

Proximate Composition, Qualitative and Quantitative Phytochemical Screening of Aqueous Extract of *Aspilia africana* (Asteraceae) C.D Adams Leaves

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ABSTRACT

Knowledge on phytobiotics for their nutritional value and usefulness is interestingly increasing. A study was conducted to investigate the proximate composition, quantitative and qualitative phytochemical constituents of *Aspilia africana* leaves. Fresh leaves of *A. africana* were obtained, identified and subjected to different processing methods for the proximate and phytochemical analysis. Standard methods of processing were used for the proximate and phytochemical analysis. Data obtained in this study were subjected to one way analysis of variance (ANOVA). The results of the proximate analysis indicated that *A. africana* contained high crude protein, $15.62 \pm 0.22\%$, ash content, $16.17 \pm 0.19\%$, crude fibre of $14.44 \pm 0.79\%$ and a low fat content of $5.07 \pm 0.04\%$. The phytochemical screening of tannin, alkaloid, saponins, sterols, terpenoids and glycosides revealed the presence of alkaloid in higher quantities ($8.22 \pm 0.40\%$), moderate quantity of tannin ($2.23 \pm 0.09\%$) and lowest quantity of terpenoids ($0.34 \pm 0.03\%$). The results of this study concluded that *A. africana* possessed some nutritional value and contained some active ingredients which makes it useful in human medicine as a result of its nutritional and medicinal value and its further strengthened the earlier works on the nutritional and medicinal values of *A. africana*.

Introduction

It was stated by [1] that for the isolation of beneficial compounds, different classes of plant species have been analysed with the help of upgraded Ayurvedic traditional methods and other advanced scientific techniques. Thus, authors such as [2] concluded that some of these plants are proven to be medicinal because they contain some active substance that bring about remedies to the cure of some peculiar diseases of man. Therefore, [3] reported that searches for substance with antimicrobial activity and healing activities are frequently considered interesting by some researchers since they are frequently used in medicine as remedies for many infectious diseases. Previous authors such as [4,5] have reported that plant extracts have been reported by various researchers to favor various activities like anti-stress, growth promotion, and appetite stimulation, enhancement of tonicity and immunostimulation, maturation of culture species, aphrodisiac and

anti-pathogen properties in fish and shrimp aquaculture. These functions performed by these plants extracts are traced to the active principles such as alkaloids, terpenoids, tannins, saponins, glycosides, flavonoids, phenolics, steroids or essential oils that are inherent in them.

A. africana (Asteraceae); (Pers) C.D. Adams (plate 1), a perennial herb varying in height from 60cm to about 1.5m depending on rainfall [6]. Authors like [7,8] also defined it as a common weed of field crops in West Africa found in fallow land, especially in the forest zone. Scientific reports of [9,10] suggested that different crude extracts of the plant contain specific bioactive constituents that could have varied effects on its biological activities. A report of [11] on the evaluation of the potentials of *A. africana* in wound care showed that the leaf extract and fractions exhibited haemostatic, antimicrobial and wound healing activities suggesting that the

constituents of the leaves may play a useful role in wound care. [12,13] both reported that phytochemical analysis of the extract and fractions indicated the presence of typical plant constituents such as alkaloids, saponins, sterols, terpenoids, carbohydrates, glycosides and tannins. The phytochemical analysis and subsequent quantification of *A. africana* revealed the presence of high amount of some bioactive compounds; saponins, tannins, alkaloids, flavonoids, terpenoid and phenol, but little amount of steroids, phylobatannin and cardiac glycoside [9].

The work of [11] concluded that these metabolites are usually responsible for the biological and pharmacological activities of these medicinal plants. The result of preliminary phytochemical analysis of the petals of *A. africana* in the study of [14] showed the presence of saponins, tannins, flavonoids and cardiac glycosides. Flavonoids exhibit a broad range of biological activity such as antimicrobial, anticancer, anti-allergic as well as anti-tumour properties. Also, flavonoids are potent water-soluble antioxidants and free radical scavengers, which prevent oxidative cell damage, have strong anticancer activity [15,16] is of opinion that flavonoid in the plant petal is an important component of a normal diet, and has been suggested that flavonoid-rich foods may limit neurodegeneration and prevent or reverse normal or abnormal deterioration in cognitive performance. Furthermore, a report of [17,18] on saponins which were present in abundant quantity in *A. africana* petal has anti-inflammatory, anti-yeast, anti-fungal, anti-tumours, anti-parasitic and antiviral activities that confirms its usefulness in trade-medicinal practices.

In addition, [19] stated that it has the property of precipitating and coagulating red blood cells and some characteristics of saponins include formation of foams in aqueous solutions, hemolytic activity, cholesterol binding properties and bitterness). [14] stated that these properties bestow high medicinal activities on the extracts from *A. africana*. Another important metabolite and active compound in *A. africana* is tannins which have astringent and detergent properties were also present in trace quantity in the plant petal, and this could be responsible for their anti-fungal activity when used against diarrhoea and malaria. This coincides with reported works of [20-23] confirmed the nutritional and medicinal importance of *A. africana* leaves which has been established and to obtain effective performance and feed efficiency, diet should be formulated to meet the needs of animal particularly age or stage of production. It is commonly used to feed livestock particularly sheep and goats [24]. Hence this study entails the investigation of aqueous extract of *A. africana* leaves for its nutritional and phytochemical constituents and importance.

Materials and Methods

Collection and Harvesting of the Phytobiotic

Fresh young leaves of *A. Africana* was harvested separately within the premises of Federal University of Agriculture, Abeokuta, and Ogun State, Nigeria. The plants was authenticated in the

Department of Forestry and Wildlife where a voucher specimen was maintained for the plant (*A. africana* ID No: UAHA/08.180001). The leaves of the phytobiotic was obtained by harvesting whole plant (stem and leaves) above a 3cm stubble height within the mid vegetative to early flowering stage of development as described by [25]. Thereafter, the leaves was hand-plucked from stems and separately put directly into jute-bag. Fresh samples of the leaves were taken to the laboratories for the proximate and phytochemical (quantitative and quantitative) analysis.

Proximate (Nutritional) Analysis of the Phytobiotic

After sample collection and identification, 200g of fresh *A. africana* leaves were weighed using a weighing scale (mettler Toledo FB602), the leaves were air-dried and grinded to fine powder using an electric blender ((Century, CB-8231-M). Proximate analysis of moisture content, crude fibre, crude protein content, carbohydrate and fat content were carried out following procedure as described by [26] in SOAR research and diagnostic laboratory. Abeokuta, Ogun state, affiliated to Federal University of Agriculture, Abeokuta, Ogun state.

Phytochemical Screening of Aqueous Extract of the Phytobiotic

80 g of the plant powder were weighed weighing balance (mettler Toledo FB602) and homogenized in a clean electric blender containing 80ml sterile distilled water following procedures as described by [27]. The homogenates (amber green solution) were shaken for 1 hr in a rotary flask and after 72 hours, filtered into separate sterile containers using a funnel containing sterile cotton wood and later with Whatman No. 1 filter paper. The liquid filtrates were transferred into sterile McCartney bottles and stored in the refrigerator. The qualitative and quantitative phytochemical screening of leaves paste of *A. africana* was carried out following procedures as described by [28-30] in TETRA "A" analytical and diagnostic laboratory affiliated to Federal University of Agriculture, Abeokuta, Ogun state.

Results and Discussion

Proximate Composition (%) of *A. africana* Leaves

The proximate composition of *A. africana* leaves is presented in (Table 1). Ash content is the highest (16.17%) in *A. africana* leaves also with a crude protein content of 15.62% and ether extract of 5.07%. The leaves has a high moisture content of 9.65% and rich in fibre content of 14.4%. The nutritional analysis of the leaves in this present study showed that crude protein and crude fibre are high in *A. africana*. This suggest that the plant is an important source of plant proteins likewise the high fibre contents in these leaves could help to maintain gastro-intestinal tract health [31]. Also, protein, containing nitrogen in any food sample is used as an indication of protein level usually termed as crude protein which is different from true protein [32]. In this study, protein content of 15.62% in *A. africana* leaves indicated that *A. africana* leaves are rich in protein.

Also, high crude protein in this leaves is in line with the work of [23,33] who made similar discovery. The high fibre content in *A. africana* leaves is in agreement with the work of [14] who made similar findings in *A. africana*. This implies that the plant has more woody materials as stated by [34] that fibre determination is the criteria for judging purity of herbal crude drugs. The carbohydrate content of 61.64% is comparable with the work of [35]. This is an indication that the plant is a good source of energy for both human and animal use. Carbohydrate as it is present in *A. africana* in this present study corroborated with the work of [14,24] who reported the presence of carbohydrate in *A. Africana* leaves.

Table 1: Proximate compositions of *Aspilia africana* leaves (% Dry weight).

Proximate Components	Amount (%)
Ash	16.17 ± 0.19
Ether extract	5.07 ± 0.04
Crude Protein	15.62 ± 0.22
Moisture Content	9.65 ± 0.24
Crude Fibre	14.44 ± 0.79
Nitrogen free extract	39.06 ± 0.89
Carbohydrate	61.64 ± 0.74

Qualitative and Quantitative Phytochemical Analysis of *A. africana* Leaves

Table 2: Qualitative Profile of Phytochemicals Found in *Aspilia africana* leaves.

Phytochemical	Status
Alkaloid	++
Saponin	++
Flavonoid	-
Sterols	+
Terpenoid	+
Cardiac glycoside	+
Tannin	++

Qualitative Profile of Phytochemicals Found in *Aspilia africana* leaves.

The qualitative phytochemicals found in *A. africana* leaves is shown in (Table 2). Alkaloid is highly present followed by saponins and tannins which are moderately present, while sterols, terpenoids and glycosides are slightly present. The quantitative phytochemicals found in *A. africana* leaves is shown in (Table 3). *A. africana* leaves contained the highest crude yield of carbohydrate (61.64 ± 0.74%), followed by alkaloid with the yield of 8.22 ± 0.40% and saponin with the yield of 4.20 ± 0.05% and terpenoid having the lowest yield of 0.34 ± 0.03%. The results of quantitative and qualitative phytochemical analysis (aqueous extract) in the leaves of *A. africana* revealed the presence of alkaloid in moderate quantities. Alkaloids possess high antimicrobial activities by disrupting the function of cytoplasm membrane causing the

leakage of some beneficial metabolite and inactivated bacterial enzymatic system [36]. This result was corroborated by the work of [24] who revealed the presence of alkaloid in moderate quantity in *A. africana*. Saponins which are present in abundant quantities in *A. africana* leaves possess some anti-inflammatory and anti-microbial activities as described by some researchers [17,18].

Table 3: Quantitative Profile of Phytochemicals Found in *Aspilia africana* leaves.

Phytochemical	Amount (%)
Alkaloid	8.22 ± 0.40
Saponin	4.20 ± 0.05
Sterols	0.40 ± 0.01
Terpenoid	0.34 ± 0.03
Glycoside	1.18 ± 0.04
Tannin	2.23 ± 0.09
Carbohydrate	61.64 ± 0.74

It also has the ability of precipitation and coagulation of red blood cells and thus serving as a haemolytic agent [19]. This observation is in agreement with the reports of [14,24,37] who revealed the presence of saponin in *A. africana*. The absence of flavonoid in *A. africana* as observed in this study corroborated with the work of [24]. Steroid and terpenoid which are known to inhibit microbial growth by destroying the plasma membrane, thus leaking the cell cytoplasm causing cellular death and therefore reducing pathogenic diseases [38] is present in *A. africana* leaves. This present investigation also revealed the presence of tannin in moderate quantities in the leaves of *A. africana*. The presence of tannins in the plant indicated that these plants can act as an astringent and this might suggest that *A. africana* leaves could have anti-viral and anti-bacteria properties. This corroborates the reports of [14] who recorded the presence of tannin in *A. africana* leaves. This report revealed the presence of cardiac glycoside in small quantity in *A. africana* leaves which is in agreement with the works of [14,39] who discovered similar findings on *A. africana*. The presence of cardiac glycoside in this plant suggest that the plant could be of medical importance and the bases of use in ethno medicines

Conclusion

This present study elucidated the importance of the nutritional composition and the quantitative and qualitative phytochemicals constituents inherent in *A. africana* leaves which confirmed that the leaves is a potent medicinal plant as a result of the important active phyto-compounds present in the leaves and as such, this study has detailed its potential for use in herbal medicine. Also, *A. africana* leaves could also be used as an anti-microbial due to the important phytochemicals such as steroid, alkaloid and terpenoid present in the leaves. Furthermore, the high protein and fibre contents present in the *A. africana* leaves indicated that plant could serve as an important forage material for animal consumption.

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