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Proximate and Phytochemical Analysis of *Ziziphus mauritania* Lam Leaves

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Abstract

Ziziphus mauritania Lam is a tree and its belongs to the family *Rhammaceace*. It is used as a medicinal plant especially its leaf and fruit. In this work the leaf of *Z. mauritania* was screened, investigated qualitatively for its phytochemical constituents, using the methods of Sofowora (1993). Oven dried pulverized leaf of the plant were sequentially extracted with ethanol, chloroform, and distilled water. The solvent shows ability to extract some components of the plant part especially ethanolic extract with high efficiency. Qualitative Phytochemical screening of the extracts shows the presence of flavonoids, alkaloids, saponins, tannins, resins and carbohydrates. Proximate nutritional analysis revealed the presence of; Moisture content 6.0±0.01%, Ash content 8.0±0.00%, Fat content 10.7±0.001%, Crude protein 28.18±0.00% and Carbohydrate 44.05±0.00%. The extracts therefore can be said to have phytochemical constituents as confirmed from analysis and this could be used as the justification for its ethnomedicinal importance in the communities where its uses for various ailments is popular.

Keywords

Phytochemicals, Medicinal Plant, Ethnomedicinal, Proximate, Food

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1. Introduction

In many tropical countries, rural people traditionally harvest wide range of leafy vegetables, roots, tubers, fruits from wild because of its taste, cultural uses, as food supplements to tide over food shortage labelled as famine, hunger, wild plant have been recognised to have potential to meet house-hold food and income security [9]. *Ziziphus* is one which that is found in all over the world. Different types of morphological temperature and climate changes. According to their morphological changes the species name was decided. *Ziziphus Mauritania* is one of which that is grown in dry places. Generally used for feeding cattle, camel, goats and it has resistance power against different types of pathogens [12].

Z. mauritania is also called *jujube* tree [11-12]. The leaves are also use in the treatment of liver diseases, asthma and fever [12], carbohydrate, starch, protein and sugar, mucilage's and vitamins are found in *Ziziphus* species. *Z. mauritania* also known as Ber, Chinese apple, jujube, Indian plum and masau is a tropical fruit species. *Z. mauritania* is a medium tree that grown vigorously and has a rapidly developing tap root, a necessary adaptation to drought conditions. The species varies widely in height, from a bushy shrub 1.5 to 2m tall, to a tree 10-12m tall with a trunk diameter of about 3.0m. *Z. mauritania* may be erect or wide-spreading with gracefully drooping thorny branches, zigzag branchlets, thorn less or set with short sharp straight or hooked spines [10-13].

The leaves are alternating ovate or oblong elliptic with rounded apex, and 3 depressed longitudinal veins at base. The leaves are about 2-5 to 3-5cm long and 1.8 to 3.8cm wide having fine tooth at margin. It is dark green and glossy on the upper side and pubescent and pale-green to grey-green on the lower side. Depending on the climate the foliage of the

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Z. mauritania may be ever green or deciduous [15]. The flowers are finny yellow, 5-petalled and are usually in twos or threes in the leaf axels, flowers are white or greenish white and the fruits are orange to brown, 2-3cm long with edible white pulp surrounding a 2-locular pyrene [15]. *Ziziphus* fruiting time is February to march and the colour is red with juicier like litchi. The fruit has been used as anodyne sedative, tonic anti-cancer, potent wound healer [14].

There are many usage of the plant for local and international; The fruit is eaten raw pickled or used in beverages. It is quite nutritious and rich in vitamin C, it is second only to guava and much higher than citrus or apples. The ripe fruits are mostly consumed raw but are sometimes stewed, slightly under ripe fruits are salty. Ripe fruits are preserved by sun drying and a powder is prepared for out-of season purposes. it contains 20-30% sugar, up to 2.3% protein and 12.8% carbohydrate. Fruits are eaten in other forms such as dried candied, pickled as juice or as Bear butter, in Ethiopia the fruits are used to stupefy fish [13]. The leaves are readily eaten by camels, cattle's and goat and are considered nutritious. The flowers are rated as a minor source of nectar for honey bees the honey is light and of fair flavour [13].

Mauritania yield Timber which is hard, strong, fine-grained, fine texture, tough, durable and reddish in colour. It has been used to line wells, to make legs for bed steads, boat ribs, agricultural implements, tool handles, and other turned items. The branches are used as frameworks in house construction and the woods make wood charcoal with a heat content of almost 4.900kcal per kg. In addition, this species is used as fire wood in many areas [13]. The fruits are applied on cuts on ulcers; the dried ripe fruits are a mild laxative. The seeds are sedative and are taken, sometimes with milk, to halt nausea, vomiting, and abdominal pains in pregnancy. The leaves are used to check diarrhoea and are poultice on wounds. Mixed with oil and rubbed on rheumatic areas. The leaves are helpful in liver troubles, asthma and fever [18]. The aim of this research work is to Determine the nutritional composition and phytochemical constituent of *Z. mauritania* leaves.

2. Methods

2.1. Sample Collection and Preparation

The leaves of *Z. mauritania* was collected in August 2015 from Yobe State University, along Gujuba road, Damaturu Metropolis, North-East Nigeria. The leaves fruit were oven dried at 50°C for 17 hours and pulverized using a simple wooden mortar and pestle, the powder was store in a brown bottle for further use [17].

2.2. Solvent Extraction

A 5.0 grams portions of the powdered leaf of *Z. mauritania* were each separately dispersed in 50ml each of distilled water, 95% ethanol, 50ml dilute hydrochloric acid, chloroform. The solutions were left to stand at room temperature for 24hrs and then filtered with whatman No. 1 filter paper. The filtrates were then used for the phytochemical analysis using the following test [17].

2.3. Phytochemical Screening

2.3.1. Test for Carbohydrate

In a test tube, 5ml of the filtrate were treated with 5ml Fehling's solutions (A&B) and heated; the appearance of a red precipitate indicates the presence of reducing sugar.

2.3.2. Test for Alkaloids

The acidic filtrate was render alkaline with ammonium hydroxide and extracted with three successive portions (each 15ml of chloroform). The chloroform extracts were evaporated till dryness and the residues were dissolved in 2ml of dilute hydrochloric acid and tested with Mayer's and modified Dragendruff's reagents.

I. Mayer's Reagent

When added to the residue solution, turbid or white precipitate was formed; this indicates the presence of alkaloids.

II. Dragendruff's Reagent

When added to the residue solution, an orange precipitate was formed; this indicates the presence of alkaloids.

2.3.3. Test for Flavonoids

5ml of 1% hydrocloric acid extract were shakes with sodium hydroxide; a yellow colour appeared indicating the presence of flavonoids.

2.3.4. Test for Tannins

One drop of ferric chloride was added to 2ml of extract, the appearance of bluish or greenish black coloration indicates the presence of pyrogallo or catechol tannins respectively.

2.3.5. Test for Saponin (Foam Test)

6ml of Water was added to 2ml of the extract in a test tube. The mixture was vigorously shakes with the aid of vortex mixer and observed for the formation of form which confirms the presence of saponins.

2.3.6. Test for Resin

50 ml of 95% ethanol were added to the powdered leaf in a test tube and boiled on water bath for 20 minutes, then

filtered; a precipitate was formed after the addition of 5ml distilled water indicating the presence of resins [16].

2.4. Proximate Analysis

Determination of proximate composition was carried out in accordance with Association of Official Analytical Chemist's methods A.O.A.C (1990). Proximate composition of a sample constitutes the difference classes of nutrients present in the samples such as carbohydrates, protein, and fat, crude fibre, ash and moisture as well as caloric values calculated from values of carbohydrate, fat, and protein [3].

2.4.1. Moisture Content Determination

2.0 grams of the powdered sample was weight in to dried crucible; the sample was put in to a moisture extraction oven at 105°C and heated for 3hrs. The dried sample was put in to desiccators and allowed to cool and reweighed. The difference in weight was calculated as a percentage of the original sample.

Percentage moisture $=W_1-W_2/W_1$ x 100/1, Where; W_1=initial weight of empty dish

W_2=weight of dish + undried sample, Mass of moisture content $=W_1-W_2$

2.4.2. Ash Content Determination

2.0 grams of the sample was weighed in to a crucible; it was heated in a moisture extraction oven for 3hrs. At 100°C before being transferred in to a muffle furnace at 550°C until it turned white and carbon free. The sample was then remove from the furnace, cooled in a desiccator to a room temperature and reweighted immediately. The weight of the residue ash was then calculated as;

Ash-content__ percentage ash = weight of ash/weight of original sample x100/1.

2.4.3. Crude Protein Determination

2.0 grams of the sample was mixed with 10ml of con. H_2SO_4 in a heating tube, one tablet of selenium catalyst was added to the tube and the mixture was heated inside a fume cupboard.

The digest was transferred in to distilled water. 10ml portion of digest mixed with equal volume of 45% NaOH solution and poured in to a distillation apparatus. The mixture was distilled and a distillate was collected in to 4% boric acid solution containing 3 drops of red methyl indicator. A total of 50ml distilled water was collected and titrated as well.

Duplicates of the sample were made and average value was taken, the nitrogen content was calculated and multiplied with 6.26 to obtain the crude protein content.

Percentage Nitrogen= (100 X N X 14 VF) T/100 X Va, Where

N=Normality of the titrate (0.1N), VF=Total volume of the digest =100ml

T=Titre value, Va = Aliquot volume Distilled.

2.4.4. Fat Content Determination

2.0 grams of the sample was loosely wrapped with a filter paper and put in to the thimble which was fitted to a clean round bottom flask, which has been clean, dried and weighted. The flask contained 120ml of petroleum ether. The sample was heated with heating mantle and allowed to reflux for 5hrs. The heating was stopped and the thimbles with the spent samples kept and later weighted. The difference in weight was received as mass of fat and it was expressed in percentage of the sample.

The percentage of oil content is percentage fat $=W_2 -W_1 /W_3$ X 100/1, Where

W_2 = weight of empty extraction flask, W_1= weight of the flask and oil extracted

W_3 = weight of the sample

2.4.5. Carbohydrate Content Determination

The Nitrogen free method described by A.O.A.C (1990) was used. The Carbohydrate is calculated as weight by difference between 100 and the Summation of other proximate parameters as;

Nitrogen free extracts (NFE)/ percentage carbohydrate. $=100 - (M+P+F+A+F_2)$

Where; M= moisture, P= protein, F= fat, A= ash, F_2= crude fibre

3. Results

The phytochemical character of the *Z. mauritania* leaf was summarized in the table 1 below. The results revealed the presence of medicinally active constituents in leaf studied. From the table, flavonoids, Tannins, carbohydrates, saponins, alkaloids, and resins were present in the sample qualitatively in different proportion.

Table 1. Phytochemical constituents of the extracts of *Z. mauritania* leaf.

Phytochemical Constituents of Z. mauritania	
Flavonoids	+
Tannins	+
Saponins	++
Resins	+
Alkaloids	++
Carbohydrate (Reducing sugar)	+

+ =present constituents, - = absent constituents

Table 2. Below shows the proximate composition in *Z. mauritania* leaf.

Proximate Analysis Mean Composition	
Moisture content	6.0±0.01%
Ash content	8.0±0.00%
Fat content	10.7±0.001%
Crude protein	28.18±0.00%
Carbohydrate	44.05±0.00%

Values are mean ± standard deviation of determinations.

Carbohydrates were estimated by difference. The values are mean and standard deviation (SD) for those determinations.

4. Discussion

The results confirm the presence of constituents which are known to exhibits medicinal as well as physiological activity [16]. The leaf of *Z. mauritania* was analysed for different phytochemicals (table 1). The carbohydrates, flavonoids, tannins, saponins, and resins were present in the dried leaf of the plant.

This research work has revealed the phytochemical and proximate potency of extracts derived from *Z. mauritania*, therefore suggesting its potent use in the pharmaceutical industry with little or no side effect as it is produced from natural source when compared to artificial or synthetic drugs. Saponins detected in the leaf extract have been known with the ability to strengthen the constriction of the heart muscles [8].

Flavonoids detected have been known to provide protection against oxidative stress induced diseases and are major responsible for the anti-oxidative activity of the leaf. The presence of alkaloids also suggests the importance of the leaf in the pharmaceutical industry as alkaloids have reported to have a stimulating effect, act as topical anaesthetic in Ophthalmology, powerful pain reliever, antipyretic action among other uses [8]. The presence of these phytochemicals indicates the importance of *Z. mauritania* in pharmaceutical industry.

The result of proximate analysis of the leave of *Z. mauritania* is shown in table 2. contain 44.05% carbohydrate, 28.18% crude protein, 8.0% ash and 6.0% moisture. Carbohydrate has the highest value, while moisture has the least. The dietary fibre can lower serum cholesterol level, risk of coronary heart disease, hypertension constipation, diabetes, colon and breast cancer [6]. The presence of secondary metabolites has contributed to its medical value as well as physiological activity [16]. Various studies show that saponins although non-toxic can generate adverse physiological responses in animals that consume them. They exhibit cytotoxic effect and growth inhibitions against a variety of cells, making them to possess anti-inflammatory and anticancer properties [16].

Tumour inhibiting activity of *Z. mauritania* has been reported on animal's model [2]. The leave contains 10.7% crude lipid, which is lower than 11.0% in water spinach leaves, 12% in sennaobfolia but higher compared to spinach leaves (0.3%) and chaya leaves (0.4%) and 1.60% in amaranthus hybridus leaves [1]. Crude lipids are the principal source of energy but should not be more than 30 calories so as to avoid obesity and other related diseases. A diet providing 1-2% of its caloric energy as fat is said to be sufficient to human being as excess for consumption is implicated in certain cardiovascular disorder for such as atherosclerosis, cancer and aging [1].

The ash content of 8.0% indicates that the leaves are rich in mineral elements. The value obtained is higher compared to 1.8% reported in sweet potato by [7]. But lower than some leafy vegetables commonly consumed in Nigeria such as Tallium trangulare (20%). The low moisture content of the leaves would hinder the growth of micro-organism and storage life would be high. The moisture content (6.0%) is lower than Acalpha hispida 11.2%, Acalpha racemosa 11.9% [5].

5. Conclusion

The result reveals the presence of phytochemical constituents in plant studied and some nutritional components. The presence of some of this compound have been confirmed by previous research to have medical as well as physiological activities and therefore could be said to be responsible for the efficacy of the leave of plant studied in treatment of different ailments. The leaves extracts could therefore be seen as potential source of useful drugs. It is suggested that further research should be carried out to isolate, purify and if possible to characterized the constituents responsible for the activity of these plants. Also additional research should be embarked upon with a view of elucidating the possible mechanism of action of these extracts. The observed proximate composition of *Z. mauritania* shows that; it has high protein content than melon leaves. Amino-acid analysis is recommended to be carried out on *Z. mauritania* leaves to find out whether it contain essential amino acid or not, so that the plant source of protein could be explored for better supplement in food, especially in the third world.

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