Nig. J. Anim. Prod. 2022, 49(2):317-324.https://doi.org/10.51791/njap.v49i2.3493 *Nigerian Journal of Animal Production*

Proximate and fibre constituents of browse plant species utilized by camels (*Camelus dromedarius*) in some selected areas of North–western Nigeria

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Abstract

Preferred plant species utilized by camels across the three seasons (wet, cold dry and hot dry) were analyzed to determine their proximate and fibre constituents using recommended analytical procedures. The browse plant species were analyzed for moisture, ash, fat, protein, neutral detergent fibre (NDF) and acid detergent fibre (ADF). Values presented from the study were within the normal range. The highest values obtained from moisture content was 4.20% from Balanites egyptiaca; protein with 16.23% from Leptadenia hastata and ash (6.53%) from Piliostigma reticulatum both in hot dry season. Fat content were 5.73% from Leptadenia hastata in cold dry season. However, NDF was 52.60% from Balanites egyptiaca in hot dry season and ADF 39.77% from Cassia arereh in wet season respectively. Camels in the study area depended on grazing throughout the year without feed supplementation. The study reveals that browse plant species utilized by the camels in the study area contain the basic nutrients required for their performance hence no any sign of intoxication detected.

Keywords: proximate, fiber constituents, browses, camel, north-west

Constituants proches et fibreux des espèces végétales de broutage utilisées par les chameaux (Camelus dromedarius) dans certaines zones sélectionnées du nord-ouest du Nigéria

Résumé

Les espèces végétales préférées utilisées par les chameaux au cours des trois saisons (humide, froide sèche et chaude sèche) ont été analysées pour déterminer leurs constituants proches et fibreux en utilisant les procédures analytiques recommandées. Les espèces de plantes fourragères ont été analysées pour l'humidité, les cendres, les matières grasses, les protéines, les fibres au détergent neutre (FDN) et les fibres au détergent acide (FDA). Les valeurs présentées à partir de l'étude se situaient dans la plage normale. Les valeurs les plus élevées obtenues à partir de la teneur en humidité étaient de 4,20 % pour Balanites egyptiaca ; protéine avec 16,23% de Leptadenia hastata et frêne (6,53%) de Piliostigma reticulatum tous deux en saison sèche chaude. La teneur en matières grasses était de 5,73% de Leptadenia hastata en saison froide et sèche. Cependant, le FDN était de 52,60% de Balanites egyptiaca en saison sèche chaude et le FDA de 39,77% de Cassia arereh en saison des pluies respectivement. Les chameaux dans la zone d'étude dépendaient du pâturage tout au long de l'année sans complément alimentaire. L'étude révèle que les espèces de plantes fourragères utilisées par les chameaux dans la zone d'étude contiennent les nutriments de base nécessaires à leur perfolrmance, donc aucun signe d'intoxication n'a été détecté.

Mots-clés : proche, constituants des fibres, brouts, chameau, nord-ouest

Introduction

Camels (*Camelus dromedarius*) originated from arid and semi–arid areas of the universe characterized byextremely sparse vegetation and needed less water frequently than other large browsing species. Camels can cover large area in search of feed and water. Consequently, camels under pastoral production system visit a particular feeding area only for a short time, browse on the vegetation withoutdestroying it, and then leave and subsequently may return to the exact area later Dorges *et al.* (2013). During the critical periods when grasses and forbs are dominant browse plant species that supply green materials with essential nutrients for camels and other browsing animals are scarce, camels utilizes any preferred available green materials that grows in the regions (Hashi *et al.,* 2005; Ghude, 2010). Chemical composition of plant species is of significant importance in the nutrient intake available for the camels (Farid, 1995). However, the CP and NDF contents indicate the quality of the biomass and this will guarantee the quality increases as the CP content increases and or NDF content decreases (Coppock, 2006). Despite camel is an important domestic animal in the study area,little work has been done on the proximate and fiber constituents of browse plant species utilized by camels. Therefore, this study was designed to determine the proximate and fiber constituents across the three seasons of the year.

Material and methods

Location of the study

The selection of the study area was based on the previous information on the availability of camel herders. These LGAs are Maigatari, Yankwashi, Kazaure and Gwiwa inJigawa State; Mashi, Mani and Daura in KatsinaState; Kaura Namoda, Bungudu and Zurmi in Zamfara State and Tangaza, Gada, Gudu and Illela in Sokoto State respectively, (Figure 1).

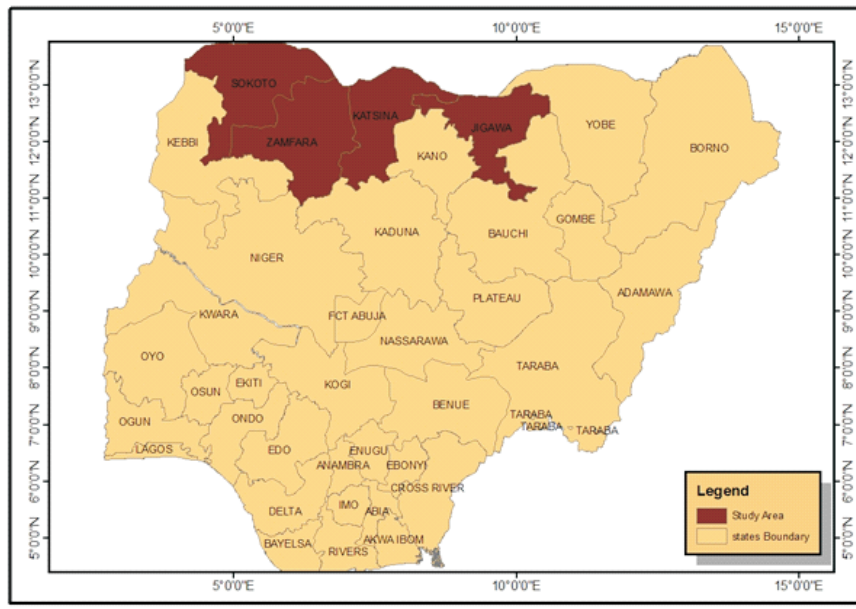

Figure I: Map of Nigeria indicating the experimental locations (States)

Sample collection

Samples of the common browse plant species were collected from the field. Camels were followed to the field during grazing across the seasons at different locations. The camel owners assisted in identifying the plant species and samples were collected and used for the analysis.

Sample preparation and processing

Selected preferred plant species' leaves and twigs collected were air-dried, milled and pass through 1mm sieve and stored in a powdered form into sealed container prior to analysis.

Analytical procedures

Various parameters (moisture, ash, fat, protein, ADF and NDF) fromproximate and fiber constituents of browse plant species utilized by camels in three (3) seasons under pastoral production system were analyzed using the methods outlined by AOAC, (2000).

Experimental design

Completely randomized design (CRD).

Treatment design

Completely randomized design – Factorial (CRD – Factorial 5 x 3).

Statistical analysis

Results were entered into SPSS version 16.0 thereafter imported into the SAS version 9.1 and analyzed. Duncan multiple range test (DMRT) were used to separate the means.

Results

Proximate and fibre constituents of browse plant species utilized by camels in wet season

Results of proximate and fiber constituents of browse plant species utilized by camels in wet season were presented in Table 1. Moisture content (3.90%) in *C. africana* were significant ($P<0.05$) among the ranking browse plant species. Ash and neutral detergent fibre (NDF) contents (2.70% and 51.70%) in *C. arereh* were significant ($P<0.05$). Values (5.33%) of Fat in *D. cinerea* and Protein (14.70%) in *C. africana* showed significant variations ($P<0.05$). However, highest values (39.77%) of acid detergent fibre (ADF) in *C. arereh* were also significant ($P<0.05$) among the ranking plant species respectively.

Proximate and fibre constituents of browse plant species utilized by camels in cold dry season

In Table 2, proximate and fiber constituents of browse plant species utilized by camels in cold dry season were presented. Values of Moisture (4.17%), Protein (15.54%) and neutral detergent fibre (52.37%) were significantly higher in *L. hastata*. However, Ash content (3.19%) were higher in *A. indica* followed by acid detergent fibre (39.30%) in *G. senegalensis* respectively.

Proximate and fiber constituents of browse plant species utilized by camels in hot dry season

In Table 3, results of proximate and fiber constituents of browse plant species utilized by camels in hot dry season were presented. Moisture and neutral detergent fibre (NDF) contents (4.20 and 52.60%) in *B. egyptiaca* showed significant variations ($P<0.05$) among the ranking browse plant species. This is followed by values (6.53 and 4.27%) of Ash and Fat in *P. reticulatum* and *A. indica*. However, values (16.40 and 36.40%) of Protein and acid detergent fibre (ADF) were significantly ($P<0.05$) higher in *M. indica* respectively.

Table 1: Proximate and fibre constituents of browse plant species utilized by camels in wet season

	Chemical Constituents %					
Plant Species	**Moisture**	**Ash**	**Fat**	**Protein**	**NDF**	**ADF**
Dichrostachys cinerea (*Sarkakkiya*)	3.33[c]	2.23[e]	5.33[a]	13.27[c]	42.33[e]	36.43[e]
Commiphora africana (*Dashi*)	3.90[a]	2.40[c]	4.80[c]	14.70[a]	49.20[b]	37.70[c]
Cassia arereh (*Marga*)	3.00[e]	2.70[a]	4.90[b]	13.90[b]	51.70[a]	39.77[a]
Acacia nilotica (*Bagaruwa*)	3.40[b]	2.37[d]	4.43[e]	12.77[e]	46.80[d]	36.70[d]
Gueira senegalensis (*Sabara*)	2.80[d]	2.53[b]	4.53[d]	12.90[d]	48.73[c]	38.73[b]

Means with different letters in the same column are significantly different (P<0.05), NDF=Neutral Detergent Fibre, ADF=Acid Detergent Fibre

Table 2: Proximate and fibre constituents of browse plant species utilized by camels in cold dry season

	Chemical constituents %					
Plant species	**Moisture**	**Ash**	**Fat**	**Protein**	**NDF**	**ADF**
Piliostigmareticulatum (*Kargo*)	4.14[b]	2.90[c]	3.57[d]	14.73[b]	49.57[c]	32.83[c]
Dichrostachyscinerea (*Sarkakkiya*)	3.53[c]	2.43[e]	5.73[a]	13.57[c]	42.63[e]	36.67[b]
Leptadeniahastata (*Yadiya*)	4.17[a]	2.97[b]	3.57[d]	15.54[a]	52.37[a]	32.00[e]
Gueirasenegalensis (*Sabara*)	3.07[e]	2.57[d]	4.50[b]	12.83[d]	48.43[d]	39.30[a]
Azadirachtaindica (Neem)	3.19[d]	3.19[a]	3.80[c]	14.73[b]	51.50[b]	32.47[d]

Means with different letters in the same column are significantly different (P< 0.05), NDF=Neutral Detergent Fibre, ADF=Acid Detergent Fibre

Table 3: Proximate and fibre constituents of browse plant species utilized by camels in hot dry season

	Chemical Constituents %					
Plant species	**Moisture**	**Ash**	**Fat**	**Protein**	**NDF**	**ADF**
Piliostigmareticulatum (*Kargo*)	4.17[b]	6.53[a]	3.70[d]	14.77[e]	50.37[c]	33.40[b]
Leptadeniahastata (*Yadiya*)	3.14[d]	4.43[b]	4.10[b]	16.23[b]	51.20[b]	31.30[d]
Balanitesagyptiaca (*Aduwa*)	4.20[a]	4.40[c]	3.63[e]	15.50[c]	52.60[a]	32.37[c]
Azadirachtaindica (Neem)	3.22[c]	3.93[d]	4.27[a]	15.30[d]	51.20[b]	30.27[e]
Mangiferaindica (Mango)	3.14[d]	3.60[e]	4.07[c]	16.40[a]	51.20[b]	36.40[a]

Means with different letters in the same column are significantly different (P<0.05), NDF=Neutral Detergent Fibre, ADF=Acid Detergent Fibre

Discussion

Proximate and fibre constituents of browse plant species utilized by camels in seasons (wet, cold dry and hot dry)

The highest values of Moisture were reported from *Balanites egyptiaca*. The high variability in the moisture content of *Balanites egyptiaca* could be attributed to within species variability owing to factors such as plant part, harvesting regime, season and location, and these factors appear to influence chemical composition, palatability, digestibility, voluntary intake and nutrient utilization by camels. Values reported were in agreement with the reports of Patil *et al.* (2010). According to Johnson (2009),its leaves, twigs and flower are utilized by animals in the arid lands and commonly used in traditional medicine in gastrointestinal disorders and respiratory infections among others. Sanogo *et al.* (1998) and Silva and Gomes (2003) also confirmed the report. *Cassia arereh* had the highest values of Ash content and stand within the normal range as contained in the report of Katende *et al.* (1995) and lower values when compared to the reports of **Getachew Addis (2013).** This may be attributed to the vegetation and soil type, season and geographical location. *Cassia arereh serve as a browse plant species utilize by ruminants and camels and also* is a medicinal plant that has been used by traditional medicine practitioners in the management of several ailment including parasitic infections. However, *Dichrostachys cinerea* recorded higher values of Fat content across the three seasons. This is in agreement with the reports of *Quatro et al. (2003);* Mlambo *et al.* (2004) *and* Thomas (2013). The chemical composition of some browse seeds, leaves and twigs reported in this study varied considerably due to the variation in plant species and location. These shows the enormous nutritional potentials of these browses to the free-ranging herbivores in the tropics. This is in harmony with the reports of *Tamboura et al. (2007);* Dossa (2009) and Lacroix et al. (2011). Also, *Mangifera indica* had the highest value of Protein content. The values reported from this study were similar to the reports of Rehab Osman (2013) and lower than the reports of Singh *et al.,* (2004). Mango trees in the study area were not fenced. The utilization of mango by camels is on the negative side especially when the plant produces flower prior to fruits production. Camel damages both the flower and fruits especially in a situation whereby camels are foraging without a herder controlling them. Mango is a tropical tree cultivated in many regions of India and Africa, and now its farming has been extended wide across the continents. According to new research study, mango fruit has been found to protect against colon, breast leukemia and prostate cancers. Several trial studies suggest that *polyphenolic anti-oxidant* compounds in mango are known to offer protection against breast and colon cancers (Sikosana *et al.,* 2002 and Rehab Osman, 2013). *Balanites egyptiaca* had the highest values of Neutral Detergent Fibre (NDF) among the ranking plant species in three seasons. Hall and Waljer, (1991) reported similar NDF value from the same plant. Similarly, Hall and Waljer (1991) and Hall, (1992)reported that *Balanitesa egyptiaca* also known as 'Desert date' in English, a member of the family *Zygophyllaceae*, is one of the most common but neglected wild plant species of the dry land areas of Africa and South Asia. This is one of the most common trees in Senegal and Northern Nigeria (Mathieu andMeissa, 2007). It can be found in many kinds of habitat, tolerating a wide variety of soil types, from sand to heavy clay, and climatic moisture levels. In areas where camels existed, they feed on the plant and manage the thorn very well more than any other species of livestock found in the desert

(Eisa *et al.,* 1999 and Johnson 2009). *Cassia arereh* had the highest values of Acid Detergent Fibre (ADF) compared to other plants species utilized by camels in three seasons. This is in agreement with the findings of Getachew Addis (2013). This study confirmed that *Cassia arerehis* among the plant species utilized by camels in wet and early dry seasons. It grows well in an area where there is limited rainfall. In another report, Topps (1992) reported that *Cassia arereh*is a medium tree which belongs to the family *Caesalpinioideae*. It is found in the Sudan savannah, on shallow but quite rich soil. However, the plant is found in northern Nigeria, Cameroun, Ethopia and Eritrea. It is used in Nigerian traditional medicine for the treatment of diarrhoea, dysentery, dermatitis, malaria and skin infections (Bhanwra *et al.,* 2000).

Conclusion

There were little variations in the proximate and fibre constituents of the preferred browse plant species across the seasons. Although, there was no serious deterioration and damage caused by the camels on the plant communities during browsing. However, the chemical contents in the plants were found to be of no harmful effect to the camels, hence they cherished and utilizes.

Acknowledgement

We would also like to thank the camel herders who grant us access to the camels, the guidance through identifying most of the browsesand collecting of samples.

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Received: 9th November, 2021
Accepted: 17th February, 2022