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Research Article

Evaluation of Nutritional Values of Crude Extract of *Abutilon nigrigiana* Leaves

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Abstract

This research work evaluated the nutritional value of *Abutilon nigrigiana* leaves to ascertain its usage in herbal medicine. Crude extract of the leaves was screened to ascertain the various nutritional parameters that are present. Parameters like phytochemical composition, vitamins of interest, proximate composition, mineral contents as well as antinutrients composition. Results revealed the presence of phytopchemicals such as; Alkaloids (13.45±0.55), Saponins (9.32±0.64), Tannins (15.44±1.77), Phlobatannins (11.52±2.45), Cardiac glycosides (4.17±0.75), Flavonoids (10.40±1.22), Reducing compounds (11.42±0.81), Polyphenols (11.05±1.55) and Anthraquinone (11.66±2.43), vitamins; Retinol (30.37±0.06), Thiamine (29.69±1.03) and Ascorbic acid (54.32±0.23), proximate components; Total carbohydrate (35.96±0.27), Moisture (31.00±0.20), Crude fibre (10.73±0.31), Crude protein (10.54±0.33), Total ash (10.40±0.52) and Crude fat (1.37±0.05), mineral elements of significant quantity; Zinc (2.79 ± 0.01), Magnesium (2.02 ± 0.14), Calcium (1.09 ± 0.13), Potassium (0.95 ± 0.11) and Iron (0.76 ± 0.04), as well as antinutrients composition; Phytates (1.100±0.91), Tannins (0.014±0.12) and Total oxalates (1.320±1.45). This implies that the consumption of the leaves of *Abutilon nigrigiana* can help in treatment/management of inflammation as well as in the treatment of common ailments. It is a good medicinal plant that should be encourage in production of pharmaceutical products.

Keywords

Abutilon nigrigiana, Phytochemicals, Proximate Composition, Mineral Contents, Antinutrients Composition

1. Introduction

Plants have continued to be important sources of bioactive compounds and involve a multidisciplinary approach combining ethnobotanical, phytochemical and biological techniques to provide new chemical compounds. From antiquity, humans have used plants to treat several ailments. Convincing proof from trials may be a requirement for the acceptance of herbal therapy on a widespread scale. In local areas where poverty and poor resources prevail, native treatment may be the steadily obtainable option. The reason for this research which looks at the nutritional values of *Abutilon nigrigiana* leaves.

This study is therefore, going to be of profit to rural dwellers that do not have readily obtainable access to orthodox medications. Additionally, due to the prevailing resistance to orthodox medications, this study was undertaken so as to ascertain the efficaciousness of natural medical aid. A comparative efficaciousness study between orthodox and herbal

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therapy can give an alternate medicative supply which can be simply obtainable to each of the agricultural and rural dwellers, at comparatively reasonable value.

2. Material and Methods

2.1. Materials

Fresh samples of *A. nigrigiana* leaf were collected from Cross River State, Nigeria and authenticated. The collected leaves were dried under ambient conditions for 7 days after being washed thoroughly with distilled water to remove dust and other undesired impurities [28]. After which they were crushed in a clean-dry mortar with pestle and blended with electric blender (Binatone model BLG – 400) into fine powder. The powdered leaves were marcerated and extracted by soxhlet method using palmwine-distilled bioethanol as solvent. The extract was then frozen at (-80°C) and percentage of extraction of the dried leaf was calculated. The leaf extracts were screened for phytochemical constituents, vitamins as well as proximate composition, using standard procedures.

2.2. Methods

2.2.1. Proximate Analysis

Standard analytical methods of Harbone [11], was used to determined phytochemical constituents, methods of AOAC [1] for the determination of moisture, crude protein, ash content, crude fibre, crude fat and carbohydrate was determined by difference. Also standard recommended methods were used to determine vitamins of interest.

2.2.2. Minerals Analysis

The determination of minerals in *A. nigrigiana* leaf was conduction using the atomic absorption spectroscopic technique as described by Welz and Sperling [32].

2.2.3. Anti-nutritional Analysis

The determination of hydrocyanic acid in *A. nigrigiana* leaf was conducted using alkaline method as described by AOAC [1], the method of Griffith and Thomas [10] was used for the determination of phytic acid, the method of Burn [4] was used in the determination of tannin, whereas the Dye [8] method was used in the determination of total oxalate.

2.3. Statistical Analysis

Paired comparison between varieties was done using t-test and analysis of variance for observable parameter. Results were expressed as mean ± SD (standard deviation) and mean ± SEM (standard error of mean). Values of $p \leq 0.05$ were regarded as significant.

3. Results and Discussion

The results showed that the palm wine-distilled bioethanol extract gave 25.00% extraction yield.

The qualitative analysis results showed that the plant contained significant amount of alkaloids, saponins and flavonoids. The presence of significant amount of phenolic compounds (tannins, flavonoids) and saponins, suggest that the extracts of this plant will be very highly anti-oxidative and consequently may be the reason for its efficacy as anti-malarial.

3.1. Phytochemical Composition of *A. nigrigiana* Leaf

Analysis has shown that crude leaves extract of *A. nigrigiana* leaf contained alkaloids, saponins, phlabotannins, tannins, flavonoids, polyphenols. It also contained cardiac glycosides and reducing compounds as well as anthraquinones, though to a lesser extent. Medicinal plants have proven their efficacy over the years as well as their safety, cultural acceptability and minimal side effects [5].

Curative/healing power of some herbs is most probably because of their secondary metabolites, collectively identified as phytochemicals [13]. The generation of free radicals are known to be risk factors for evolution of diseases. And since intrinsic defense mechanisms of the human body may not be enough to combat the mounting effects of free radicals, antioxidants from supplements may be required to build a strong defense for the generation of diseases. However, antioxidants from plants are more preferred to synthetic sources [24]. Such plant free radical scavengers may include phenolic compounds and flavonoids. “Alkaloids possess various pharmacological activities including antihypertensive, antiarrhythmic, antimalarial and anticancer activity” [25], hence alkaloids in the leaf of *A. nigrigiana* suggests the possible use of the leaf for therapy. Saponins are also important blood lipids modulating agents, that act as anticancer agents and glycemic regulators [12], as well as possessing antimicrobial activities [26]. Plants tannins are usually utilized as therapeutic agents along the gastrointestinal tract [25], tannins found in the leaf of *A. nigrigiana* suggests its recognition as therapy for the treatment ulcers as well as hemorrhoids. Plant flavonoids are known for its medicinal benefits in alleviating inflammatory [25]. Hence flavonoid in the leaf of *A. nigrigiana* suggests its use as anticancer, anti-inflammatory as well as antiatherosclerotic therapy.

Table 1. *Phytochemical composition of A. nigrigiana leaf.*

Parameters	Indications	Composition %w/w
Alkaloids	+++	13.45 ±0.55
Saponins	+++	9.32±0.64

Parameters	Indications	Composition %w/w
Tannins	+++	15.44±1.77
Phlobatannins	+++	11.52±2.45
Cardiac glycosides	+	4.17±0.75
Flavonoids	++	10.40±1.22
Reducing compounds	+	11.42±0.81
Polyphenols	++	11.05±1.55
Anthraquinone	++	11.66±2.43

Mean ± SEM, n=3Key, +++ Significantly present, ++ Moderately present, + Slightly present.

3.2. Vitamin Content of *A. nigrigiana* Leaf

The plant extracts have been shown to contain three of the key vitamins of interest in this study in significant amounts. These include vitamin A (Retinol) – 30.37±0.06, vitamin B1 (Thiamine) – 29.69±1.03 and vitamin C (Ascorbic acid) - 54.32±0.23, all of which have been reported variously to be anti-oxidants. Thus complementing the anti-oxidant effect of the secondary compounds of this plant and confirms the reason for its strong anti-malarial effect.

Table 2. *Concentration of vitamins of interest in A. nigrigiana leaf.*

Vitamins	concentration
Retinol (iu)	30.37±0.06
Thiamine (µg/100g)	29.69±1.03
Ascorbic acid (µg/100g)	54.32±0.23

Mean of 3 determinations ± SD

The Vitamin A is necessary for the regulation of cell-mediated immunity and humoral antibody responses, suggesting that it could play a role in protecting the cell against malaria infection [27]. This is so, due to its ability to increase the absorption of iron from food along the gastrointestinal tract thereby encouraging the erythropoiesis [20]. B vitamins are found in coenzymes as they are involved in the release of energy from nutrients. Their role in cell multiplication and the utilization of amino acid in the proliferation of proteins lends credence to the fact that their deficiency may be associated with greater risk of severe malaria [14]. Vitamin C supplementation may play a role in the management of malaria [16], thus its deficiency may endanger the cell as free radicals are prone to scavenge tissues and therefore may predispose cells to chronic/acute malaria infections [6, 17].

3.3. Proximate Composition of *A. nigrigiana* Leaf

Results obtained showed that *A. nigrigiana* leaf has high moisture (31.00±0.20 mg/100g) and carbohydrate (35.96±0.27 mg/100g) contents, moderate concentrations of crude fiber, protein and ash, and low concentration of fat (1.37±0.05 mg/100g). The carbohydrate composition of *A. nigrigiana* leaf (35.96%) was observed to be high, thus could be recommended as energy source. The fat composition (1.37±0.05) is low suggesting that consumption of the leaf may play a role in the control of obesity. Protein composition was observed to be moderate in the leaf (10.54±0.33). Crude fiber was also present in this plant which contributes to the bulk content.

Table 3. *Proximate composition of A. nigrigiana leaf.*

Constituents	Dry weight (mg/100g)
Total carbohydrate	35.96±0.27
Moisture	31.00±0.20
Crude fibre	10.73±0.31
Crude protein	10.54±0.33
Total ash	10.40±0.52
Crude fat	1.37±0.05
Energy value (Kcal/100g)	19833.00±0.14

Mean of 3 determinations ± SD

3.4. Mineral Element Composition of *A. nigrigiana* Leaf

The mineral compositions of *A. nigrigiana* leaf contain considerable amount of Zinc, Iron, Calcium, Magnesium and Potassium. According to Pathak and Kapil [22], "zinc is vital in protein synthesis, cellular differentiation and replication, immunity and sexual functions". Calcium is "essential for blood clotting, bone and teeth formation and as a co-factor in some enzyme catalysis" [23]. "In humans, magnesium is required in the plasma and extracellular fluid, where it helps maintain osmotic equilibrium [29]. According to Thomas and Krishnakumari [29], "Iron facilitates the oxidation of biomolecules to control obesity, which predisposes an individual to various diseases. It is also essential for hemoglobin formation" [29].

Table 4. *Mineral element composition of A. nigrigiana leaf.*

Mineral	Values (mg/100g)
Zinc	2.79 ±0.01

Mineral	Values (mg/100g)
Magnesium	2.02 ± 0.14
Calcium	1.09 ± 0.13
Potassium	0.95 ± 0.11
Iron	0.76 ± 0.04
Sodium	0.19 ± 0.14
Phosphorus	0.18 ± 0.05
Copper	0.12 ± 0.20
Selenium	0.11 ± 0.01
Manganese	0.09 ± 0.16
Nickel	0.005 ± 1.06
Chromium	0.002 ± 1.42
Cadmium	0.002 ± 0.18
Lead	0.002 ± 0.00

Mean of 3 determinations ± SD

Moderate amount of sodium and potassium were observed in *A. nigrigiana* leaf. "Both sodium and potassium are principal cations of extracellular and intracellular fluids that play roles in the homeostasis of the body" [23]. "Potassium is essential and is required in large amounts for proper growth and plant reproduction. Sodium and potassium regulate the acid-base balance. According to Akinyeye *et al*. [2], the recommended Na/K ratio is 0.6, and the values for the leaf obtained in the present study was 0.14, considered good for effective health condition". When the potassium content of diet is inversely proportional to sodium content, there is a direct correlation to blood pressure in humans [19]. The calcium content was high, 1.09±0.13 mg/100g in the leaf. "High concentration of calcium in the body is very important because of its role in formation of bones and teeth, clotting of blood, muscle contraction and synaptic transmission of nerve impulses" [9]. "The intake of calcium supports building and maintaining bone mass, and strength against chemotherapeutic agents that cause osteopenia and osteoporosis" [18]. Thus, the high concentration of calcium contained in *A. nigrigiana* suggests its use in therapy. "Phosphorous may be involved in the maintenance of blood sugar levels and normal heart contraction" [15]. Fluctuations in the levels of these elements may cause many metabolic disorders [3]. Lead, Cu and Mn concentration were low in leaf. The Zn concentrations in the leaf was moderate. "Zinc is essential for growth and development. It is essential for the function of the cells of the immune system. It is used in the prevention and treatment of diarrhea, pneumonia, cold, respiratory infections and malaria" [7]. The concentration of Cr in the sample was very low (0.002±1.42 mg/100g).

3.5. Antinutrients Composition of *A. nigritiana* Leaf

The nutritive value of any foodstuff is determined by its content of essential nutrients and antinutrients. The presence of phytic acid in diets reduces the apparent digestibility of total phosphorus and hinders absorption and utilization of certain mineral elements such as calcium, iron, zinc and magnesium in humans and other animals. It is not hydrolyzed by intestinal enzymes [30]. Phytic acid was also reported to have an inhibiting effect on iron diffusibility. The study of phytate: zinc molar ratios have been reported to give accurate zinc status in humans in both omnivorous and vegetarian diets [21]. Phytate: zinc molar ratios between 9:1 and 15:1 have been reported to lead to reduced zinc bioavailability, thus inducing zinc deficiency [31]. The phytate: zinc molar ratio obtained (3.92:1) was less than the critical level of 15:1, suggesting that the leaf did not contain phytic acid to a level that will hinder availability of zinc in the leaf.

Table 5. *Antinutrients composition of A. nigrigiana leaf.*

Composition	Concentration mg/100g
Phytates	1.100±0.91
Tannins	0.014±0.12
Total oxalates	1.320±1.45

Mean of 3 determinations ± SD

In this study, the result obtained regarding tannin content, indicates low concentration which is regarded to be nutritionally beneficial. The total oxalate level obtained in this study does not suggest oxalate toxicity arising from the consumption of the leaf.

4. Conclusion

In conclusion, results have shown that the crude extract, n-butanol and aqueous residual fractions of *Abutilon nigrigiana* leaves contain nutrients, mineral elements and plant chemicals as well as vitamins that can sustain wellbeing. In addition, *Abutilon nigrigiana* leaves general, does not contain high levels of anti-nutrients, thus making it a candidate for the developments of drugs for common ailments in the near future.

Author Contributions

Moses Eso Bassey Eka: Conceptualization, Resources, Supervision, Funding acquisition, Writing - original draft,

Methodology, Writing - review & editing

Esther Offiong Asuquo: Resources, Project administration, Writing - review & editing

Victor Odey Ogar: Data curation, Formal Analysis, Investigation, Visualization, Project administration

Conflicts of Interest

The authors declare no conflicts of interest.

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