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Short Communication

Proximate, Phytochemicals and Phyto Quantitative Analysis of *Ocimum gratissimum*

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Abstract

Medicinal plants are essential for human health and are a significant aspect of traditional medicine in many developing countries. Among these plants, Ocimum gratissimum Linn. is notable for its multifaceted applications in treating various infections and culinary uses. This study aims to explore the nutritional composition and phytochemical properties of Ocimum gratissimum leaves collected from Gusau, Nigeria. Proximate analysis showed that Ocimum gratissimum is rich in crude protein (26.52%), carbohydrates (21.73%), and crude lipids (16.25%), making it a valuable dietary supplement. Furthermore, the plant exhibited moderate levels of crude fiber (15.06%), ash content (12.98%), and moisture (7.46%), suggesting potential health benefits such as improved digestion and mineral supplementation. Phytochemical screening revealed the presence of several bioactive compounds, including flavonoids, tannins, saponins, alkaloids, and glycosides. These compounds contribute to the therapeutic properties of the plant, such as antioxidant, antimicrobial, and anti-inflammatory effects. The abundance of flavonoids and alkaloids highlights the medicinal potential of Ocimum gratissimum. Quantitative phytochemical analysis revealed significant levels of flavonoids (0.28%) and alkaloids (0.29%) in Ocimum gratissimum. These findings support the plant's pharmacological significance and its potential as a natural source of antioxidants for therapeutic applications. The plant possesses noteworthy nutritional and phytochemical attributes, making it a promising candidate for both culinary use and medicinal purposes. The diverse bioactive compounds of this substance suggest potential health benefits, highlighting the need for further research to fully understand its therapeutic potential.

Keywords: *Ocimum gratissimum*, proximate, phytochemical, analysis, quantitative.

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Introduction

Medicinal plants are crucial for human health. The World Health Organization estimates that 80% of the population in developing countries rely on traditional medicine for primary healthcare (Pant, 2014). Therefore, medicinal plants have played a significant role in the socio-cultural and therapeutic needs of people. Some of these plants serve as spices and food (Hussein *et al*., 2011) and also act as natural sources for the research and development of new drugs (Pant, 2008).

Ocimum gratissimum Linn. is a well-known plant that is widely used in the treatment of various infections in Africa and other parts of the world (Pavithra, 2019). Ethnobotanical surveys have shown its effectiveness in treating these ailments. In India, it is used to cure stomach ache, diarrhea, and skin The leaves of this plant are used for both religious ceremonies and medicinal purposes, as they have laxative properties and can be consumed as tea (Talabi and Makanjuola, 2017; Clove, 2018). Essential oils derived from the plant are also used in medicine to treat ailments such as headaches, flu, fever, sore throat, ears, or eyes. Additionally, the seeds of the plant are prescribed as a laxative and to treat gonorrhea (Essoung *et al*., 2020). It is worth noting that the plant can withstand drying for years, but growth is completely suppressed when the water activity falls below 0.94 (Essoung *et al*., 2020).

Ocimum gratissimum has both medicinal and culinary uses. In Nigeria, the leaves are commonly used as a condiment in dishes such as 'pepper soup', 'jollof rice', and vegetable soups to enhance their flavour. The perceived nutraceutical benefits of using these leaves in cooking have led to their increased acceptance.

This study aims to explore the nutritional composition and phytochemical properties of *Ocimum gratissimum* leaves collected from Gusau, Nigeria.

Materials and Methods

The leaves of *Ocimum gratissimum* were collected from Gusau Local Government Area of Zamfara State, Nigeria. The samples were identified and authenticated at the Herbarium and Ethno Botany Unit of Biological Sciences Department Federal University, Gusau. The leaves were separated from the stems, air dried for weeks and crushed into fine powder.

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Proximate analysis

Proximate analysis was assayed as described in Association of Official Analytical Chemists (AOAC, 1990). The leaf powder was analysed for crude protein, crude fat, crude fibre, ash, and moisture, and carbohydrate was calculated by difference.

Qualitative Phytochemical screening:

Methanol (50ml) was used to extract 5g of each powdered sample for 48hours. After 48hours the supernatant obtained was used to make the crude extract by the process of evaporation. The preliminary phytochemical analysis was used to analyze the presence of compounds namely Alkaloids, Flavonoids, Saponins, Tannins, Phenols, Cardiac glycosides, Terpenoids and Quinones.

Test for flavonoids

To 3ml of the extract, 1ml of 10%NaOH was added, the development of yellow color indicates the possible presence of flavonoids

Test for Tannins

To 2ml extract, 2ml of 5% ferric chloride solution was added. Formation of colored products is noted. Condense Tannins usually gives a dark green color while hydrolysable tannins give blue-black color.

Determination of alkaloids

Wagner's reagent were added in few drops to 2ml of methanol and ethanol extracts, the reddish-brown precipitate showed the presence of alkaloids.

Determination of flavonoids:

The yellow color was observed when 20% of NaoH was added in few drops to 2ml of each extract. To this, 70% dilute HCl was added in few drops and the yellow color disappeared. The flavonoids presence was determined by the formation and disappearance of yellow color.

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Test for Glycosides

Extract (2ml) was dissolved in 2ml chloroform solution, 2ml of sulfuric acid was gently poured to form a lower layer. A reddish-brown color at the interface indicates the presence of glycoside.

Test for Cardiac glycoside

Exactly 5ml of plant extract was shaken with 10ml benzene solution followed by 5ml of 10% ammonia solution. The mixture was shaken and the formation of pink, red or violet color in the ammoniacal phase indicates the presence of cardiac glycoside.

Quantitative Phytochemical Analysis

Flavonoids Determination

Five grams (5g) of sample was hydrolyzed by boiling in 100ml of hydrochloric acid solution for 30 minutes. The hydrolysate was filtered to recover the filtrate. The filtrate was treated with ethyl acetate drop wise until excess. The precipitated flavonoids were recovered by filtration using a weighed filter paper after drying in an ovum at 100 ^{o}C for 30 minutes, it was then cool and reweight. The difference in the weighed gave the weighed flavonoids which was expressed as the percentage of the weighed of the sample analysed.

$$\% \text{ Flavonoid} = \frac{W2-W1\times100}{W3} \qquad 1$$

Where W1 = weight of empty filer paper

W2 = weight of filer paper + flavonoids precipitate

W3 = weight of sample.

Determination of Glycoside

Exactly 0.1g of powdered sample was put in a 100ml volumetric flask and 10ml of 100% methanol was added then the mixture was allowed to stand for one hour after which it was filtered using Whatman's filter paper number one in a 100ml beaker. Then three test

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tubes were arranged and leveled as test, standard and blank. 1ml of methanolic extract was added into the first test tube, 1ml of standard reagent was added into the standard test tube and 1ml of distilled water was added into the blank test tube. 2ml of 0.5% $FeCl_3$ was added into all the three test tubes 22 respectively, 2ml of 4N H_2SO_4 was also added into all the test tubes and 0.5ml of potassium hexacyanoferrate was added in each test tubes respectively. The solution was mixed and boiled for 20 minutes at 60°C and then cooled. The absorbance of both the sample and standard was measured spectrophotometrically at 780nm. The concentration of steroids was calculated using the formula.

$$\% \text{ Glycoside} = \frac{W2-W1\times100}{W3} \qquad 2$$

Alkaloids Determination

Exactly 5g of powdered sample were weighed into a 250ml beaker and 200ml of 20% acetic acid in ethanol was added and covered to stand for four hours. This was filtered and the extract was concentrated using water bath to one quarter of the original volume. Concentrated ammonia solution was added drop wise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitate was collected by filtration using weighed filter paper.

$$\% \text{ Alkaloids} = \frac{W2-W1\times100}{W3} \qquad 3$$

Where W1 is weight of filter paper,

W2 weight of filter paper + sample and

W3 as weight of the sample.

Determination of Tannins

Powdered sample (100mg) was put into 100ml conical flask, 50ml of distilled water were added and boil for 30 minutes, in a boiling water and filter using filter paper. Then three test tubes were arranged and labeled as test, standard and blank. 10ml of the extract was added into test tube labelled as test, 10ml of standard tannic acid solution was added into standard test tube and 10ml 23 of distilled water was also added into the blank test tube. 10ml of 17% sodium carbonate was added into all the test tubes, 2.5ml of follin dennis

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reagent was added into all the three test tubes respectively. The solution was mixed to make the volume of 50ml of distilled water and incubated for 20 minutes at room temperature and recorded the absorbance at 760nm

$$\text{Tannins (mg)} = \text{Absorbance of sample} \times \frac{Conc.of\ Standard}{\text{Absorbance of standard}} \quad 4$$

Determination of Saponins

Exactly 50g of sample was placed in a 50ml flask containing 300ml of 50% alcohol. The mixture was boiled under reflux for 30 minutes and was immediately filtered through a coarse filter paper. 2g of charcoal was added; the control was boiled and filtered while hot. The extract was cooled. Some saponins may be collected by decantation and dissolved in the heat amount of boiling 95% alcohol and filtered while hot to remove any insoluble matter. The filtrate was allowed to cool at room temperature resulting in the precipitation of saponins which was collected by decantation and suspended in about 20ml of alcohol and filtered. The filter paper was immediately transferred to a desiccator containing anhydrous calcium chloride and the saponins was left to dry and weighed.

$$\%\ \text{Saponins} = \frac{W2-W1\times 100}{W3} \quad 5$$

Where W1 = weight of empty filer paper

W2 = weight of filer paper + flavonoids precipitate

W3 = weight of sample.

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Results and Discussion

Table 1: Proximate composition of *Ocimum gratissimum*

Parameters	% **Composition**
Crude protein (%)	26.52 ± 0.011
Carbohydrate (%)	21.73 ± 0.002
Crude lipid (%)	16.25 ± 0.011
Crude fibre (%)	15.06 ± 0.001
Ash Content (%)	12.98 ± 0.001
Moisture (%)	7.46 ± 0.002

Table 2: Phytochemical screening of *Ocimum gratissimum*

Phytochemicals	Indicator
Flavonoids	+
Tannins	+
Saponins	+
Steroid	-
Terpenoids	-
Anthraquinones	-
Alkaloids	+
Phenol	-
Glycosides	+
Cardiac glycosides	-

Key: + = present, - = absent

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Table 3: Phyto quantitative analysis of *Ocimum gratissimum* leaf

Phyto quantitative	Concentration
Phytate	0.13±0.0014
Oxalate	0.11±0.0014
Tannin (mg)	0.012±0.0014
Saponin (%)	0.23±0.0021
Alkaloid (%)	0.29±0.0021
Flavonoid (%)	0.28±0.0017
Phenol	0.030±0.0021
Glycoside (%)	0.11±0.00

Nutrient compositions, Phytochemicals and Phyto quantitative analysis of *Ocimum gratissimum* have been investigated. The result of proximate analysis showed that crude protein has the highest (26.52 ± 0.011) percent nutrient analysed in *Ocimum gratissimum*. This value is higher than 10.71±0.25 and 10.83±0.80 of crude protein obtained from *Ficus polita* and Ipomoea aquatic forsk leaves (Musah and Itodo, 2010; Umar, 2007). Proteins act as enzymes, hormones, and antibodies. Protein is responsible for the formation of bones, teeth, hair and the outer layer of skin and they help maintain the structure of blood vessels and other tissues. *Ocimum gratissimum* also contained appreciable amount of carbohydrate. High quantity of carbohydrate in a sample serves as a major energy source in the diet of animals. Crude lipid is among the highest (16.25 ± 0.011) nutrient content detected in the plant. Crude lipid in a sample enhances its energy giving value, as fat is broken down in the body by oxidation process with the release of high amount of energy. *Ocimum gratissimum,* contained moderate amount of crude fibre (15.06 ± 0.001) having appreciable amount of crude fibre in a sample improves protection against constipation and it also have an effect on heart diseases. Studies have shown that intake of fiber can reduce serum cholesterol level, hypertension, diabetes, breast cancer and constipation (Ramula and Rao, 2003). Thus, the leaves of *Ocimum gratissimum* (15.06 ± 0.001%) could be valuable source of dietary fiber. The ash content of *Ocimum gratissimum* (12.98 ± 0.001%) has indicated that the plant is a good source of mineral element since the ash

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content of a plant material is an index of total mineral content. The moisture content of *Ocimum gratissimum* was found to be (7.46 ± 0.002) which is lower when compared to 11.20% for *Oryza sativa* leaves (Akiniyi and Waziri, 2011). It was reported that high moisture content of a sample implies its poor storage quality because sample with moisture content more than 15% encourages microbial attacks especially during storage.

The phytochemical analysis indicates the presence of tannins, flavonoid, saponin, alkaloid and glycoside in the samples analysed. Phytochemicals are valuable sources of food and medicine for the prevention of illness and maintenance of human health (Aliyu *et al.,* 2008). Phytochemicals are either the product of plant metabolism or synthesized for defense purposes. They may be useful or toxic to human body. Tannins are stringent bitter plant polyphenols that bind, precipitate and shrink proteins and various organic compounds (Mgbemena and Amako, 2020). Tannins are used as antiseptic and this activity is due to presence of the phenolic group. Tannin rich medicinal plants are used as healing agents in a number of diseases. Similarly, presence of alkaloids in plants is good because they serve as defensive molecules in plants against herbivores and pathogens, and are widely exploited as pharmaceuticals, stimulants, narcotics, and poisons due to their potent biological activities. In nature, the alkaloids exist in large proportions in the seeds and roots of plants and often in combination with vegetable acids. Other important alkaloids of plant origin include the addictive stimulants caffeine, nicotine, codeine, atropine, morphine, ergotamine, cocaine, nicotine and ephedrine. Amino acids act as precursors for biosynthesis of alkaloids with ornithine and lysine commonly used as starting materials. Saponins were also present in *Ocimum gratissimum* and this signifies its antibiotic properties because Okwu and Emenike, (2006) showed that saponins serves as a defensive mechanism against microbial attacks in plants. Phytochemical analysis revealed the presence of flavonoids in *Ocimum gratissimum.* Occurrence of flavonoids in plants signifies it's important in protection against allergies, inflammation, platelets aggregation and microbial infections (Okwu and Omodimiro, 2005).

Conclusion

The analysis of nutrient compositions of *Ocimum gratissimum* showed that the plant contained appreciable amounts of crude protein, fibre and lipids as well as ash content which could be considered as potential source of spice. This would provide both flavoring and medicinal benefits when consumed. Moreover, analysis of phytochemicals has shown that *Ocimum gratissimum* is rich in phytochemicals compounds such as flavonoids, saponins, tannins, alkaloids which are known as biologically active ingredients that have antioxidant activity. A concentration of phytochemicals found in

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Ocimum gratissimum indicates a greater advantage in the treatment of various diseases. The phytochemicals present in Ocimum *gratissimum* have been shown higher antioxidant activity. Therefore, it can be concluded that phytochemical components in *Ocimum gratissimum* are the rich sources of antioxidants which have a more beneficial role in the pharmacology.

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