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RESEARCH ARTICLE

NUTRITIONAL EVALUATION OF SOME TRESS PODS AS SOURCES OF FEED FOR LIVESTOCK

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ABSTRACT

The pods of three trees namely *Fidherbia albida*, *Ceratonia seliqua* and *Tamarindus indica* were evaluated as animal feed in terms of its chemical composition, macro mineral content and in vitro digestibility. The experiment was carried out during the period from March- April 2015. The results showed that crude protein content was significantly ($p<0.05$) higher in F. albida (4.22%) than in C. seliqua (1.43%) and in T. indica (1.46%).Crude fiber in F.albida (48.21%) was higher than in C. seliqua (29.39%) and T.indica (25.73%). Ether extract was significantly ($p<0.05$) higher in C.seligua (2.7%) than in f. albida (1.72%) and T. indica (1.3%).Ash content was not significantly ($p>0.05$) between them which registed (4.40%, 4.67%, 3.51%) respectively. NFE was significantly ($p<0.05$) higher in C.seligua (57.50%) than in T. indica (55.56%) and f. albida (35.96%). Sodium content were no significantly between them witch registed (0.10%, 0.11%, 0.10%).potassium content was lower in f.albida (1.24%) than in C.seliqua (2.05%) and higher than in T. indica (1.05%). Calcium, magnesium, and phosphorus were (0.59%, 0.75% and 0.40%), (0.22%, 0.19% and 0.12%) and (1.04%, 1.06% and 1.05%) in F. albida , C. seliqua and t. indica respectively. The In vitro dry matter digestibility of F. albida (79.14%) was significantly ($P<0.05$) higher than in C. seliqua (65.03%) and in T.indica (77.69%). It could be concluded that the pods of three tree species could contribute most of livestock nutrition requirements.

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INTRODUCTION

Livestock production plays a major part in rural economy and social stability. It is the main supplier of high quality proteins, cash for families, draught power, satisfaction of religious and social festivals, and manure for the soil. In addition it is a way of living to people and their families (Harbi, 1992). Most of the developing countries have been fighting against the problem of how to adequately feed their livestock, because of inadequate production of conventional ingredients for livestock feeding, so the scarcity of feed sources often imposes a major challenge in livestock production in the countries (Aregheore, 2000). Thus searching for alternative unconventional feed sources that may have valuable components of animal diets is indispensable. For the instance, feeding by-products from agricultural and food processing industries to livestock can be one of the solutions (Negesse *et al.* (2009); Szumacher-Strabel *et al.* (2011); Zhou *et al.* (2012). The use of tree parts as alternative feed resources for ruminant livestock is becoming increasingly important in many parts of the tropics and sub-tropics (Silanikove, (2000); Melesse *et al,* (2009).

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Pods of several legume trees or shrubs have been included in livestock diets in many parts of the world during critical periods of the year when quality and quantity of forages are restricted (Batista *et al.* (2002); Ahmed and El-Hag, (2004); Mahgoup *et al*. (2005); Silanikove *et al*. (2006). Incorporation of Faidherbia albida pods up to 45% had no adverse effects on kids' performance and nutrient digestion (Ibrahim and Tibin, 2003). On the other hand, high levels of condensed tannins in carob (Ceratonia siliqua) pods restricted nutrient utilization and decreased voluntary feed intake, crude protein digestibility and animal performance (Silanikove *et al*., 2006). The objective of this study is to determine Chemical composition of three types of tree pods.

MATERIALS AND METHODS

The experiment was carried out at Faculty of animal production, Department of animal nutrition, University of Khartoum. During the period from March- April 2015, to investigate the chemical composition, digestibility and mineral content of trees pods.

Sample collection: The samples of trees pods were collected from Kass locality, South Darfur state, Collection was done by

hand plucking or cutting with hook during wet season in mid-march. Sample was sun dried and then ground, milled to uniform size and screened and taken to the laboratory for subsequent analysis.

Laboratory analysis: All experimental samples in this study ware analyzed by using proximate analysis method of feed to determine the dry matter (DM), crude protein (CP), Crude fiber(CF), ether extract (EE), ash and nitrogen free extract (NFE) according to the methods of AOAC (1980). Plant species minerals were determined as for phosphorous (p), calcium (Ca) and Magnesium (Mg). phosphorous (P) was determined by spectrophotometer according to Murphy and riley (1962). Potassium (K), calcium (Ca) and magnesium (Mg) by atomic absorption according to Houba et al. (1989). Dry matter digestibility of the samples was determined using the procedure 'two-stage in vitro' described by Tilly and Terry (1963).

Statistical analysis: Data for all response variables were subjected to analysis of variance (ANOVA) using the statistical Package for social sciences (SPSS), 2008 and significant differences between treatment means were determined by using Least Significant Difference (LSD) at level ($p<0.05$) according to (Gormez and Gomez, 1984).

RESULTS AND DISCUSSION

Chemical Composition of Trees Pods

Dry Matter Content (DM): Table (1) shows the dry matter content of the trees pods which ranges from 87.59 to 95.68%. Dry matter of Carob is the highest with 95.68% whereas haraz is lower with 94.50% and tamarind is the lowest with 87.59%DM. There were significantly ($p<0.05$) differences among the trees pods on DM. C.seliqua had high DM content this is an indication that C. seliqua samples analysed constitute important, useful and dependable sources of DM for feeding livestock. The high DM content of the pods of F. albida which is an indication of low moisture content, show a better storage potential of the pods, since high moisture content is associated with increase of microbial activities during storage which reduces the nutritional value of feed material (Tona *et al*, 2003) .The values of the DM obtained in the present study are comparable with those reported for two species of Acacia tumida, and A. colei (Adewusi, *et al* .2013).

Crude protein content (CP): The data in table (1) illustrated that the crude protein differed significantly ($p<0.05$) among trees pods. In this study, fidherbia albida shows the highest content of Crude protein (4.22%) than the other two species. T. indica contain low level of CP than the level reported earlier (pugalenthi, *et al*. 2004). Information on the levels of CP in T. indica seaems to be meager. The crude protein in ceratonia seliqua is lower when compared with earlier reports (Akin-Osanaiye, *et al*.2009). The lower values in T. indica for crude protein recorded during the present study were lower than those reported by Ega (1986) and within the range of 20-37% reported by Glew *et al*. (1997) for indigenous plants and soybean (Prakash, *et al*. 2001) hence showing that T. indica will not be a very good source of plant protein on its own unless incorporated with other protein sources or feeds in case of livestock.

Crude fiber content (CF): Table (1) noted crude fiber content of the different trees pods was ranging from 25.73 to 48.21%. There were significant ($p<0.05$) differences between the tree pods. *Fidherbia albida* shows high content of Crude fiber (48.21%) than the other two species. The crude fiber content of *F. albida* pods (48.21%) was high compared to that of *Acacia colei* (39.9%) and *Acacia tumida* (20.3%) (Adewusi *et al.,* 2003) *F. albida* pods have low energy values than the *Ceratonia seliqua* as shown in Table 1. The low energy value of the pod could be due to low concentration of ether extract in the seed. This further confirms that fruits of *Ceratonia seliqua* pods are important sources of energy to livestock. Fiber is an important part of diet, which decreases serum cholesterol levels, risk of coronary heart disease, hypertension, Diabetes, colon and breast cancer (Ishida et al. 2000). Values for crude fiber were within the range reported for legumes by Prakash *et al.* (2001) and for Nigerian underutilized legumes (Aremu *et al*. 2006). However, the values are below the RDA for fiber in children and lactating mothers, which are 19-25, and 29% respectively (Ishida et al. 2000).

Ether Extract content (EE): Table (1) given the EE content of different Trees pods. T. indica contained a high level of ether extract content (2.7 %). This value is found to be lower than that reported earlier (pugalenthi, *etal* 2004). ether extract content of *Ceratonia seliqua* is found to be more or less equal to that of *Prosopis gladulosa* (Harden and Zolfaghari, 1988) whereas the ether extract content in T. indica pods was lower than that obtained by (Yusif, *et al.*2007). Generally, these values were lower than the range of 27.1% for dinyan kwakwa (Glew *et al.* 2005) and 75 mg/g for T. indica seeds reported in Glew *et al.* (1997). The high values reported by Glew *et al.* (1997) could be because they use a different method of solvent extraction and lipid analysis using GC/MS.

Ash content: No significant differences were found between different trees pods (Table 1) concerning the content of Ash. The seeds of T.indica exhibited the low level of Ash content. This value are found to be agreeing with that of earlier reports in T. Indica (Ishola *et al.,* (1990).

Nitrogen Free Extract content (NFE): Table (1) indicates a significant ($P\leq0.05$) difference in NFE content, ranging from 35.96 to 55.56%. Among the presently investigated of the three species, Ceratonia seliqua exhibits higher levels of Nitrogen Free Extract (NFE) than T. Indica and F. albida. These values are found to disagree to that of some earlier investigated of wild pulses like Afzelia africana (Madubuike *et al*., 1994) The NFE contents in *T. indica* indicated a low value than carbohydrates value in G. africanun seeds (Ekop 2007) but within the range reported for legumes Parkash *et al.* (2001), suggesting that the seeds of T. indica arepoor sources for carbohydrates on their own compared to other food sources like vegetables.

Mineral content of trees pods

Sodium content (Na): Table (2) Shows the mineral content of the three trees pods of Na content. Among the presently investigated, All the three species contain less sodium content, but it is seems to be agree compared to an earlier report (Akin-Osanaiye , 2009**)** in the Ceratonia seliqua and in the same species (Ishola *et al*., 1990; Siddhuraju *et al.,* 1995a).

Potassium content (K): The mean of Potassium content of the three pods is significantly ($p<0.05$) difference. It was found that mean value ranged from 1.05 to 2.05% K.

Table 1. Proximate composition of three trees pods

Botanical name (local name)	DM	CP	CF	EE	ASH	NFE
Fidherbia albida (Haraz)	94.50[b]	4.22[a]	48.21[a]	1.72[b]	4.40[a]	35.96[c]
Ceratonia seliqua (Carob)	95.68[a]	1.43[b]	29.39[b]	1.7[a]	4.47[a]	57.50[a]
Tamarindus indica (tamarind)	87.59[c]	1.46[b]	25.73[c]	1.3[c]	3.51[a]	55.56[b]
SEM	0.19	0.07	0.02	0.03	0.27	0.37

DM: Dry matter CP: Crude protein CF: Crude fiber
EE: Ether Extract NFE: Nitrogen Free Extract
* Means within the same columns with different superscripts are significantly different at ($P<0.05$).

Table 2. Macro mineral composition of the three trees pods (g/kg DM):

Botanical name (local name)	Na	K	Ca	Mg	P
Fidherbia albida (Haraz)	1.03[a]	14.2[b]	5.9[ab]	2.2[a]	10.4[a]
Ceratonia seliqua (Carob)	1.02[a]	20.5[a]	7.5[a]	1.9[a]	10.6[a]
Tamarindus indica (Tamarind)	1.00[a]	10.5[c]	4.0[b]	1.2[b]	10.5[a]
SEM	o.87	0.03	0.07	0.01	0.04

Na: Sodium K: Potassium Ca: Calcium MG: Magnesium P: Phosphorus

Table 3. In vitro Dry matter Digestibility (%) of trees pods

Botanical name (local name)	Means
Fidherbia albida (Haraz)	79.14[a]
Ceratonia seliqua (Carob)	65.03[b]
Tamarindus indica (Tamarind)	77.69[a]
SEM	0.64

* Means within the same columns with different superscripts are significantly different at ($P<0.05$).

Carob is the highest with 2.05% while Tamarind is lowest with 1.05%. Among the three species T. indica registers the lowest level of potassium. However these values seem to disagree when compared to an earlier report in the same species (Siddhuraju *et al.,* 1995b) and other legumes like Vigna unguiculata (Akinyele, 1989).

Calcium content (Ca): Calcium content of the trees pods is given in table (3). The mean value is within the range from 0.40 - 0.75%. For comparison carob is the highest 0.75%Ca, Tamarind is lowest 0.40%. There are significant ($p<0.05$) difference among the means. For calcium content among the three species, Ceratonia seliqua registered the highest level of calcium content. It appears to be higher than that of earlier report in the same species (Ishola *et al.,* 1990; Siddhuraju *et al.,* 1995a). Nieman *et al.* (1992) considered a food source good if the Ca ratio is above 1 and poor if the ratio is less than 0.5. The pods of T. indica ratio (0.40%) happen to be bad food source in terms minerals used in bone formation.

Magnesium content (Mg): Table (2) shows the magnesium content of trees pods. The mean value is range 0.12 to 0.22%. All the pods had low magnesium content than that reported by (Pugalenthi *et al,* 2004). Haraz had the highest content of Mg; tamarind had the lowest content of magnesium. All the presently studied tree pods are found to contain less magnesium content compared to some tribal pulses like *Canavalia ensiformis,* C. gladiate (Mohan and Janardhanan, 1994; Rodriques and Torne, 1991)

Phosphorus content (P): Phosphorus content of trees pods is given in table (3). There is no significance differences difference between the means. Nieman et al (1992) ranked the feed as good if contain above 1 and poor if the ratio is less than 0.5%. The pods of T. indicated to be good food source of Phosphorus 1.05) for minerals used in bone formation. Hence the whole seeds and seed nuts of T. indica could be useful in lowering blood pressure, which comparing favorably with flours of some Nigerian underutilized legumes (Aremu *et al.* 2006).

In vitro Dry Matter Digestibility (IVDMD): Table (3): shows that the in vitro dry matter digestibility of different trees pods ranging from 65.03 to 79.14% IVDMD, indicating significant ($P<0.o5$) difference among the species. Haraz had the highest 79.14; Carob is lowest 65.05% IVDMD. It has been reported that pods with a digestibility of 45.5% could be considered an appropriate resource for animal production (Sotelo et al. 1995).in same species higher digestibility values have been found for some pods such as A. pennatula and E. cyclocarpum (66.8% and 72.3% respectively, Briceño-Poot et al. 2012).

Conclusion and Recommendation

The chemical compositions, including major and minor nutrients, were examined in the pods of Fidherbia albida, ceratonia seliqua and T. indica used for browsing in Sudan. For the first time based on the reported nutritional indices, it could be concluded that the pods of these species offer acceptable nutritional values especially protein and minerals for livestock. Most nutritious constituents are within the range of levels reported in previous studies for the same species. Since it is the first study, this manuscript presents a baseline data of these species as indispensible source of fodder for livestock in Sudan.

However, more investigations are recommended to be accomplished. A study on the effect of climate on the nutritional indices of the pods of these species is desirable. In addition, examining the digestion and mineral of the nutritional components, which effect on the production of meat and milk, of the pods of these species are required as well. Therefore we

recommended that more research needed to be carried on the trees pods in animal nutrition.

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