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QUALITATIVE AND QUANTITATIVE PHYTOCHEMICAL EVALUATION AND MINERAL CONTENTS OF THE LEAF OF *ANNONA MURICATA*

Nwaehujor Idorenyin Ugochi*, Lawal Israel Oluwasanmi, Akande Samuel Adesayo

Biochemistry/Chemistry Department, Nigerian Stored Products Research Institute, Ilorin, Kwara State, Nigeria

Correspondence
Nwaehujor Idorenyin Ugochi
Nigerian Stored Products Research Institute, P.M.B. 1489, Ilorin, Kwara State, Nigeria
✉ idorenyinugochi@gmail.com

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ABSTRACT

In recent years, interest has increased in the utilization of therapeutic plants since herbal remedies have been publicized to be safe and without adverse side reaction as synthetic drugs. The goal of this research was to perform qualitative and quantitative phytochemical evaluation and also to examine the mineral contents of *Annona muricata* leaf collected in Ilorin, Kwara State, Nigeria. *Annona muricata* leaf was dried at room temperature. Cold extraction method was employed to obtained crude extracts with solvents of varying polarities. Hexane, ethyl acetate and ethanol were utilized. Mineral determination was carried out using Atomic Absorption Spectroscopy. Phytochemicals from the leaf extracts were; saponins, phenols, tannins, glycosides, steroids, terpenoids and alkaloids. All the samples showed high content of alkaloids and saponins. Mineral evaluation of the leaf showed that Calcium had highest concentration in the leaf, (6.7 mg/g) while Iron, Manganese, Copper and Zinc were also detected. *Annona muricata* leaf contain important phytochemicals, as such, the leaf is a potential source of new bioactive compounds. Due to the high concentration of Calcium in the leaf, the leaf can serve as herbal supplement for patient with high blood pressure.

INTRODUCTION

Medicinal plants contain phytochemicals which are used for the remedy of different diseases. Phytochemicals are divided into primary and secondary metabolites. [1] From previous reports, it is evidence that secondary metabolites play essential function in the health of man. In most cases, crude extracts from medicinal plants are more biologically potent than isolated compounds because of their interdependent effects. [2] In recent times, herbal medicine have become well known in the remedy of many diseases because they are believed to be safe, easily available and with less side effects. [3] Trace elements are very vital to human health. [4]

Annona muricata belongs to the family annonaceae, it is called sour soup because the fruit of the plant has a characteristic sour taste and flavor. [5] *Annona muricata* is indigenous to tropical South and North America, it is now well spread all over the world. Parts of the tree have been used locally in the tropics including the bark, leaves, root, fruits and seeds for the remedy of diseases such as hypertension, fever and wounds. [6] Ethno botanical survey of plants revealed that *Annona muricta* leaf is used by Agboville people in Cote-d'Ivoire as diabetes remedy. [7] It has been revealed that the nature and composition of a plant depends on its geographical location. [8] This research was therefore to carry out phytochemical studies and mineral contents investigation of *Annona muricata* leaf collected in Ilorin, Kwara State, Nigeria.

MATERIALS AND METHODS

Extraction of the leaf of *Annona muricata*

Fresh leaves of *Annona muricata* were harvested from a farm in Ilorin, Kwara State, Nigeria. The sample was registered at the Herbarium of Plant Biology Department, University of Ilorin, and Ilorin, Nigeria (UIH001/1106). The leaves were dried at ambient temperature, blended using a mill and extracted by cold extraction method. 2.5 Kg of the blended leaf was extracted with n-hexane for three days. The n-hexane crude extract solution was decanted, filtered and the solvent was evaporated at a reduced pressure to obtain 52 g; 2.08 % which was preserved in the refrigerator for more analyses. The same process was repeated using ethyl acetate with the leftover plant material. Ethyl acetate extract weighed 110 g; 4.4 %. It was stored in refrigerator for more analyses. The leftover plant material was again soaked in ethanol for three days. The resulting ethanol crude extract which weighed 66 g (2.4 %) was preserved in the refrigerator until further

analyses. The crude extracts; n-hexane, ethyl acetate and ethanol were dark green oils.

Qualitative phytochemical screening

The Phytochemicals considered were; alkaloids, steroids, phenolic compounds, flavonoids, saponins, tannins, glycosides and terpenoids. They were analyzed using established techniques. [9]

Quantitative phytochemical screening

Phytochemicals in the extracts of *Annona muricata* leaf were quantified following the procedures described by Vijay & Rajendra. [10]

Mineral analysis of the leaf of *Annona muricata*

One gram (1g) of A*nnona. muricata* leaf was weighed into a crucible and heated at 600 ^{0}C for three hours in a muffle furnace. The ash was dissolved in 5 mL of 10% hydrochloric acid and then filtered. It was then transferred into a 100 mL volumetric flask and the volume was adjusted to 100 mL with distilled water. The solution was analyzed for minerals of interest using Buck Scientific ACCUSYS 211 Atomic Absorption Spectrophotometer (AAS) at the University of Ilorin Research Laboratory. The minerals that were analyzed for were; Ca, Fe, Cr, Mn, Ni, Cu, Zn and Pb.

RESULTS AND DISCUSSION

Results of phytochemical screening

The qualitative phytochemical investigation of *Annona muricata* leaf extracts showed the presence of saponins, phenols, tannins, glycosides, steroids, terpenoids, and alkaloids. The results are reported in Table 1. Alkaloids have significant pharmacological functions such as; antimalarial, anticancer, analgesic, and anti-hyperglycemic and antibacterial functions. [11] Terpenoids have antioxidant activity and Steroids are used to remedy inflammatory conditions. Glycosides have antimicrobial and anticancer activities. Saponins have been evidenced to possess anticoagulant, anti-carcinogenic, hypoglycemic, immunomodulator, neuroprotective, anti-inflammatory and antioxidant potentials. [12] The availability of these constituents in the leaf of *Annona muricata* gives credence for its traditional use in the remedy of diseases. Table 2 shows the quantity of the phytochemicals present in each of the samples. All the extracts showed high contents of alkaloids and saponins. The quantitative phytochemical evaluation indicated very low flavonoid content, this explains why it was not detected in the qualitative analysis. Pathak *et al*., [13] reported that saponins, phenols and alkaloids were not detected in the methanol and aqueous

extracts of the leaf, this might be due to the geographical location of the plant. Aku and Okolie [14] reported the present of flavonoids in methanol extract of the leaf and this is different from our findings.

Table 1: Qualitative phytochemical content of *Annona muricata* leaf extracts

Phytochemicals	Hexane extract	Ethyl acetate extract	Ethanol extract
Saponins	+	+	+
Phenols	-	-	+
Tannins	-	-	+
Glycosides	+	+	+
Steroids	+	+	+
Terpenoids	+	+	+
Alkaloid	+	+	+
Flavonoids	-	-	-

+ Indicate present, - Indicate Not present

Table 2: Quantitative phytochemical content of *Annona muricata* leaf extracts

Phytochemicals	Hexane Extract	Ethyl acetate Extract	Ethanol Extract
Tannins (mg/g)	0.50	0.86	3.41
Phenols (mg/g)	0.32	1.64	20.85
Flavonoids (mg/g)	0.18	0.46	0.24
Glycosides (mg/g)	45.62	64.15	86.57
Alkaloids (mg/g)	278.72	303.66	294.70
Saponins (mg/g)	290.09	367.60	396.63

Results of mineral contents evaluation of the leaf of *Annona muricata*

The results of the mineral contents analysis revealed that Ca had the highest concentration in the leaf (6.7 mg/g), this is consistence with the reports of Onuah *et al*. [15] and Usunobun and Okolie. [16] The presence and quantity of the different minerals in plants is attributed to the composition of the soil. It also depends on how selective the plant is, in retaining these micronutrients. [17] The presence and variations in concentration of these minerals are therefore attributed to the type of plant and its surroundings.

Some minerals play important roles in biological functions of plants and animals. Minerals are mostly responsible for medicinal and toxic properties in plants. Calcium performs a significant function in the uptake of dietary Vitamin B and activation of lipase. It also functions in the building of neurotransmitter acetylcholine. Calcium supplements lowers blood pressure. [18] Olaniyi *l*. [19] reported that Calcium helps in the production and conservation of bone mass. Iron is the main component of hemoglobin and many enzymes that play significant function in the oxygenation of red blood cells. It is needed to improve the Immune system and for energy production, its deficiency results in anemia. Chromium is a micronutrient required for glucose metabolism. Its function in regulating insulin contributes to normalize blood sugar levels. Excess Chromium in the body can lead to stomach problem and low blood sugar

(hypoglycemia). Manganese is a part of pyruvate carboxylase and superoxide dismutase. It helps in the metabolism of protein. [20]

Nickel and Lead are toxic to the body. They are non-essential minerals to the human body. The availability of these micronutrients in plant could be attributed to pollution from industrial activities. Copper is a vital catalyst for iron absorption. Deficiency of Copper may cause osteoporosis and anemia. Zinc is a major component of many enzymes. It plays a significant function in alcohol dehydrogenase, ribonucleic polymerases, alkaline phosphatase and carbonic anhydrase. Deficiency of Zinc in pregnant woman may cause problem in the growth of the offspring. Zinc deficiency can also cause coronary disease. [21]

Table 3: Mineral contents of *Annona muricata* leaf

Minerals	Conc. (mg/g)
Ca	6.7
Fe	0.1
Cr	ND
Mn	0.06
Ni	ND
Cu	0.02
Zn	0.05
Pb	ND

ND = Not detected

CONCLUSION

The phytochemical contents and concentration of minerals showed that the leaf of Annona muricata is a promising source of important phytochemicals and minerals which could enhance health and prevent diseases. The outcome of this study is important in understanding the pharmacological functions of the plant.

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