NUTRITIVE EVALUATION OF SOME BROWSE TREES FRUITS (SEED AND PODS) AS DRY SEASON SUPPLEMENT FOR LIVESTOCK IN ARID AND SEMI-ARID LANDS OF SUDAN

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ABSTRACT

High nutritive value for livestock is an essential pre-requisite for successful adoption of forage species. Without high quality, farmers may not achieve the economic animal responses they require to justify their investment. On the other hand, in areas where feed resources are grossly inadequate, or other uses are equally important, farmers may accept a more modest contribution from browse, especially if the species is indigenous and does not require specific introduction and management.

In evaluating forage species, it is important to obtain information on crude protein content, digestibility and forage intake. These values usually determine the amount of energy that can be obtained by animals. In individual situations, high ash or oil content may also affect quality.

In the present study ,nine forage tree species were evaluated for their nutritional value in terms of nutrient composition namely ,crude protein (CP), crude fiber (CF), starch, fat and ash content, in addition to mineral concentration . Results obtained showed adequate amount of protein and variable mineral levels, available for livestock during dry periods in arid and semi- arid lands of Sudan.

Keywords: Fodder trees , minerals, Butana, Sudan, browse

INTRODUCTION

Many areas in Sudan are characterized by dense population of livestock , one of them is the Lower Atbara River, that located in eastern Sudan, and the northward areas. Eastern Sudan, which is divided between desert and semi-desert regions, includes Butana area, the Gash Delta, the Red Sea Hills, and the coastal plain of the Red Sea. Trees and bushes provide grazing for livestock particularly nomadic camels from north of Butana while the rich moist soil provides an abundance of food crops and cotton. Although Eastern Sudan is very rich in natural vegetation, very little information is available about the nutritional values of the trees and shrubs, except for

some studies elaborating on fodder trees in Butana area. Animal keeping in this area is a major and the most important source of income for the majority of the population.
Shrubs and trees are regular feature of most of the Sudan arid and semi-arid rangelands. These rangelands vary from region to another, where the shrubs may constitute 100% of the diet of sheep on occasions, to arid woodlands where browse trees are sparse and unimportant for forage. seasonal variation plays a minor part in determining browse quality (Leigh et al 1978) and may be ignored in this paper.

In many parts of the tropics, arid and semi-arid lands constitute a large proportion of the area. Inadequacy of livestock feed in the dry season, particularly lack of protein, is a major constraint to livestock production in these areas (Minson, 1990). On the other hand, conventional protein sources such as oilseed cakes and meals made from animal by-products are expensive and not readily available. Under these circumstances, the most practical supplement may be locally available browse trees (Topps, 1992).

Some trees and shrubs of the study area were also included in some nutritive studies for other areas, e.g. FadelElSeed, (1999) who carried out chemical analysis of the leaves and twigs of 10 browse species in the Butana area at early and late dry season. The analyses performed showed various ranges of chemical composition of browse species samples which were expected to affect their nutritive value. Most browse species investigated showed relatively high fodder value due to high level of crude protein(05.84-28.98%), metabolisable energy (04.71-09.39Mj/Kg), Calcium (0.40-03.9%), Magnesium (0.13-01.37%) and Potassium (0.41-03.5%). In terms of Sodium and Phosphorus concentration, all browse species samples were nearly deficient. There is limited information on the nutritive value of seedpods, and their value as dietary supplements. Nyambati et al (2006) claimed that, seedpods of *Leucaena*. *leucocephala* can be used by smallholder crop-livestock farmers and agro -pastoralists in arid and semi-arid areas to provide a locally available feed that is cheap and high in protein. These seedpods can be used as supplements to low quality forages, resulting in better utilization of the forage and improved live-weight gains in cattle.

The objective of this study was to assess the potential nutritive value of some selected species of fodder trees fruits (pods + seeds) in Lower Atbara River area, based on their chemical composition.

MATERIALS AND METHODS

Samples collection

Random seeds and pods were manually collected from the nine trees species at different positions on the study area.

The fruit was hand-picked to elimine damaged pieces. samples were immediately weighed and stored in cloth bags till laboratory analysis.

Sample Pretreatment

After sample collection as were described in the previous section, samples were immediately weighed and stored in cloth bags till laboratory analysis. At laboratory, samples were sun-dried for three days, carefully cleaned and ground to powder. Then, the moisture contents were determined. Notably, the guidelines recommended by the Official Methods of Analysis of AOAC (Association of Official Analytical Chemists) (1995) for sample treatment were applied.

Sample Treatment for Elemental Analysis

Appropriate aliquots of samples were ground and burned to ash. Thereafter, HCl and HNO3 in the ratio of 3:1 (v/v) were added in order to digest further residues of organic matter. There after, the samples were filtered using Whatmann filter paper number 42 (Indrayan et al. 2005; Jimoh and Oladiji 2005; Glew et al. 2006). 2380 Perkin Elmer atomic absorption spectrophotometer (Massachusetts, US) was used for the determination of Mg, Ca, Cu and Fe. The Sherwood Model 410 Flame Photometer (Corning, Cambridge, UK) was used for the determination of Na and K. P was determined using UV-VIS Spectrophotometer (UV-1800; Shimadzu, Kyoto, Japan). Major Nutritious Analysis Near-Infrared Reflectance Spectroscopy (NIRS) was exploited for proximate quantification of moisture, crude protein, crude fiber, ash, fat and starch (Hacisalihoglu et al. 2010). The NIRS region was covered with the wavelengths between 730 and 2500 nm. 1.0 g was exposed to an electro-magnetic scan over a spectral wavelength range of 1100 to 2500 nm. In this range, energy was directed to the sample and the reflected energy was detected. The official NIRS methods were recommended by the Official and methods of Analysis of AOAC for the quantification of crude protein (989.03) and moisture (991.01) (Barton and Windham 1998). Starch and fat were also proximately quantified by NIRS as recommended by the Official Methods of Analysis of AOAC (Wrigley 1999).

RESULTS AND DISCUSSION

The present status of some shrubs and trees involved in the study, was shown in table (1). It's obviously clear that most of the investigated trees are indigenous except *Prosopis chilensis* that introduced into Sudan in 1917 by Massy (Broun& Massey, 1929). This is advantageous that, less management and adaptation is required to conserve and distribute such fodder trees in the area.

Table 1: Present status of some shrub and tree species in the study area

Species	Indigenous %	Exotic %	Endangered %
*Acacia tortilis*subsp.*raddiana*	51.3	0.7	0
Acacia ehrenbergiana	30	0.7	0
*Acacia tortilis*subsp.*spirocarpa*	8	0.7	0
Acacia seyal	57.3	1.3	1.3
Acacia nilotica	33.3	0.7	0
Capparis decidua	35.5	0	0
Calotropisprocera	12.7	3.3	0
Ziziphusspina-christi	11.3	0	0
Hyphaenethebica	16	4	8.7
Prosopis chilensis	4.7	14.7	0
Other trees and shrubs	20	2	2

Table (2) represents the chemical analysis for the fruits of the trees used in this study. The content of CP showed variation among these tree species ,four Acacia species, namely , *Acacia raddiana*, *Acacia spirocarpa* , *Acacia ehrenbergiana*, and *Acacia seyal*, showed high crude protein content which exceed 30% CP , while (*Acacia nilotica*) scored 21,4% CP. fruits of *Balanites aegyptiaca* reveals the least CP value as 6.31%. The protein content was consistent with what has been reported in other work with acacia species (Tanner et al ,1999;sawe et al, 1998 ; Abdulrazak et al,2000).However, Gohl,1981 claimed that pods have lower crude protein concentration and higher organic matter digestibility than forage. The other species investigated in this work (*Prosopischilensis*, *Maeruacrassifolia* , *Capparis deciduas,and Balanites*

aegyptiaca) showed lower CP content compared to the Acacias and ranged from 6.31- 28.25% but still well arranged with results reported for browse trees in the area (FadelElSeed, (1999, 2002),although *Balanites aegyptiaca* may be less palatable due to its lowest protein content. In individual situations, high ash or oil content may also affect quality , this is obviously seen in *Acacia nilotica* which showed the highest fat content (24,77) among these species.

Table 2: Proximal composition of fruits of commonly grazed species in the study area

Species	Ash Content%	Crude Fiber %	Starch %	Crude Protein %	Fat %	Moisture Content %
Acacia nilotica	11.76	30.12	21.94	21.40	24.77	6.29
Maeruacrassifolia	3.82	17.76	16.79	28.25	9.60	13.68
Capparis decidua	4.54	12.87	12.68	13.70	4.87	19.26
Balanites aegyptiaca	8.27	21.38	13.89	6.31	3.97	19.55
Acacia seyal	11.62	24.34	9.76	31.05	5.13	10.92
Prosopis chilensis	7.5	13.4	15.14	18.61	2.06	17.29
Acacia ehrenbergiana	11.81	25.11	12.21	30.99	4.10	9.68
Acacia spirocarpa	9.4	24.73	10.99	31.25	4.62	5.5
Acacia raddiana	9.3	24.92	11.60	31.12	4.36	5.0

Table 3 shows the mineral concentration of fodder trees fruits investigated in this study. All fodder trees fruits contain less than 1.0% Ca and P content except Acacia seyal which contains 1.1% . this necessitates supplementing Ca and P to the diet . K contents in all fodder tree fruits is as high as 0.95-2.96% compared to the other minerals, this is consistent with values reported by FadlElseed et al (2002) who studied the nutritive evaluation of some fodder tree species in central Sudan .Other minerals , namely Mg , Na, Fe , and Cu showed variable amounts, but still well adequate for ruminant requirements.

Table 3: Mineral composition of fruits of commonly grazed species in the study area

Species	Ca %	P %	K %	Mg %	Na ppm	Fe ppm	Cu ppm
Acacia nilotica	0.69	0.14	1.15	0.15	98	39	4.95
Maeruacrassifolia	0.16	0.23	2.96	0.18	245	56	6.92
Capparis decidua	0.22	0.20	1.80	0.11	318	64	6.65
Balanites aegyptiaca	0.16	0.07	1.29	0.07	355	38	4.99
Acacia seyal	1.10	0.29	1.50	0.35	259	85	6.85
Prosopischilensis	0.80	0.19	1.85	0.18	996	55	12
Acacia ehrenbergiana	0.71	0.23	1.25	0.26	1055	215	15.25
Acacia spirocarpa	0.30	0.22	0.95	0.23	242	902	5.45
Acacia raddiana	0.35	0.25	1.23	0.21	348	122	3.48

CONCLUSION

The nine fodder trees showed high crude protein content , except *Balanites aegyptiaca* which tend to be less promising to act as protein supplement for livestock diets during dry seasons. Minerals concentration are adequate except P which is recommended to be supplemented . Further studies on feeding trials are needed to quantify the animal response when offered these fodder trees seeds and pods.

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