Science Forum (Journal of Pure and Applied Sciences)

Journal Homepage: https://atbuscienceforum.com.ng/index.php/jpas

Phytochemical Analysis and Proximate Composition of *Jatropha tagorensis* Plant

M.Y. Yahaya*[1], Z. B. Abdullahi[1], Isah[2], A.

[1]Samaru College of Agriculture, Division of Agricultural Colleges, Ahmadu Bello University, Zaria

[2]Department of Agricultural Biotechnology, National Biotechnology Development Agency, Airport Road, Abuja Nigeria

Abstract

Consumption of a diet rich in vegetables significantly enhances overall wellbeing by reducing the risk of various chronic conditions, including cardiovascular diseases, hypertension, hypercholesterolemia, osteoporosis, several types of cancer, chronic obstructive pulmonary disease, respiratory disorders, and mental health issues. The protective effects of vegetables are often attributed to their phytochemical content, which may contribute to anti-inflammatory properties beneficial in managing cardiovascular diseases. However, the precise mechanisms of action of these phytochemicals remain difficult to fully elucidate. Anaemia remains a serious health concern across all age groups—children, adolescents, and adults alike. Jatropha tagorensis, commonly referred to in Northern Nigeria as "Get well soon" or "Kafi likita," is traditionally used for its antianaemic and antioxidant properties. This study investigated the phytochemical composition and proximate nutrient content of fresh J. tagorensis leaves sourced from farms on the outskirts of Zaria, Kaduna State, Nigeria. Qualitative phytochemical screening was performed using established methods to detect the presence of key bioactive compounds: tannins (Van-Burden and Robinson, 1981), saponins (Obadoni and Ochuko, 2001), flavonoids (Boham and Kocipai-Abyazan, 1994), alkaloids (Harborne, 1973), phenols (Trease and Evans, 1985), and phlobatannins (Sofowora, 1993). The percentage composition obtained was: tannins (0.53%), saponins (0.80%), flavonoids (3.32%), alkaloids (0.67%), phenols (0.31%), and phlobatannins (1.43%). Proximate analysis, conducted using the Association of Official Analytical Chemists (AOAC, 2000) methods, revealed the following composition: dry matter (89.01%), moisture content (5.44%), crude protein (17.75%), lipid (5.36%), crude fibre (5.32%), ash (14.49%), and carbohydrate (51.64%).

Keywords
J. tagorensis, Phytochemicals, Proximate analysis, Antianaemic, Antioxidants.

Corresponding Author: M.Y. Yahaya, Samaru College of Agriculture, Division of Agricultural Colleges, Ahmadu Bello University, Zaria
Email: mardiyyahyakubu@yahoo.com

INTRODUCTION

Consumption of diet rich in vegetables enhances an individual's wellbeing by lowering the chances of certain chronic ailments such as cardiovascular diseases, blood pressure, hypercholesterolemia, osteoporosis, many cancers, chronic obstructive pulmonary diseases, respiratory problems as well as mental health (Pem and Jeewon, 2015). Most of the diseases associated with oxidative stress are due to presence of high levels of free radicals in the body. This has triggered several researches toward finding natural antioxidants in plants. Nature has made it possible for plants to possess free radical scavenging molecules, such as vitamins, terpenoids, phenolic acids, lignins, tannins, flavonoids, quinones, alkaloids, and other metabolites, which are rich in antioxidant activity (Cai *et al*,2003). Studies have shown that most of these compounds possess anti-inflammatory, antiatherosclerotic, antitumor, antimutagenic, anticarcinogenic, antibacterial, and antiviral activities (Sala *et al.*, 2002; Rice *et al.*, 1995).

Intake of natural antioxidants has been associated with lowered risks of diabetes, cancer, cardiovascular disease and other age-related diseases (Ashokkumar *et al.*, 2008; Veerapur *et al.*, 2009), fortunately, science and traditional medicine has paved way towards the use of natural phytochemical present in berry crops, teas, herbs, oilseeds, beans, fruits and vegetables (Kitts *et al.*, 2000; Muselík *et al.*, 2007; Wang and Jiao, 2000). Vegetables are the fresh and edible portions of herbaceous plants, which can be eaten either raw or cooked (Dhellot *et al.*, 2006). Just like in other African countries, vegetables are the cheapest and most readily available in Nigeria, despite the fact that her societies are buried in the consumption of highly starchy staple foods. To topple it up, these vegetables are sources of important proteins, vitamins, minerals and essential amino acids (Thompson and Kelly, 1990).

Though the presence of some phytochemicals may be among the principal reasons for their anti-inflammatory properties (Deanna, 2019) in the treatment of cardiovascular diseases, knowing their precise mechanism of action is very difficult to ascertain (Carlsen, *et al.*, 2010).

Jatropha tagorensis is a perennial vine, growing to 15m or more in length. The stems are thick and have branches with much leaves. *J. tagorensis* is popularly called the 'get well soon' in English or 'kafi likita' by the Hausas and is now gradually cultivated in many farms and homes. *J. tagorensis* leaf are now often used as vegetable in the preparation of soups due to its nutritious and medicinal properties. The consumption of the *J. tagorensis* as a leafy vegetable in the diet is been promoted as a result of the various medicinal properties it possesses such as antianeamic, antioxidant, antimicrobial activities and as a purgative leafy vegetable (Oboh *et al.*, 2006).

Scientific findings reporting the evaluation and functional properties of various types of edible wild plants used in developing countries are now coming up due to their availability in our surroundings (Ekop, 2007). Yet, little is known regarding the edible vegetables (chemical composition) that are grown in Nigeria, thus, much needs to be done. The objective of this study was to carry out the

analyses of *J. tagorensis* for its proximate and phytochemical compositions.

MATERIALS AND METHODS

Collection and Extraction

Fresh leaves of *J. tagorensis* were cultivated from a farm in the outskirts of Zaria town, Kaduna State and identified by the herbarium in Ahmadu Bello University, Zaria. The leaves were thoroughly rinsed and air-dried at room temperature (24℃) before they were pulverized into fine powdered form. Samples were weighed and stored aqueous extracts of the plants were prepared by soaking 1kg of the dry powdered plant materials in 5 liters of double distilled water and then kept at room temperature for 48 hours (for thorough extraction). At the end of the 48 hours, the extracts were filtered first through a Whatmann filter paper No. 42 (125mm) and then through cotton wool. The filtrate was concentrated using a rotary evaporator with the water bath set at 40℃to one-tenth its original volume and then finally with freeze drier. The dried residue (crude extract) was then stored at 4°C.

Qualitative Analysis of Phytochemicals

Phytochemical screening was performed using standard procedures of Sofowora (1993), Trease and Evans (1985) and Ayoola *et al.* (2008).

Determination of Alkaloids

The determination of Alkaoid content was done according to method described by (Harborne 1973). A 5g sample was weighed into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol added. The beaker was covered and allowed to stand for 4 hours. It was then filtered and the extract concentrated on a water-bath to one-quarter of the original volume. Concentrated ammonium hydroxide was added dropwise to the extract until the precipitation was complete. The whole solution was allowed to settle after which and the precipitate was collected and washed with dilute ammonium hydroxide (2M) and then filtered. The residue (if available) is the alkaloid which is then dried and weighed.

Determination of Tannin

The concentration of tannin was determined according to methods described by Van-burden and Robinson (1981). The sample (5g) was weighed into a 50 ml conical flask after which 50 ml of distilled water was added and shaken for 1 hour in a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the mark. Then 5 ml of the filtrate was pipette out into a test tube and mixed with 2 ml of 0.1M $FeCl_3$ in 0.1N HCl and 0.008M potassium ferrocyanide. The absorbance was measured at 395 nm within 10 minutes.

Determination of Saponin

The determination of Saponin content was done according to methods described by Obadoni and Ochuko (2001). Measurement of 20g powdered sample was done after which 100 ml of 20% aqueous ethanol was added in a conical flask. The mixture was then heated over a hot water bath for 4 hours with continuous stirring at about 55℃ and the residues collected was then reextracted with another 200 ml of 20% ethanol. The extract was reduced to 40 ml over water bath at about 90℃. The concentrate was transferred into a 250 ml separatory funnel and 20 ml of diethyl ether added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process

was repeated with the addition of 60 ml n–butanol. The n–butanol extracts was washed twice with 10 ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation, the sample was dried in the oven to a constant weight. Saponin content was calculated as percentage.

Determination of Flavonoids

The samples (10g) were extracted repeatedly with 100 ml of 80% aqueous methanol at room temperature according to methods described by Boham and Kocipai-abyazan (1994). The entire solution was filtered through Whatman filter paper No 42 (125mm). The filtrate was transferred into a crucible and evaporated to dryness over a water bath and weighed to constant weight.

Determination of Total Phenols by Spectrophotometric Method

Fat free sample was boiled with 50 ml of diethyl ether for the extraction of the phenolic component for 15 minutes. The extract (5ml) was pipetted into a 50 ml flask, followed by the addition of 10 ml of distilled water. A volume of 2 ml ammonium hydroxide solution and 5 ml concentrated amyl alcohol was also added. The samples were made up to mark and the colour developed was measured after 30 minutes at 505nm at room temperature.

Proximate Analysis

Dried and powdered plant samples were used to perform proximate analysis. Crude fat, crude protein, ash and crude fibre were assayed using the standard methods of the Association of Official Analytical Chemists (AOAC, 2000). Carbohydrate content was estimated based on the difference between the total percentage composition and the other factors (nutrients).

RESULTS

The phytochemical analysis of the *J. tagorensis* revealed the presence of flavonoids, alkaloids, tannins, saponins, phenolics and phylobatannins with percentages reading as 3.32%, 0.67%, 0.53%, 0.80%), 0.31% and 1.43% respectively. Results on proximate analysis showed 89.01% dry matter, 5.44% moisture content, 17.75% crude protein, 5.36% lipid, 5.32% crude fiber, 14.49% ash content, and 51.64 % carbohydrate.

Table 1: Phytoconstituents of *Jatropha tagorensis* aqueous leaf extract

Phytochemical	Reaction
Saponins	+
Tannin	+
Flavonoid	+
Phenol	+
Phylobatannins	+
Alkaloid	+
Glycosides	-
Steroids	-

Key: (+) means present and (–) means absent

Table 2: Percentages of reacting phytochemicals in *Jatropha tagorensis*

Plant	%Saponin	%Tannin	%Flavonoid	%Phenol	%Phylobatannin	%Alkaloid
J. tagorensis	0.80	0.53	3.32	0.31	1.43	0.67

Mean of triplicate determinations

Table 3: Proximate composition (per 100g dry matter) of *Jatropha tagorensis* leaves

Content	Composition (%)
Ash	14.49
Crude protein	17.75
Crude fibre	5.36
Dry matter	89.01
Moisture	5.44
Lipid	5.32
Carbohydrate	51.64

DISCUSSION

Phytochemical analysis conducted on *J. tagorensis* leaves revealed the presence of flavonoids, alkaloids, tannins, saponins and phenol and phylobatannins. These compounds are reported to support bioactive activities in medicinal plants, thus making it responsible for the antioxidant activities of this plant. Tannins are useful in the treatment of inflammations and equally reported to have remarkable role in cancer prevention (Ruch *et al.*, 1989; Motar *et al.*, 1985). Thus, it can be said that plants containing tannins may serve as a potential source of bioactive compound in cancer prevention and treatment.

Flavonoids just like tannins possess anti-inflammatory, antitumor, anti-viral, antiplatelet properties (Pourmorad *et al*, 2006)). Okwu, (2004) reported that flavonoids, which contain hydroxyl groups are responsible for the radical scavenging effects of most plants. The mechanisms of action of flavonoids are through scavenging or chelating process (Pourmorad *et al.*, 2006; Omale and Okafor, 2008).

Alkaloids serve to benefit plants as repellants to predators and some parasites endowing an antimicrobial activity to this phytochemical. Some alkaloids are useful against HIV infection as well as intestinal infection associated with AIDS (McDevitt *et al.*, 1998). Saponins are known bioactive substances that can reduce the uptake of cholesterol and glucose in the gut through intra-lumenal physiochemical interaction (Price *et al.*, 1987).

The presence of these phenolic compounds in this plant contributes to their antioxidative properties and thus the usefulness of these plants in herbal medicament. Phenols have been found to be useful in the preparation of some antimicrobial compounds. Phenols also act as

free radical chain reaction terminators thereby acting as antioxidant (Shahidi and Wanasundra, 1992). Phenols also have a potential of combating oxidative stress syndrome, causative of some neurodegenerative diseases and cardiovascular diseases. These properties bestow high medicinal activities on *J. tagorensis*. The nutrient composition revealed that *J. tagorensis leaves* contained protein, fiber, ash, fats/oil as well as carbohydrate as shown in table 3 above.

CONCLUSION

The result of these findings revealed that *J. tagorensis* leaves are good source of carbohydrates. Furthermore, the plant leaves may strongly be recommended for the anti-inflammatory treatment of chronic diseases due to their rich antioxidant content.

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