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Phytochemical and Proximate Analysis of *Jatropha curcas Lam* Leaves

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Abstract
Jatropha curcas leaves have various uses and promise various benefits to humans, animals, and industry. This study was carried out to evaluate the phytochemical and proximate composition of *Jatropha curcus lam* dried leaves. The phytochemical analysis was done to determine the presence and absence of the secondary metabolites. While the proximate analysis was done using the standard method of AOAC. The phytochemical results revealed the presence of Alkaloids, Tannins, Flavonoids, Saponins, Phenolics, and absences of steroids. Proximate composition showed a high percentage of carbohydrates content of 64.84±0.01 and a lower moisture content of 3.25±0.01. It could be concluded *Jatropha curcus* leaves can be a source of energy, antinutritional, and treating antimicrobial infectious.
Keywords: Jatropha Curcas, Phytochemical, Proximate, Tannin

1. Introduction

Jatropha curcas Lam. is a tropical fruit belonging to the family Euphorbiaceae. It is a remarkable plant with medical and industrial applications (Gogoi *et al.,* 2015). It is a seed-bearing plant, and the seed kernel contains 40-60% (w/w) oil (Gogoi *et al.,* 2015). Its cultivation has a long history in tropical America, Africa, and Asia and offers a variety of benefits, mainly as a potential source of biofuel (Fairless, 2007). Despite the fact that a sizeable section of the world's population largely relies on medicinal plants as their primary source of healthcare, there hasn't been enough research to identify and assess the bioactive chemicals contained in various medicinal plants. It is vital to keep discovering these phytochemicals in order to support and validate their purported therapeutic effects.

For the bulk of the rural population in Nigeria and other parts of Africa, medicinal plants are the main source of medicines for treating a variety of ailments in primary healthcare (Ekundayo and Ekekwe, 2013). According to the World Health Organisation (WHO, 2011) approximately 70-95% of the population in developing countries rely on medicinal plants as their primary source of healthcare. The majority of plants grown in rural residential areas contain these biologically active substances, which have been demonstrated over many generations to be effective treatments for particular ailments (Mark, 2002; Eldahshan and Abdel-Daim, 2015).

Unfortunately, only a small number of these plants have been studied and are known to have therapeutic value. It is interesting to note that each medicinal plant species has its own unique phytochemicals and nutritional composition that makes it effective and pharmacologically important for the various functions they perform (Adamu, 2008). As plants are the main source of novel pharmaceuticals and healthcare products, the prevention and treatment of diseases using locally accessible and available medicinal plants will continue to play a significant role in the

implementation of medical healthcare in developing nations (Ivanova *et al.*, 2005).

Jatropha curcas can be used for the healthcare management of plants, animals, and human beings, besides biofuel and healthcare management. It is also useful to control soil erosion and improve alter filtration to reclaim wasteland phytoremediation of various contaminated soils, livestock barriers, and land demarcation or live fences around agricultural fields, fuelwood, and support for vanilla, green manure, soil carbon sequestration, and sustainable environmental development. Other economic products obtained from various parts of *J.curcas* are glycerol, soap, cosmetics, varnish, dye, molluscicide, pesticide, fertilizer, and synthesis of silver Nanoparticles (Warra, 2012).

Jatropha curcas leaves have been widely used (sometimes) indiscriminately as remedies for various diseases and ailments. Synthetic drugs have been proven to have adverse effects on human health, become increasingly expensive, and are also relatively out of reach. Therefore natural products are gaining attention as an alternative to health care, especially those derived from plants (Helal *et al*., 2015). The main aim of this research is to determine the phytochemical and proximate analysis of *Jatropha curcas* Lam dried leaves.

2. Materials And Methods

2.1 Sample Collection and Processing

Fresh leaves of *Jatropha curcas* (*Euphorbiaceae)* were collected from a Low-cost area, in Sokoto State in July 2021. The leaves were identified, and authenticated at the Herbarium, with the ID No: (UDUSH/ANS/0694), Department of Botany at Usmanu Danfodiyo University, Sokoto State, Nigeria. The leaves were rinsed with tap water, air-dried at room temperature for two weeks, and pulverized into powder using mortar and pestle.

2.1.1 Preparation of Ethanolic and Methanolic Extract

Forty grams (40g) of the powdered leaves were weighed and dissolved in four hundred milliliters (400ml) of ethanol in a beaker and allowed to stand for 48 hrs. This was then heated in a water bath (60°C) and filtered. Hot water was continuously added to a residue and subsequently filtered. The procedure was repeated three times and the filtrate then evaporated to dryness in a water bath (60^{o}C) (Lar *et al.*, 2011). The same procedure was repeated for the methanol extract.

2.1.2 Phytochemical Analysis of Ethanolic and Methanolic Extract of Jatropha curcas leaves

The phytochemical screening of the leaf extracts was carried out to detect the presence or absence of phytocompounds such as Flavonoids, Tannins, Alkaloids, Saponins, and phenols as described by Sofowora (1994).

2.2 Proximate Analysis

The proximate composition of the *Jatropha curcas* leaves was determined as described by the Association of Official Analytical Chemists (AOAC, 2010). All determinations were carried out in triplicate

2.2.1 Determination of Moisture Content

Two grams (2g) of the powdered sample were weighed in a beaker of known weight. The sample was then placed in a hot air oven at 105°C for 3 h. The sample was then cooled and weighed again to determine water loss in the powdered sample which was calculated using equation 1.

$$\textbf{Moisture \%} = \frac{(W1 - W2)}{W0} \; x \; 100 \qquad \text{------1}$$

Where: W_0=Weight of empty crucible
W_1=weight of sample and crucible before heating
W_2=weight of sample and crucible after heating

2.2.2 Determination of Crude Lipid

The apparatus used for the estimation of fat is the Soxhlet extractor. To determine the percentage of fat the dried sample of the plant was extracted with petroleum ether. It was then distilled off completely and dried. The oil weight and percentage of oil were calculated.

$$\textbf{Crude Lipid \%} = \frac{W_2 - W_3}{W_2 - W_1} \, x \, 100 \quad \text{--------2}$$

Where: W_1=Initial weight of the empty crucible
W_2=weight of sample and crucible before heating
W_3=weight of sample and crucible after heating

2.2.3 Determination of Crude Fiber

During the acid and subsequent alkali treatment, oxidative hydrolytic degradation of native cellulose and considerable degradation of lignin occurs. The residue obtained after final filtration was been weighed, incinerated, cooled, and weighed again. The loss in weight is the crude fiber content.

$$\textbf{Crude fiber \%} = \frac{(W1 - W2)}{W0} \, x \, 100 \quad \text{----3}$$

W_0=Initial weight of the empty crucible
W_1=weight of the mixture before heating
W_2=weight of the mixed sample after heating

2.2.4 Determination of Ash Content

For the estimation of ash, the sample was incinerated at a higher temperature. Briefly, 2g of sample in a crucible were incinerated in the Muffle furnace at 600˚C for 5 hours. The crucible was then cooled, the sample was reweighed and the percentage of ash was calculated.

$$\textbf{Ash \%} = \frac{(W3 - W1)}{(W2 - W1)} \times 100 \text{ ---4}$$

Where: W_1= weight of the empty crucible
W_2= weight of crucible + sample
W_3= weight of crucible + ash

2.2.5 Determination of Carbohydrate

The carbohydrate content was determined as Nitrogen Free Extract (NFE) using this formula.

CHO = 100 – (% CP + % CF + % CFa + % Ash + % moisture) ----------5

Where CP- Crude Protein, CFa-Crude Fat, CF-Crude Fibre

2.3 Statistical Analysis

All the work experiments were conducted in triplicates. All data obtained is expressed as mean and standard deviation.

3. Results and Discussion

The qualitative phytochemical analysis result of *Jatropha curcas* dried leaves on methanolic and ethanolic solvents are presented in Table 1. It indicates the presence of different phytochemicals such as (Saponins, Alkaloids, Tannins, Flavonoids, and Phenolics) which are all positive on both methanolic and ethanolic extracts, while Cardiac glycoside is negative in methanol but positive in ethanolic extract and Steroids is negative on both the extracts. They are secondary metabolites responsible bioactivity of the plant. The presence of Saponins in the plants revealed it has beneficial effects on blood cholesterol levels, bone health, cancer, and the stimulation of the immune system (Adeolu

and Enesi, 2013). Alkaloids have been acclaimed for their antimicrobial activities, especially against gram-negative bacteria (Cushine *et al.*, 2014). The presence of phenolic compounds in the *Jatropha curcas* revealed that it might have an antimicrobial agent, which is effective in the treatment of typhoid fever and other bacterial infections (Ofokansi *et al.*, 2005). This study is in agreement with Ofolabi *et al.*, (2017) and Evanjelena and Velu (2021) who stated the phytochemical compound from *Jatropha curcas* leaves.

Table 1: Qualitative Phytochemical Analysis of the *Jatropha curcas* dried leaves on methanolic and ethanolic extracts.

Tests	Methanolic	Ethanolic
Saponins	+	+
Alkaloids	+	+
Tannins	+	+
Cardiac glycosides	-	+
Flavonoids	+	+
Steriods	-	-
Phenolics	+	+

Key: + = Present, - = Absent.

The result of the proximate analysis of *Jatropha curcas* dried leaves is shown in table 2 which includes Moisture content, Ash content, Crude lipid, Crude fibre, Protein, and Carbohydrate content. Where Carbohydrate has the highest percentage of (68.4±0.01) and Crude lipid has the least percentage of (2.35±0.01) respectively. High carbohydrate content can be a good source of energy for humans and animals. This finding conforms with Bello *et al* ., (2019) who also reported the concentration of carbohydrate 61.94± 5.56%. The moisture content in this study revealed a low percentage of 3.25±0.01%, it might be due to *Jatropha curcas* leaves having been dried which reduces the water activity at their metabolic processes and decreased microbial spoilage deterioration and long shelf life. The moisture content of the sample was lower than those reported 89.70% by Afolabi *et al.*,(2017) from fresh *Jatropha curcas* leaves. But the value obtained is comparable with Bello *et al.*, (2019). The crude fibre revealed in this study was been stated to support bowel regularity, help maintain blood sugar levels, reduce constipation, and prevention of heart disease (Wasagu *et al* ., 2013). This finding is in agreement with Evanjelene and Velu (2021) who reported 10.24% of *Jatropha curcas* aqueous extract.

Table 2: Result of the Proximate Analysis of *Jatropha curcas* leaves

Parameters	Percentages (%)
Moisture content	3.25 ± 0.01
Ash	12.33 ± 0.02
Crude lipid	2.35 ± 0.01
Crude Fibre	11.36 ± 0.01
Protein	5.87 ± 0.02
Carbohydrate	64.84 ± 0.01

Key: %= percentage of constituents

Conclusion

This research study, *Jatropha curcas lam* dried leaves indicate a high percentage of carbohydrates, fibre, ash, and lower moisture, and the presence of phytochemical compounds which serve as a source of energy and antimicrobial agents. Further research should be conducted on antimicrobial activity, liver test, thin-layer chromatography, and also detect the toxicity of *Jatropha curcas*.

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