factor for the utilization of feed by livestock and therefore is a critical factor of energy and protein availability as well as performance of ruminants. The daily feed intake was observed to increase with increasing level of groundnut haulms compared to the control diets. This indicated that groundnut

Moumouni Ousseini, IJSR Volume 11 Issue 10 October 2023

AH-2023-468
haulms is palatable legume roughages which can improved dry matter intake and efficiency of concentrate utilization.

The daily weight gain range (0.175-0.231kg was significantly (p<0.05) affected by the GH substitution level in the diet. The present result is lower than the average daily weight gain of 0.51, 0.42, 0.3 and 0.3kg obtained by Finangwai et al, (2018) when fed into 0, 25, 50 and 75% levels of inclusion of GH in concentrate. The difference between these findings might be related to the physiological condition of the animals under investigation. However these values recorded were either above or equal to the mean daily weight gain of 0.11, 0.2 and 0.23 kg reported by Bui Xuan An, (1998) for heifers fed concentrate, GH silage and dried GH respectively.

Feed efficiency shows the amount of one kg of certain nutrients to be converted into Live Weight. The lower the feed efficiency, the better the feed quality. The dams fed 33 and 50% GH had feed to gain ratios (39.07 vs 40.84), but were significantly (p<0.05) lower than those fed 67 and 100% (43.50vs 45.50) which were equal among themselves. Both animals fed 33, 50, 67 and 100% GH were statistically inferior (P<0.05) to those fed the control diet (53.47). The value range of values obtained were is higher those 13.46-19.01 obtained by Finangwai et al, (2018).

The results of the present study on the milk yield of lactating Azawak cattle breed was not significantly (p>0.05) affected by the inclusion level of groundnut haulms in the diets. The total milk yield of all the treatments under investigation were similar. However the highest milk yield in absolute term was recorded by dams on 50% inclusion level followed by 33%, control, 67, and 100% groundnut inclusion level. The daily milk values range (3.68 to 4 liters /day) were similar to the average milk production of 3.8 liters of kg per day registered by Zhaïrath Foukpê et al, (2020). The Azawak breed is considered as the best dairy cattle in West Africa (Issa et al. 2014). The daily milk yield was close to that (3.95 kg) recorded by Saidou (2004) at the Experimental Sahelian station in Toukounous (SSET) in Niger. The values were however lower than the figures (5.28; 6.88; 6.98 and 7.11 liters) reporded by Barthe (2014) at the Sahelian Experimental Station of Toukounous (SSET) in 2013 on cows in an experiment involving the replacing of cottonseed cakes by Acacia raddiana pods. The average milk production of Azawak in this study is also lower than that recorded by Abdou (2007) at the kirkissoye dairy cooperative in Niger. The difference could attributed to the nature of the supplements used in the feeding trial of cows. Indeed, the cows in this study received a supplement based on formulated concentrate replaced by varying level of groundnut haulms those of Abdou's experimentation (2007) received the fresh brewer’s grain highly energetic and the medium wheat bran. In addition despite tropical animals are already well adapted to high ambient temperatures, the relatively high environmental temperature of 36°C might have contributed to reduce the feed intake and milk production as highlighted by the report of NRC (1981) which reported that ambient temperatures above 25°C affected feed intake and productivity. For example, in Shika, Nigeria, milk yield and feed consumption by Freisian-Bunaji crosses declined sharply at temperatures above 27°C during early and mid-lactation (Alhassan & Buvanendran, 1985) in order to reduce body heat production.

The feed conversion efficiency of milk is the amount of feed needed to produce one kg of milk, calculated based on the DM intake (kg) to milk (kg). The value of the feed conversion ratio is the amount of feed intake to increase by 1.0 kg/head/day of milk (Petty & Cecava, 1995). The higher of the FCR, the worse of the quality of the feed; and this is inversely proportional to feed efficiency. The feed conversion efficiency in milk (FCEM) was not significantly (P>0.05) affected by the dietary treatments meaning all the FCEM were statistically similar. Cows fed concentrate diet with inclusion level of 50% GH had better feed conversion efficiency of milk, while those fed 100% legume was the poorest. The range values in this stay was higher that the range of 1.39-1.49 obtained by Tesfaye et al, (2016) when they fed Napier grass and natural grass hay on crossbred dairy cows supplemented with concentrate diet. However, the values were close to the value 2.08 DMI/ kg milk yield, reported by Olorunnisomo and Ib haze (2013) when they fed Napier grass-cassava peel silage diet to Sokoto Gudali cows. The little variation observed might be due to intrinsic factors like level of production, parity, stage of lactation, external factors like environmental stress, and unequal intervals between milking and changes in feeding.
CONCLUSION

Crude protein value of concentrate was enhanced at different levels of inclusion of groundnut haulms.

Total weight gain was enhanced at 50% level of inclusion of groundnut haulms. All inclusion levels produced higher weight gain than the control diet (0% legume). Feed conversion ratio was also better at 50% level of inclusion of legume haulms.

Total milk yield was higher at 50% level of inclusion groundnut haulm in the concentrate. Similarly feed conversion efficiency of milk was better at the same level of inclusion ditto for daily Body score condition.

Based on the foregoing, it can be recommended that concentrate diet for Azawak cattle should be supplemented with 50% legume haulm.

Acknowledgement

The authors acknowledge the funding support of the Centre for Dryland Agriculture, Bayero University, Kano (Nigeria). The authors are also grateful to the support provided by Directorate of Pastoral Development of the Ministry of livestock and Regional Directorate of livestock service of Tahoua State

References


sociales de Niamey. 158 p.


or ammonia-treated straw. *Animal Feed Science and Technology*, 19: 277-287


