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Phytochemical and Nutritional Evaluation of Aqueous and Ethyl Acetate Leaf Extracts of *Alchornea Cordifolia*

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ABSTRACT

Background: *Alchornea cordifolia* is a strangling shrub or small evergreen plant used by traditional healers to treat different ailments.

Materials and Methods: The evaluation of phytochemical and nutritional contents of aqueous and ethylacetate leaf extracts of *Alchornea cordifolia* were performed using standard methods.

Results: The results of the phytochemical analysis revealed that both extracts of the plant contained verse amounts of the phytochemiacls in the order of alkaloids> tannins> flavonoids> saponins> phenols>cyanogenic glycosides while the proximate compositions were in the order of moisture> carbohydrates> protein> ash> lipids> crude fibre. Vitamins A, B1, B2, B3, B6, C, E and K were found present in comparable proportions while minerals Ca, K, Fe, Mg, Mn, Cu, Na, Se and Zn were found in the extracts in varying degrees.

Conclusions: The prosperous chemical compositions of *A. cordifolia* leaf extracts might justify its use in the prevention and treatment of diverse ailments.

Keywords: *Alchornea cordifolia*, phytochemicals, proximates, vitamins, minerals and diseases

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Introduction

Medicinal plants are plants that have been used in human disease treatment for ages because they contain compounds that possess therapeutic values. The increased material worth of medical treatment and their strong physiological or chemical effects, contribute to the reason why individuals make use of herbal therapy [1]. The high cost of pharmaceutical and nutritional products has neccesitated this study. Nigeria is one of the countries in Africa endured with vast arry of plants that have been locally used in treament/control and prevention of diversity of affinities but a good number of these plants have not been chemically characterized as to avail the researchers the apple opportunity to exploy them fully. Thus, *Alchornea cordifolia is among the plant.*

Alchornea cordifolia is a plant that belongs to the family of Euphorbiaceae and the common names of the plant are Christmas bush and Dovewood. In Nigeria, this plant is given diverse names by dissimilar tribe. Thus, it is called"ububo", in Igbo ''ipaesinyin", in Yoruba and "banbani'' in Hausa [2]. The plant is a strangling shrub or small evergreen plant that can grow up to 32 feet tall in swampy locations. It is propagated through seeds or stem - cuttings and grows well in very moist soil. The leaves and stems are the part mostly used therapeutically in countless countries in Africa as remedies for veneral diseases, treatment of acute and chronic inflammatory disorders, cancer, ulcers, canker sores, to prevent miscarriage and cure various reproductive diseases [3]. The stem bark is tinctured with local gin for its aphrodisiac effects [4]. It is also used as a local remedy for cold, rheumatism, arthritis and muscle pains [5]. Similarly, it is used as an antidote for poison, as a sedative and antispasmodic [6]. The parts mostly used according to local users for tradomedicine are the leaves and stem bark.

Despite the wide use of *Alchornea cordifolia* by rural dwellers in fight against diseases, there is paucity of information on the phytochemical and nutritional contents of the plant and it is on this premise that the study was carried out. Also, due to high cost of health care services in Nigeria of This paper therefore dealt with evaluation of the phytochemical, proximate, vitamin and mineral contents of aqueous and ethyl acetate leaf extracts of *Alchornea cordifolia* grown in Abakaliki, Nigeria.

MATERIALS AND METHODS

Collection of Plant Materials

Alchornea cordifolia leaves were collected from NdiaguOgba in Ohaukwu Local Government Area of Ebonyi State. The leave was identified and authenticated by a plant Taxonomist in the Department Applied Biology of Enugu state University of Science and Technology, Enugu (ESUT).

METHODS

Extraction of Leaves of *Alchornea cordifolia*

The fresh leaves were washed and dried under ambient temperature before they were ground into fine powder using manual grinder and stored in an air tight container.

Preparation of deionized water and Ethylacetate Extracts

The homogenized sample (250 g) was soaked in 500 ml of deionised water and Ethylacetate for 48 hours. The solutions were filtered using a muslin cloth. The filtrates were evaporated to dryness using a rotary evaporator and stored in air-tight container.

Quantitative Phytochemical, Proximate and mineral analysis of Extracts: The phytochemical, proximate and mineral contents of *A. cordifolia* were carried out according to the method described by AOAC [7].

Vitamin Analysis: Estimation of the vitamins was performed according to the method described by Pearson [8].

Statistical Analysis

The data was analyzed by ANOVA and results expressed as means and standard deviation.

RESULTS

Results show in Figures 1-4

DISCUSSIONS

Higher conents of alkaloids, tanninis and flavonoids than saponnins, phenol and cyanogenic glycosides were observed in both extracts (figure 1). In general, all the analyzed phytochemicals were found to be more in the aqueous extract

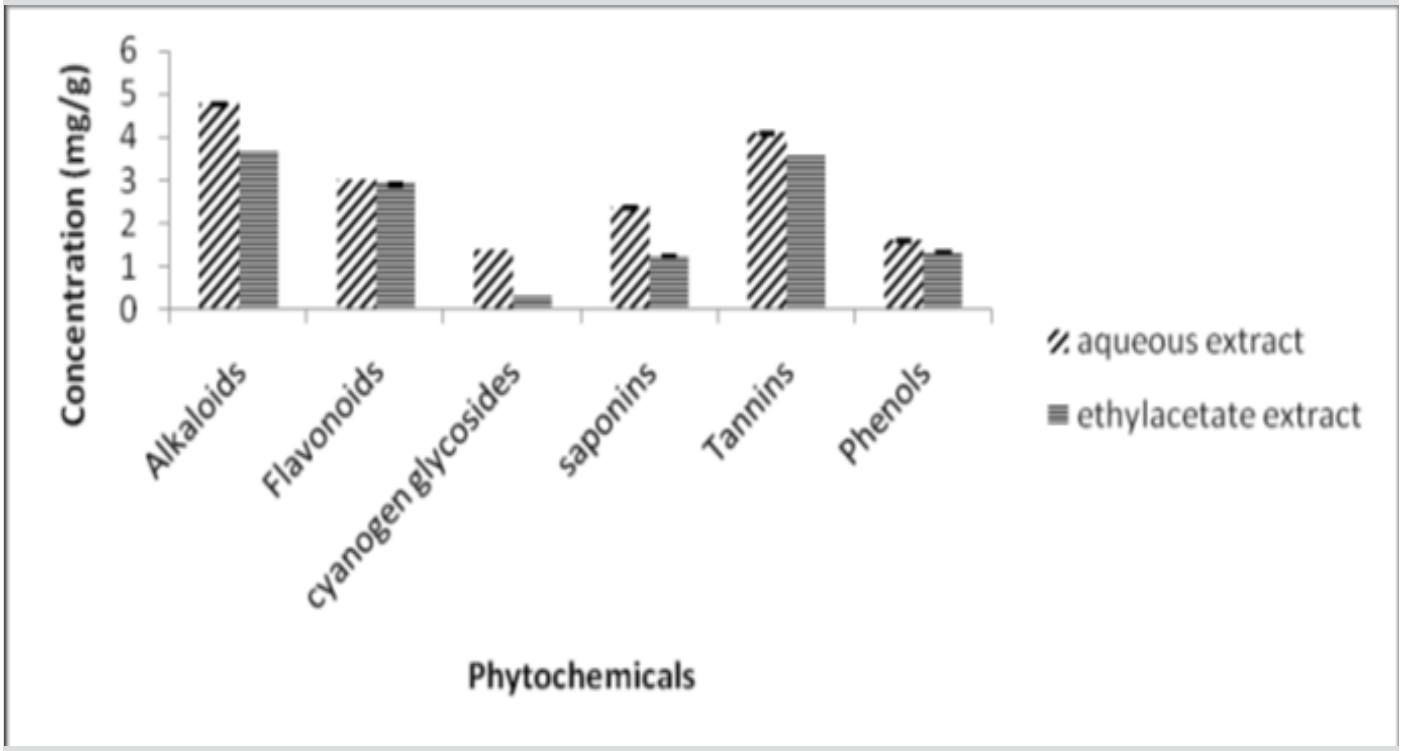

Figure 1: Phytochemical Constituents of Aqueous and Ethylacetate Leaf Extracts.

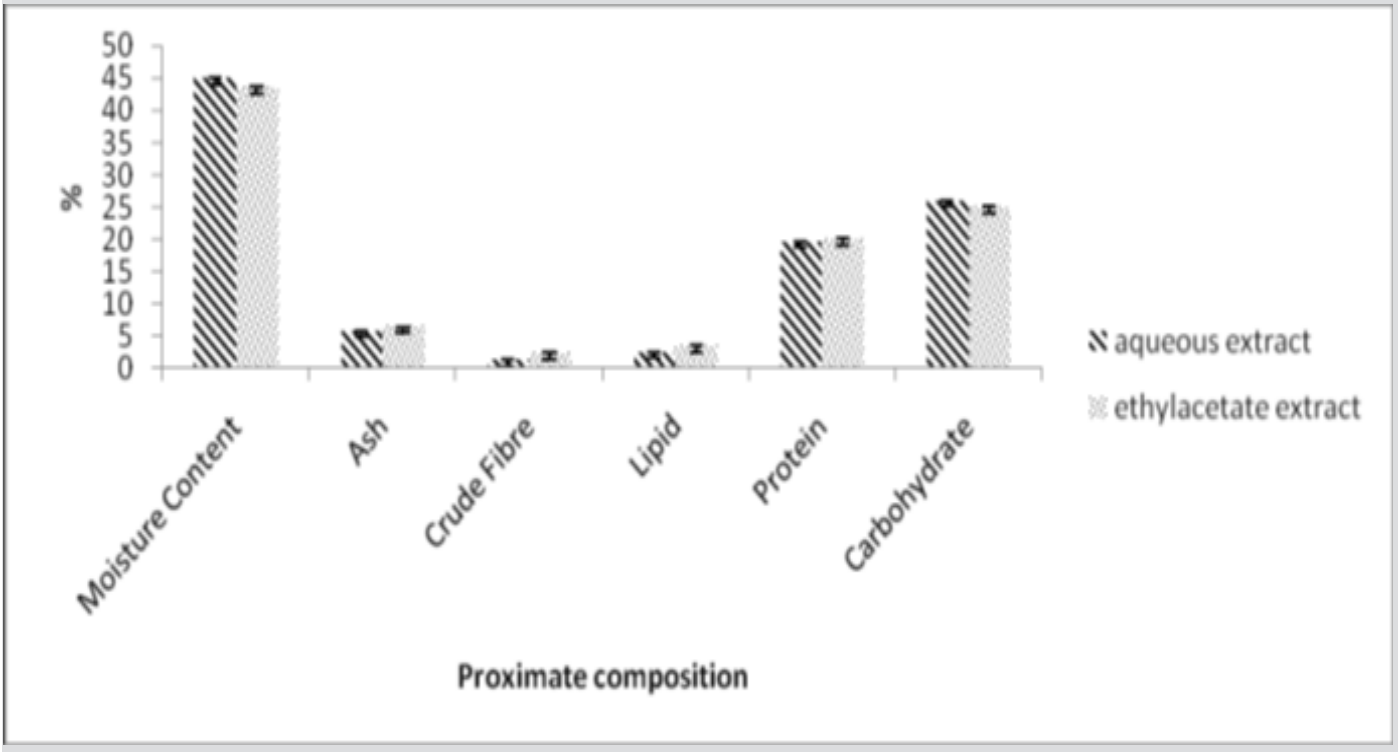

Figure 2: Proximate Composition (%) of Aqueous and Ethylacetate Leaf Extracts.

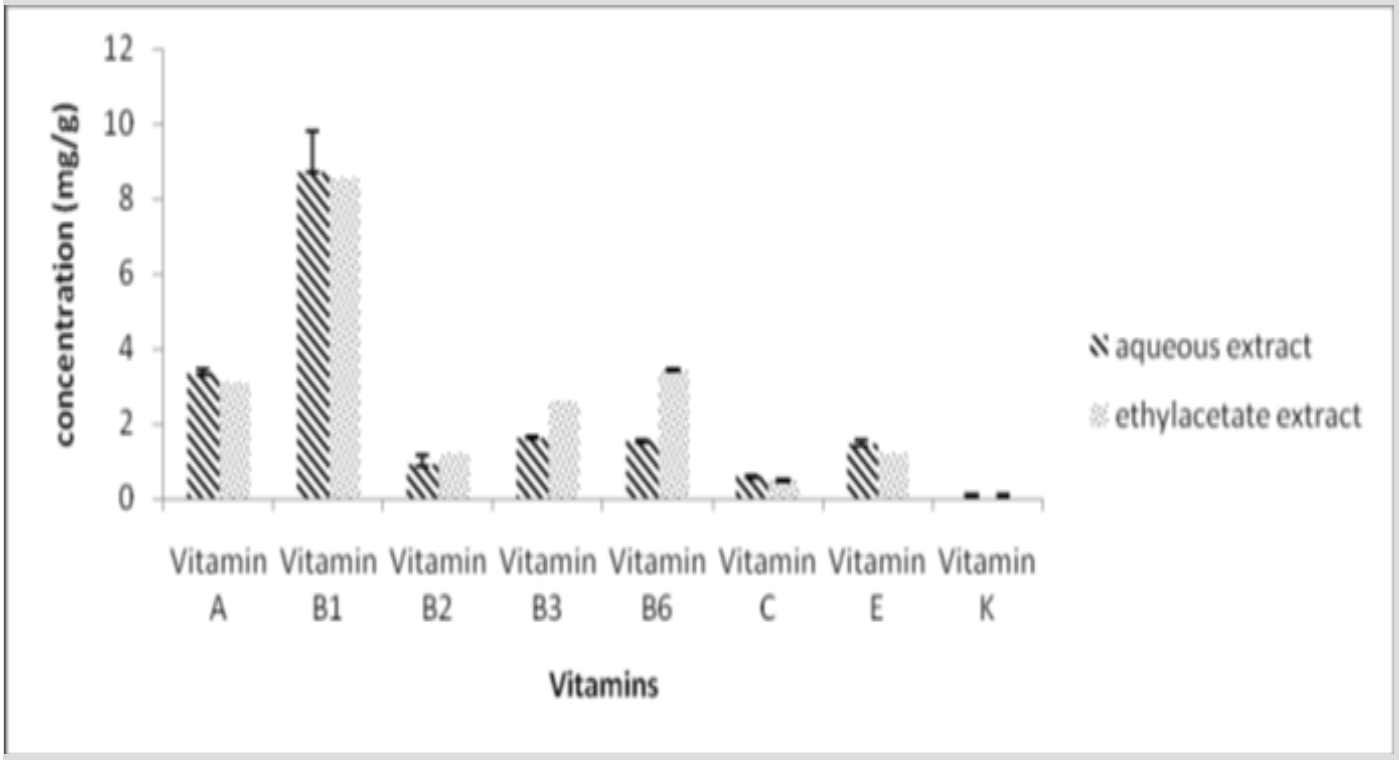

Figure 3: Various Vitamins present in Aqueous and Ethylacetate Leaf Extracts.

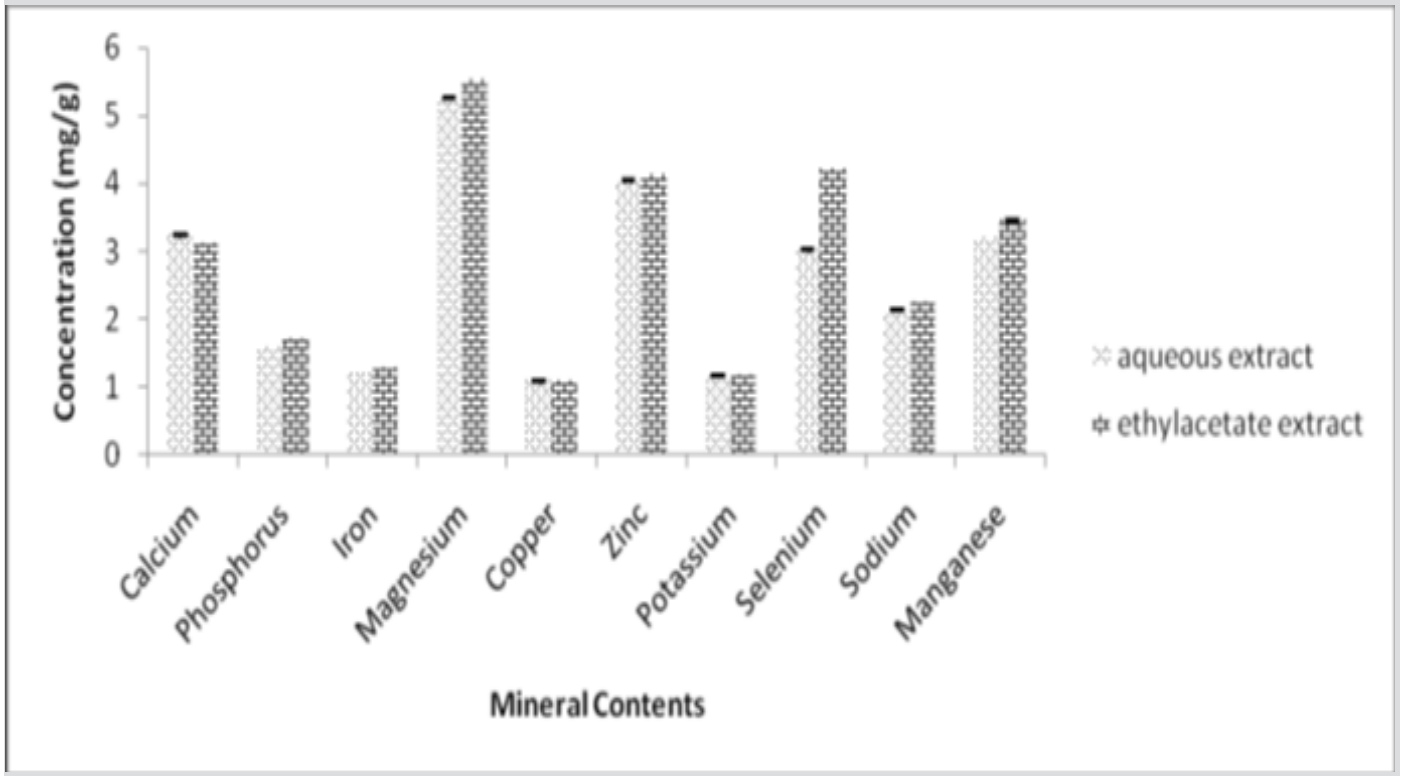

Figure 4: Mineral Constituents of Aqueous and Ethylacetate Leaf Extracts.

compared to ethyl acetate extract as shown in figure 1. The phytochemical composition of the leaf extracts of *A*. *cordifolia* is similar to those observed in the methanol fraction as reported by Amos-tautau *et al*. [3].

Alkaloids are the most effecient therapeutically significant plant compound. Thus, they are used as basic medicinal agent due to their analgasic, antiplasmodic and bacterial potentials [9]. Moreover, they are benefical chemicals to plant with predator and parasit repelling effects [10]. Althogh, they inhibit certain mammalian enzymatic activities. Also, they affect glucagon and thyroid stimulating hormones while some have been reported to be carcinogenic [11]. Fortunately, the level of the alkoloids found in the extracts is not high enough to cause toxic effects and their presences in plant are usually non-toxic as preprocessing strategy reduces their levels in plant extracts.

Tannin is another important phytochemical contained in the aqueous and the ethyl acetate extracts of *A*. *cordifolia.* The aqueous extarct contains higher tannin than the ethyl acetate extracts. Tannins are organic substances of diverse composition with pronounced astringent properties that promote the healing of wounds and inflamed mucous membranes [10]. Tannins are anti-nutrient which reduce the uptake of blood glucose by binding with calcium which is needed to stabilize amylase activity. They can equally bind with starch to influence its degree of gelatinization or its accessibility to the digestive enzymes. Tannins can suppress hyperglycemia by inhibiting glucose transport across the intestine through inhibiting sodium-glucose co-transporter-1 [9].

The flavonoid content was found to be high in both extracts but in comparable amounts. Flavonoids are known to possess antioxidant property, protect against allergies, inflammation, microbes, ulcer, viruses and tumor [12]. This may account for the use of the stem bark of *A*. *cordifolia* to stop the inflammation of broken limbs, and cure infections. They are also known to prevent oxidative cell damage, have strong anti-cancer activity and inhibit all stages of carcinogenesis [12]. This supported the use of *A*. *cordifolia* leaf and stem by the natives for the treatment of diseases such as cancer [3].

Both the extracts of *A*. *cordifolia* were found to contain saponin but higher in aqueous extract. Plants that contain saponin are known to produce foams in aqueous solution, and this may be the reason the ash from the burnt bark is used in soap making. Saponins are known to make the bronchial secretion more liquid, reduce the congestion of the bronchi and ease coughing. This also may be the reason the plant is used in herbal medicine for the treatment of tuberculosis. The saponin content of the leaf of *A*. *cordifolia* justifies the use of the extract from this plant to stop bleeding and in treating wounds. Furthermore, Saponins have beneficial properties like anti-inflammatory activity, spasmolytic, antimicrobial activities and hypocholesterolemic activity in the body [13]. According to the reports of Uraku *et al [*9] non-sugar part of saponins have been indicated to play an important part in the direct antioxidant activity, which also contributes to other beneficial effect such as decreased risk of cardiovascular diseases and tumour growth.

Phenols and polyphenols were also seen present in both extracts. This is in conformation with the results previously reported by Banzouzi *et al. [6]*.The major roles of phenols and polyphenols in human health and disease ranges from defence against infection to their involvement in allelopathic interactions, for example in soil [14]. Robert [15] also reported that some phenolic compounds act as germicids and are useful in the production of disinfectants while some phenols possess endocrine or estrogenic disrupting, antiseptic and anti-inflammatory activity. Thus the medicinal applications of *A. cordifolia* may be explained by its chemical constituents.

The result of proximate analysis reviewed that *A. cordifolia* extract contained high quantities of moisture, carbohydrate and protein with low amounts of ash, lipid and crude fibre (figure 2). However, there is no significant difference between the proximate contents of both aqueous and ethyl acetate extracts of *A*. *Cordifolia* as indicated in figure 2. The high moisture contents indicate low shelf life of the fresh plant hence long storage is susceptible to microbial attack. This supports the practice of storage in dry forms by users and it is a vital tool in processing, preservation and storage of food [16]. The sky-scraping levels of carbohydrate and protein indicate that the plant is rich in calories as well as a good

source of protein. The result of the study is in-line with the result of Okunrobo *et al*. [17] who showed that leaf of *Psidium guajava* had highest amounts of carbohydrate and protein with lowest amount of lipid. Similarly, the result obtained in this study afirmed with the report of Uraku *et al*. [18] on leaf of *Culcasia scandens.*

The result of vitamin analysis showed that the extracts contained appreciable amounts with vitamin B_1, A, B_6, B_3, E and B_2 being high (figure 3). The vitamin A, B_2, C and E contents of *A*. *Cordifolia* is higher than that reported by Adewale *et al*. [19] on leaf of *Launaea taraxacifolia, Solanum aethiopicum, Telfairia occidentalis, Amaranthus caudatum* and *Amaranthus hybridus.* However, the vitamin A, E and C contents *of* akpulu (*Ficus capensis*), big eggplant (*Solanum melongena*), agbara leaf (*Mucuna pruriens*), medium eggplant (*Solanum macrocarpon*), ewa (*Solanum nigrum*), *Moringa oleifera* lam, small egg plant (*Solanum aethiopicum*), and kale (*Cridoscolus acontifolius*) as reported by Achikanu *at al*. [20] were higher than that gotten from leaf of *A*. *Cordifolia.* The highest amounts of B_1 suggest that the plant could be use in treatment of nutritional disease called beri-beri while that of vitamin A opined that it plays a crucial role in iron utilization, humoral immunity; T-cell mediated immunity, natural killer cell activity with anti-oxidant effects inclussive. Study according to Agboola [21], slated that progesterone levels is balanced by vitamin B_6 that helps to lengthen luteal phase in women and allows adequate time interval between ovulation and menstruation which is vital for a successful pregnancy. The presence of vitamin C improves fertility whilas E increases the amount of healthy sperm deficiency contributes to infertility [22]. This could be why this plant is used by local users to achieve fertility.

The results of mineral analysis are presented in Figure 4 and it showed that magnesium, zinc and selenium were found to be higher than other minerals both in aqueous and ethyl acetate extracts. This was followed by manganese, calcium, sodium, phosphorus, iron, potassium and copper. The minerals; selenium, calcium, zinc, manganese, iron, magnesium and potassium values obtained in *A*. *Cordifolia* is lower than that observed in akpulu (*Ficus capensis*), big eggplant (*Solanum melongena*), agbara leaf (*Mucuna pruriens*), medium eggplant (*Solanum macrocarpon*), ewa (*Solanum nigrum*), *Moringa oleifera* lam, small egg plant (*Solanum aethiopicum*), and kale (*Cridoscolus acontifolius*) as reported by Achikanu *et al*. [20]. According to Ojo *et al*. [22] zinc, copper and iron contents of *Fiscus asperifolia* were higher that of *A*. *Cordifoliaas* recorded in this study while that of Na, K, Ca, Mg and Se contents were lower. These minerals are involved in many biochenical activities. Magnesium is associated with bone and teeth maintenance, muscle contraction and transmision of nerve impulses. Zinc is involved in formation of heme in hemoglobin and muscle contraction. Also, zinc assists in immune function, wound healing, sperm production, fetal development and growth while selenium protects vulnerable body chemical against oxidative destruction. In nutshell, all the minerals found in both extracts are of immense important for the normal functiong of the body and this plant has proved to contained appreciable quantities of the minerals.

CONCLUSION

Overwhelmingly, the study has publicized that leaf of *A*. *Cordifolia* is potential sources of phytochemicals, nutrients and minerals needed for both pharmaceutical and food industries. The importance of these phytochemicals, macro and micronutrients can not be over emphasized for effective and proper metabolism as well as the maintenance of good physiological state in human and animals.

Authors' contributions

This work was carried out in collaboration between all Authors. Author ELNdesigned the

Study and managed the analysis of the study and the bench work. Author UAJ wrote the protocol, performed the statistical Analysis as well as wrote the first draft of the manuscript and managed the literature search. All authors read and approved the final manuscript

Competing interest: the authors have decleared that there is no competing interest existing.

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