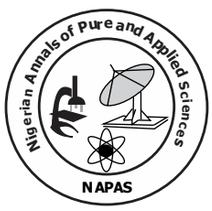

Phytochemical Screening, Antimicrobial Activities and Nutritional content of *Jatropha Tanjorensis* Leaves

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Abstract

The leaves of *Jatropha tanjarensis* were collected and assessed for their phytochemical compositions and antimicrobial activities using methanolic and hexane extracts as to determine the bioactive components and their effects on microorganisms. Also, the nutritional potential was investigated through the determination of proximate composition using standard procedures. The result of phytochemical screening indicated the presence of saponins, cardiac glycosides, reducing sugars, steroids, alkaloids and flavonoids in methanolic extract, the same observation was recorded in n-hexane extract except that reducing sugars were absent and phlobotannins were present. The antimicrobial activities of the leaves extract show that it have some antimicrobial properties. Results of the proximate composition and mineral analysis revealed that the plant is a good source of fiber and minerals. Therefore, leaves of *Jatropha tanjarensis*apart from being used as antimicrobial agents, can serve as good sources of fiber and minerals when used as vegetables.

Keywords: Phytochemicals, Screening, Nutrition, Antimicrobial, *Jatropha*.

Introduction

Plants have been found to provide bioactive substances whose modified derivatives are used in the treatment of many ailments with reduced toxicity. Studies have shown that many of the modern drugs have been produced from plants, for example, Vedavathy (2003), reported that aspirin was produced from *Filipendul aulmaria.* The decoction of the back of this plant was prescribed by herbalists for treatment of pain and inflammations, while Quinine used for the treatment of malaria was obtained from *Cinchona pubescens.* The decoction of the leaves was used for the treatment of fever (Norman, 1966). Literature has also shown that over 400 traditional plants or plant derived products have been used for the management of type 2 diabetes across the world. For example, Manisha *et al*, (2007), reported that Galegine, a chemical substance from which metformin, an efficient oral glucose-lowering agent was produced, was obtained from the herb *Galega officinalis*. Bassam (2012), stated that the use of medicinal plants in the treatment of diseases is considered to be very safe because it has little or minimal side effects and their remedies are in sync with nature and do not depend on age or sex.

Apart from the medicinal value, plants are known to contain nutrients that are highly needed by the body but cannot be produced by the body. These nutrients are found to be higher or in most cases comparable to conventional food products. Tapan (2012), observed that most wildplants are generally known to serve as indispensable constituents of human diet supplying the body with minerals, vitamins and certain hormone precursors, in addition to protein, energy and fibre through their leaves, fruits, seeds, tubers and shoots.

Considering the importance of plants and plant products in both nutrition and medicine, the exploration of the vast numbers of unconventional plant resources that exist in the wild cannot be over emphasised. Many of such plants if identified and their chemical composition known, will solve both some of the persistent ailments confronting man now and also solve the problem of food security.

Jatropha tanjorensis belongs to the family *Euphorbiaceae* and is commonly called 'hospital is too far' or 'Catholic vegetable' (Akhigbe *et al*., 2009). In Nigeria, the leaves of the plant are locally consumed as vegetables. The leaves are good sources of protein, vitamins and minerals. According to Olayiwola *et. al.* (2004), the leaves extract of the plant is used for the treatment of diabetes by most communities in Southern Nigeria. The leaves of the plant are also used in the treatment of anaemia (Ehimwenma and Osagie, 2007). Abiodun *et al.* (2013) reported that *Jatropha tanjorensis* is known to show hematological, anti-malarial, antimicrobial, hypoglycemic, hypolipidemic and antihypertensive activities. It is in the light of the above that the present study considers the analysis of the phytochemical, nutritional content and antimicrobial activities of *Jatropha tanjorensis* leaves.

Materials and Methods

Sample Collection and Preparation

The leaves of *Jatropha tanjorensis* were obtained from HUDCO quarters, North Bank Makurdi and were taken to a botanist in the Department of Biological Sciences Benue State University, Makurdi for identification. The leaves were thereafter dried at room temperature for three weeks. The dried leaves were pulverized using clean mortar and pestle and stored in a polythene bag for analysis.

Phytochemical Screening

The ground (150 g) leaf sample was extracted successively with 300 mL each of methanol and n- hexane which are solvents of varying polarity for 14 h under constant agitation. The extracts were evaporated to dryness in vacuo and stored in the 4 degrees refrigerator until used (Mahesha *et. al*., 2015). The extracts were tested for the presence of saponins, tannins, glycosides, reducing sugars, steroids, phlobatanins, alkaloids, anthraquinones and flavonoids using standard qualitative methods as reported by Amos-Tautua*et al.* (2011), Altemimi *et al*. (2017) andPatrick *et al*. (2011).

Antimicrobial Activity

Preparation of culture medium

Exactly 8.4 g of the nutrient agar was weighed and dissolved in 250 mL of distilled water. The mixture was sterilized in an autoclave at 121 ^{o}C for 15 minutes. The mixture was removed from the autoclave and allowed to cool

to 45 ^{o}C, after which it was poured into a petri dish and allowed to gel. The bacteria already cultured were dissolved in 0.9% normal saline solution as the diluent and gentamycin as the positive control.

Preparation of extracts

The diffusion method was adopted; About 1 g of the extract of was weighed and dissolved in 100 mL of distilled water to give the full strength. Exactly 1mL of the solution was pipetted and dissolved in 10 mL of distilled water, 5 mL of the diluents was pipetted and dissolved in 5 mL of distilled water to give the second dilution. 1 g of the extract was weighed and dissolved in 100 mL of distilled water to give the full strength solution. The procedure was repeated for all the numbers of samples.

Determination of Zone of Inhibition

The extract was prepared in the ratio1:10 which is equivalent to 100 mg/mL and 1:5 equivalent to 500 mg/mL. Holes were dug in the nutrient agar medium and 0.2 mL of the 1:10 dilution was dispersed into the nutrient agar medium making a concentration of 20 mg per hole and 0.2 mL of the 1:5 dilution was also dispersed into the hole of the nutrient agar medium making a concentration of 10 mg per hole. Before inoculation, the four different microorganisms *Escherichia coli, Staphylococcus aureus, Klebsiella pneumonia and Candida albicans* were smeared separately using swap sticks on different petri dishes. Each extract was then introduced and the petri dishes were incubated for 24 hours. The dishes were removed and the zone of inhibition was measured for each organism. The extract was then tested for antimicrobial activities of various micro-organisms like *Candida albecans, Klebsiella pneumonia, Eschericia Coli, staphylococcus aereus, S. lutea and M. Pheliand*the result recorded

Determination of Nutritional Content of *Jatrophatanjorensis*

Proximate composition of the ground sample was assessed by determining the moisture, ash, crude lipid, crude fibre, crude protein and carbohydrate contents using standard methods

Determination of Mineral Content

The following essential metals: magnesium, zinc, iron, calcium, potassium, and manganese, copper were determined after wet digestion of each sample with a 1:1 mixture of nitric and perchloric acids (Shaibur*et al*., 2010), using Atomic Absorption Spectrophotometer (AAS) model PG 990.

Results and Discussion

Phytochemical screening of the leaf extract of the plant (Table 1) indicated the presence of saponins, cardiac glycosides, reducing sugars, steroids, alkaloids and flavonoids using methanol as solvent, the same observation was recorded using n-hexane as solvent except that reducing sugar was absent and phlobotannins were present. According to Wadood *et al.,* (2013), phlobatannins are anti-inflammatory, analgesic and antioxidant agents known to have the ability to heal wounds. Tannins, cyanogenetic glycosides and anthraquinones were not detected in both solvent extracts.

The presence of the bioactive substances could be responsible for the therapeutic nature of the plant. Studies have shown that flavonoids are water soluble polyphenolic molecules with antioxidant activity which prevent cardiovascular and heart related ailments (Pier-Giorgio, 2000). Apart from their anti-fungal and anti-bacterial properties, they are known to prevent the oxidation of low-density lipoproteins and reduce the risk of atherosclerosis hence flavonoids are capable of lowering cholesterol and triglyceride levels in the blood.

Saponins are also found to lower blood cholesterol levels, while cardiac glycosides are known diuretics and heart tonics which help in the prevention of heart failure (Sunil, 2013).The absence of tannins is an indication that the intake of the extract has no effect on inhibition of minerals in the body.

Table 1: Preliminary Phytochemical Examination of n-Hexane and Methanol Leaf Extract of *Jatrophatanjorensis*

Test	Class of compound	Results	
		Methanol	**N- hexane**
Froth	Saponins	+	+
Ferric Chloride	Tannins	-	-
Lieberman-Burchard's Reaction	Cardiac glycoside	+	+
Fehling's Solution	Reducing sugar	+	-
Sodium picrate	Cyanogenetic glycoside	-	-
Salkowski	Steroids	+	+
Dragendorff' Reagent	Alkaloids	+	+
Lead acetate	Flavonoids	+	+
Borntrager's Reagent	Anthraquinone	-	-
1% HCl	Phlobatannins	-	+

Table 2: Antimicrobial screening of the Leaf extract of *Jatrophatanjorensis*

Organism	Average Zone of inhibition					
	Methanol	Standard	Control	Hexane	Standard	Control
Staphylococcus aureus	10	25	00	15	23	00
Escherichia coli	12	29	00	13	24	00
Candida albicans	11	27	00	10	26	00
Klebsiellapneumoniae	12	28	00	14	22	00

Table 3: Proximate composition of *Jatrophatanjorensis* Leaves

Macronutrient	**Composition (%)**
Moisture	80.59
Ash	5.06
Crude fibre	7.15
Crude lipid	0.89
Crude protein	4.79
Crude Carbohydrate	1.52

Table 4: Mineral content of *Jatrophatanjorensis*leaves

Parameters	**Concentration (mg/Kg)**
Calcium	98.10 ± 0.01
Magnesium	05.85 ± 0.01
Potassium	13.73 ± 0.02
Iron	35.34 ± 0.04
Zinc	13.83 ± 0.01
Manganese	06.83 ± 0.03
Copper	00.76 ± 0.01

The results also indicate that the leaves extract is free from hydrogen cyanide, hence cyanogenetic glycosides were absent. The result compared favourably with that reported by Oluwole *et al* (2011) for the same plant.

The antimicrobial activities of the leaves extract (Table 2) of both solvents indicate some degree of inhibition on the growth of the microorganisms. This implies that the leaf extracts have antimicrobial properties on all the microorganisms investigated.

The proximate composition of sample (Table 3) indicates the moisture and ash contents of the sample to be 80.59% and 5.06% respectively. The crude fibre content of the leaf sample was 7.15%. Generally, vegetables with high water and adequate dietary fibre contents provide low energy density to meals and create a feeling of satiation.

The food materials with high fibre content are beneficial to the body because fibre aids absorption of cholesterol and it possesses anti-anaemic properties. The crude lipid content of the sample was found to be 0.89%, while protein was 4.78%. Egbon*et al* (2013), reported the protein content of the leaves to be very low,

however it remains a staple vegetable among many rural dwellers. The carbohydrate content of the sample was found to be high (52%).

The mineral content of the leaves (Table 4) was found to be 98.10 mg/Kg of calcium. Calcium is necessary for the coagulation of blood and proper functioning of the heart, nervous system and normal contraction of muscles. Its most important function is to aid in the formation of bones and teeth. This result is relatively higher than ~~that~~ that reported by Egbon*et al* (2013). The difference could be linked to environmental factors. Potassium concentration of the leaves was 13.73 mg/Kg. Potassium helps in normal digestion and muscular functioning of the body. The level of magnesium in the sample was observed to be 5.85 mg/Kg. Magnesium and calcium help in the development of strong bones and teeth. Iron was observed to be 35.34 mg/Kg. Iron helps in the production of red blood cells which are essential for the formation of haemoglobin. Zinc was found to be 13.83 mg/Kg. Zinc is important for nerve function and male fertility. It aids the development of testes and ovaries, it stimulates the activity of some vitamins, formation of red and white blood corpuscles, healthy functioning of the heart and normal growth. The levels of manganese and copper in the leaves were found to be 6.68 mg/Kg and 0.78 mg/Kg respectively. Manganese helps in the proper functioning of pituitary gland, pineal gland and the brain. It promotes hepato-renal function, combats anaemia and also essential for growth while copper is needed for the transport of iron and the maintenance of red blood cell membranes.

Conclusion

The result of the study revealed that the leaves of *Jatropha tanjorensis* contained some phytochemical constituents which may be responsible for its medicinal properties. Proximate composition of the leaves indicate that it is a good source of fibre.

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