

NUTRITIONAL POTENTIALS OF *Ziziphus spinachristi* FODDER FRACTIONS FOR SMALL RUMINANTS PRODUCTION

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ABSTRACT

This study was conducted to evaluate the nutritive value of *Ziziphus spinachristi* fresh, dried leaves, fruits pulp and seeds. Fifty (50) *Ziziphus spinachristi* trees were sampled using multistage sampling techniques within Hadejia local government area in Jigawa state. The samples were bulked in to fractions of; T1 (fresh leaves), T2 (dried leaves), T3 (fruits pulp) and T4 (seeds). The fraction samples were evaluated for proximate and fiber compositions in laboratory, in three replicates. The results revealed significant ($P < 0.05$) differences in all parameters evaluated. Fruits pulp had the highest moisture content (16.80%) while dried leaves had the lowest value (5.40%). The fresh leaves had the highest ash content (8.90%) while dried leaves had the smallest amount (2.00%). Seeds content highest CP content (15.00%) as compared with others. The dried leaves lead in crude fibre content (22.40%), while seeds (T4) had the lowest value (6.26%). The highest ether extract (EE) content (17.20%) was found in seeds while dried leaves is the lowest EE content (1.00%). Neutral detergent fibre content was higher in dried leaves with value of 71.70% as compared with that of seeds which resulted in lowest value 25.30%. The highest value of acid detergent fibre 68.10% was found in dried leaves while seeds had the lowest value 4.50%. Conclusively, fresh leaves have more nutritional qualities as compare to dry leaves in all parameters evaluated except for fibre contents, the seeds have high crude protein content. Therefore, recommended that, further research work should be conducted on feeding *Ziziphus* seeds as supplement.

Keywords: Fruits pulp, Nutritive value, Ruminants, Seed and *Ziziphus spinachristi*

INTRODUCTION

Browse plants play a significant role in nutrition of ruminant livestock in tropical regions. Browse plants, because of their resistance to heat, drought, salinity, alkalinity, drifting sand, grazing and repeated cutting are the major feed resources during the dry season. Browse leaves and pods form a natural part of the diet of goats which meets over 60 percent of the forage requirement and have been used by traditional farmers as sources of forage in Nigeria (Njidda and Olatunji, 2012). The tree and shrubs legume forages are rich in most essential nutrients such as proteins and minerals and tend to be more digestible than grasses and crops residues. They also serve other useful purposes such as the provision of food and drugs. Some parts of browse species can be found during the dry season including pods, fruits and leaves. The leaves of the evergreen tree and shrub are used as emergency food by goat and sheep in the semi-arid region of North-Eastern Nigeria (Njidda, 2010). Recently, importance of trees and shrubs as alternative fodder resources in ruminant nutrition has attracted the attention of researchers worldwide. Several indigenous and exotic browse species have been investigated and evaluated for inclusion in ruminant feeding system in Nigeria (Muftau *et al.*, 2019). Browse plants have many advantages as far as livestock production is concerned. They are less subject to seasonal variation. They can serve as the only feeding stuff to keep livestock in healthy and fair condition. However, browse plants are also very palatable and can offer considerable potentials as feeds to livestock (Abdurrahaman and Kibon, 2017). *Ziziphus* species are widely distributed throughout the warm subtropics and tropics of South Asia and Africa. They are found in the arid to semi-arid zones of all Sahelian countries in West Africa, and of East and southern Africa. However, the main products from these species are the fruits pulp which is consumed fresh or dry and also made into a juice. In addition, leaves are used for fodder and the leaves, roots and bark are used for medicinal purposes. The wood is used for handles, kitchen utensils, firewood and charcoal (Kalinganire and Koné, 2011). They are highly variable in size and form, ranging from a spreading shrub to an erect small or medium sized tree. Height varies from 3-16 m. Branches and twigs may or may not have spines and leaf size and shape also varies. The flowers have an acrid smell and form small clusters. The plum-like fruits are

variously coloured and smooth-skinned, and from improved varieties, maybe 5 cm long by 3 cm in diameter (Kalinganire and Koné. 2011). This research work was designed to evaluate the nutritive value of *Ziziphus spinachristi*'s fresh, dried leaves, fruits pulp and seeds and conclude the best among in terms of high value.

MATERIALS AND METHOD

Description of the study area

The study was conducted in Hadejia Local Government Area, Jigawa State, Nigeria. Hadejia lies between latitudes 12° 13' - 13° 60' N and longitudes 9° 22' - 11° 00'E. The climate of the area is semi-arid. It is characterized by long dry season and a short wet season from June to September. The location has an average annual temperature of 27.2°C, annual rainfall 600mm to 762mm. However, the environment is conducive to different species of livestock production, such as cattle, sheep, goats, rabbits, donkeys, horses and poultry (Dahiru *et al.*, 2022).

Sampling technique and treatments

Sampling was done using multistage techniques, in the first stage Hadejia LGA was sampled purposely due to high number of *Ziziphus spinachristi* trees. Five (5) Communities were selected randomly within Hadejia in the second stage, followed by selection of Ten (10) *Ziziphus spinachristi* trees per Community in the third stage. This gave us fifty (50) *Ziziphus spinachristi* trees within the study area. Thereafter from each tree, samples of fractions were collected and later bulked in to fresh leaves, dried leaves, fruits pulp and seeds of *Ziziphus spinachristi* making four (4) treatments as shown in Table 1.

Table 1: Treatments Evaluated of Different Parts of *Ziziphus spinachristi*

Treatments	<i>Ziziphus spinachristi</i> fractions
T1	Fresh Leaves
T2	Dried Leaves
T3	Fruits pulp
T4	Seeds

Chemical analysis

The collected samples (fresh and dried leaves, fruits pulp and seeds) of *Ziziphus spinachristi* from study location were oven dried at 65°C for 48 hours and determination of moisture were carried out. Thereafter sub-samples were grounded in hammer miller to pass a 1mm mesh sieve for the determination of crude protein (CP), crude fibre (CF), ether extract (EE) and ash (ASH) according to procedures described by AOAC (2010). Fibre fractions; neutral detergent fibre (NDF) and acid detergent fibre (ADF) according to procedures as described by Van Soest *et al.* (1991). Hemicellulose was calculated as the difference between NDF and ADF.

Statistical analysis

The data collected from nutritional potential evaluation were stored in Microsoft excel 2016 and subjected to analysis of variance (ANOVA) using General Linear Model of SAS 2013. While means differences were separated by Fisher's least significant difference (FLSD) at 5% level of probability.

RESULTS AND DISCUSSION

Results

The proximate compositions of different parts of *Ziziphus spinachristi* were presented in Table 2. The values obtained were significantly difference ($p < 0.05$) among the evaluated treatments. Moisture content ranges from 5.40 - 16.80%. Fruits pulp (T3) had the highest moisture content (16.80%) while dried leaves (T2) had the lowest value (5.40%). The ash content values range from 2.00 - 8.90%. The fresh leaves (T1) had the highest ash content (8.90%) while dried leaves (T2) had the smallest amount (2.00%). The values of crude protein content range from 8.20 - 15.00%. Seeds (T4) resulted in highest CP content (15.00%) as compared with that of fruits pulp (T3). The dried leaves (T2) had the highest crude fibre content value of 22.40%, while seeds (T4) had the lowest value (6.26%). The highest ether extract (EE) content (17.20%) was found in seeds (T4) while dried leaves (T2) resulted the lowest EE content (1.00%).

Table 2: Proximate Compositions of Different Parts of *Ziziphus spinachristi*

Parameters (%)	Treatments				SEM
	T ₁	T ₂	T ₃	T ₄	
Moisture	8.00 ^b	5.40 ^c	16.80 ^a	5.90 ^c	0.81
Ash	8.90 ^a	2.00 ^b	7.90 ^a	3.50 ^b	0.85
CP	11.50 ^b	8.70 ^c	8.20 ^c	15.00 ^a	0.67
CF	7.70 ^b	22.40 ^a	6.90 ^{bc}	6.26 ^c	0.62
EE	3.30 ^b	1.00 ^d	2.00 ^c	17.20 ^a	0.40

The fibre fractions of different parts of *Ziziphus spinachristi* are presented in Table 3. The values evaluated were significant difference ($p < 0.05$) among the treatments. The results showed that neutral detergent fibre (NDF) content was higher in dried leaves (T₂) with value of 71.70% as compared with that of seeds (T₄) which resulted in lowest value 25.30%. The highest value of acid detergent fibre (ADF) 68.10% was found in dried leaves (T₂) while seeds (T₄) had the lowest value 4.50%. The values of hemicellulose content ranges from 3.60 - 20.80% in dried leaves (T₂) and seeds (T₄) respectively.

Table 3: Fibre Fractions of Different Parts of *Ziziphus spinachristi*

Parameters (%)	Treatments				SEM
	T ₁	T ₂	T ₃	T ₄	
NDF	44.90 ^b	71.70 ^a	40.40 ^c	25.30 ^d	0.62
ADF	37.70 ^b	68.10 ^a	21.80 ^c	4.50 ^d	0.59
HEM	7.20 ^c	3.60 ^d	18.60 ^b	20.80 ^a	0.39

Discussion

Development and improvement of a ruminants feed involves evaluation of proximate composition, fiber fractions, digestibility and performance efficiency as well as cost implications and conditions of application (Abdurrahman *et al.*, 2021). This research work was conducted to evaluate the nutritional potential of *Ziziphus spinachristi* for small ruminant production. The crude protein content analyzed ranged from 8.20 - 15.00% in fruits pulp and seeds respectively. This result is in-line with the findings of Keta (2017) who reported lowest crude protein (6.18%) in *Ziziphus muaritiana* fruits pulp, while Yarima and Adamu (2011) reported highest crude protein (36.10%) in *Ziziphus muaritiana* seeds when compared with the current research. As reported by Abdurrahman *et al.* (2021), the factors that contributed to low concentration of protein were the high levels of fiber content. Neutral detergent fibre (NDF) and acid detergent fibre (ADF) contents evaluated were lower than that of cereal husk (%NDF; 51.15 and %ADF; 37.05) as reported by Abdurrahman *et al.* (2021). Keta (2017); Yarima and Adamu (2011) recorded lower values for Moisture (5.16%; 4.21%) and Ash (6.16%; 2.79%) contents in *Ziziphus muaritiana* fruits pulp and seeds respectively.

CONCLUSION AND RECOMMENDATION

It is concluded that, fresh leaves has more nutritional qualities as compare to dry one except in term of fibre contents. However, the seeds have high crude protein content which can be used in any animals feed formulation. Therefore recommended that, further research work should be conducted on feeding *Ziziphus* seeds as supplement.

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