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Original Research Article

Phytochemicals Screening and Nutritional Profile of *Cnidosculus aconitflius* Leaves collected in Birnin Kebbi, Nigeria

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Abstract

Plants materials contained some bio-active ingredients which help in treating of so many diseases and also provide vital components for human and animal nutrition. Preliminary phytochemical screening and some nutritional profile of *Cnidoscolus aconitofolius* leaves were investigated in this study. The dry leaves of *Cnidoscolus aconitofolius* were subjected to proximate, vitamins and mineral contents analysis. Furthermore, the samples were subjected to soxlet extraction using methanol and water of different polarities for qualitative phytochemical screening. The preliminary qualitative phytochemical screening revealed the presence of phenols, flavonoids, alkaloids, terpenoids, saponins, steroids and absence of tannins respectively. Among the proximate composition carbohydrate was found to be high (65.54%), followed by crude fat (13.33%) and ash (12.08%), while moisture, proteins and crude fibre were 0.67%, 5.55% and 2.83 % respectively. The results showed that the sample contained 18.12mg/100g vitamin A and 15.20mg/100g vitamin C concentrations. The levels of some selected mineral elements of public health important are Potassium 378.62mg/100g, Sodium 82.02mg/100g, Phosphorus 5.73mg/100g, Magnesium 1.72mg/100g, Iron 1.02mg/100g, Calcium 1.02mg/100g, Copper 0.30mg/100g, Zinc 1.14mg/100g and Manganese with 0.08mg/100g respectively. This study revealed that the leaves of *Cnidoscolus aconitifolius* contained some phytochemicals constituents of medicinal importance. The nutritional compositions also showed an appreciable amount of vitamin A and C and some minerals elements. Therefore, the plant may be considered as a good source of macro and micro-nutrients of potential nutritional importance.

Keywords: Phytochemicals, Nutritional profile, micronutrients and *Cnidoscolus aconitofoliu*.

INTRODUCTION

Plants are indispensable sources of bioactive chemical compounds with enormous benefits. These benefits include medicinal, physiological and also as source nutritional just to mention a few (Yuan, *et al.*, 2007). Medicinal plants and herbs have been proved to be of great importance to health care in developing countries and the world at large (Awoyinka, *et al.*, 2007). Plants with medicinal and nutritional values have been identified and used throughout human history. They are used not only in the course of their nutritional value but also as a source treatment and cure from diseases and infections (Idris *et al*., 2018).

Cnidoscolus aconitifolius is a large and fast growing leafy perennial shrub. The plant is evergreen and drought deciduous shrubs which grow up to 6 meters height (Ross and Molina, 2002). It has an alternate palmate lobed leaves with a succulent stem which releases a milky sap when cut (Mordi and Akanji, 2012). The shoots and leaves of *Cnidoscolus aconitifolius* have been reported to used as laxatives, diuretic, circulatory stimulant and treatment of alcoholism (Atuahene *et al*., 1999). The leaves also aid in digestion, stimulate lactation and hardening of the fingernails (Jensen, 1997; Rowe, 1994). Because of its medicinal importance *Cnidoscolus aconitifolius* posses so many name by different tribes and ethnic groups of Nigeria. It is often referred as Chaya in English, *Efo IyanaIpaja* and *Efo Jerusalem* in Yoruba, *Obarandu* or *Akwukwonriohurun* in Igbo and '*Hospital not Too Far*' in Hausa because they believe it gives blood almost immediately even before one can rush to get from the hospital (Donkoh *et al*., 1990; Iwalewa *et al*., 2005).

Previous studies revealed that Chaya is an excellent source of ascorbic acid, retinol and minerals elements of public heath importance (Donkoh *et al.*, 1999). The young leaf of Chaya contain 350.83mg/100g of ascorbic acid, 5.26mg/100g of retinol, 7.5mg/100g of Fe and 8.15% of protein (Kuti *et al.*, 2004). It is pertinent to note that literature search suggest that Chaya plant grown in different location have different level of nutritional and phytochemical constituent (Kuti *et al*., 2004; Adeleke *et al*., 2010; Tadeu *et al*., 2012). Therefore, the current study seeks to investigate the phytochemical constituents and nutritional profile of *Cnidoscolus aconitifolius* collected at Bayan Kara area in Birnin Kebbi LGA of Kebbi State, Nigeria.

MATERIALS AND METHODS

Sample collection and identification

Fresh leaves of sample were collected in the month of December 2019 at Bayan Kara, Birnin Kebbi Northern part of Nigeria. The plant was identified by the Taxonomist at Department of Biological Sciences Kebbi State University of Science and Technology Aliero, Nigeria. Then the leaves were washed to remove dirt and the leaves were shade dried and ground to fine powder for analysis.

Phytochemical Screening

Methanolic extract of powdered leaves were used to test for the presence or absence of secondary metabolites according to the following procedures.

Test for Alkaloids

Few drops of Wagner's reagent (a solution of potassium iodide and iodine) were added to 2ml of methanolic extract of *Cnidoscolus aconitifolius* in the test tube. The formation of orange brown precipitate indicated the presence of alkaloids (Sofowora, 1993).

Test for Flavonoids

To 3ml of plant extract, 1ml of NaOH was added. Formation of yellow colouration indicated the presence of flavonoids (Treas and Evans, 2002).

Test for Saponins

To 2ml of the methanolic extract, 3ml of distilled water were added and shaken vigorously for about 5minutes. The formation 2cm layer of foam which in turn persist for 10minutes indicated the presence of saponins (Harborne, 1973).

Test for Tannins

To 2ml of plant extract, 3 drops of 0.1% ferric chloride were added. A brownish green precipitate indicated the presences of tannins (Treas and Evans, 2002).

Test for Steroids

2ml of extract were dissolved in 6ml chloroform in the test tube and 4ml of concentrated H2SO4 were carefully added by the side of the test tube. The upper layer turned red and sulfuric acid layer showed yellow with green fluorescence. This indicated the presence of steroids (Gibbs, 1974).

Test for Terpenoids

2mls of chloroform were dissolved in 5ml of plant extract and 3ml of concentrated H2SO4 were carefully added. Formation of reddish colouration at the inter-phase indicated a positive result for the terpenoids (Harborne, 1998).

Test for Phenols

To 2ml of the plant extract, 2 ml of 5% aqueous ferric chloride was added. Formation of blue colour indicated the presence of phenols.

Proximate analysis

The standard analytical procedures for food analysis to determine proximate composition (moisture content, crude protein, crude fibre, percentage lipids, carbohydrate and ash) were used as recommended by the Association of Official Analytical Chemists (AOAC, 1999). The moisture content was determined by oven drying method, Crude protein was determined by Micro-Kjeldahl Method. Fat was determined by soxhlet extraction using hexane as solvent and Ash content was determined by dry ashing method of AOAC (AOAC, 1999). While carbohydrate was determined by difference as shown below (%Carbohydrate) = [100-(%Protein + %Moisture+ %Ash+% Fibre% + %Crude Lipid)] (Mathew *et al*., 2015).

Determination of Some selected minerals

Iron, Zinc, Copper, Manganese, Sodium, Potassium, Magnesium, Calcium and Phosphorous were determined determined by means of atomic absorption spectrophotometer (AAS) (Shimadzu AA-6200 Tokyo, Japan) according to AOAC method (AOAC, 1996).

Determinaton of Ascorbate and β-Carotene

Ascorbate and β-carotene content were determined by a means of atomic absorption spectrophotometer according to AOAC method (AOAC, 1996).

RESULTS AND DISCUSSION

Table 1: Phytochemical composition of *Cnidoscolus aconitifolius* leaves

Phytochemical	Methanolic extract	Aqeous Extract
Flavonoid	+	+
Tannin	_	_
Saponin	+	+
Glycoside	+	_
Alkaloid	+	+
Terpenes	+	+
Steroids	+	+
Phenolics	+	+

Key; Present (+), Absent (-)

Table 2: Proximate composition of *Cnidocolus aconitifolius* leaves

Parameter	(%)
Ash	12.08±0.24
Carbohydrate	65.54±0.46
Fiber	2.83±0.76
Lipid	13.33±1.05
Moisture	0.67±0.58
Protein	5.55±0.25

Values are mean ± standard deviation of triplicate determination

Table 3: Minerals constituents of *Cnidocolus aconitifolius* leaves

Minerals	Concentration (mg/100g)
Na	82.03±0.36
P	5.73±0.36
K	378.62±1.36
Mg	1.72±0.05
Fe	1.02±0.03
Cu	0.3±0.04
Zn	1.14±0.01
Mn	0.08±0.20
Ca	1.02±0.07

Values are mean ± standard deviation of triplicate determination

Table 4: Level of β-carotene and Ascobate in *Cnidocolus aconitifolius* leaves

Parameter	Constituents (mg/100g)
β-carotene	18.12±0.20
Ascobate	15.20±2.41

Values are mean ± standard deviation of triplicate determination

DISCUSSION

Plants contained phytochemicals when ingested by humans and animals elicit different biochemical and pharmacological functions (Farquar, 1996). This study revealed the presence various phytochemicals (Table 1) which includes saponins, flavonoids, alkaloids, steroids, terpenoids, phenols and glycosides but absence of tannins. The presence of saponins, flavonoids and alkaloids in this study collaborate with (Peixoto *et al.*, 2012). However, Peixoto *et al.*, (2012) reported presence of tannins upon phytochemical screening of the plant extract. Absence of tannins in this study could be attributed to the type of solvent use during soxhlet extraction. Saponins were found to posses anti-inflammatory activities, hemolytic and cholesterol binding activities (Stray, 1998). While Flavonoids aids in relaxing cellular oxidative stress and also they good anticancer and antimicrobial agents.

The current study recorded the presence of terpenoids, it is imperative to note that terpenoids play a vital role in faster healing of wound and inflamed mucous membrane (Farnsworth, 1966). It is also reported to have an analgesic and anti-inflammatory activity which prove the potency of chaya plant in relaxing of inflammation (Okwu, 2001). Steroids have similar pharmacological functions with sex hormones (Mohammed *et al*., 2016). Steroids were found to be present in this study which was also reported in previous study by (Otitolaiye and Asokan (2016). Alkaloids are cyclic like compounds possessing a nitrogen atom in their native structure. Hence, behave like alkali in nature. In line with Pinent *et al.*, (2005)

and Orji *et al.*, (2016) this study also recorded the presence of alkaloids in extract of *Cnidoscolus aconitifoliu* leaves. Alkaloids are good anti-inflammatory, antidiabeties, antioxidants and antibacterials compounds (Souto *et al*., 2011; Bousselssela *et al*., 2013; Tiong *et al*., 2013).

The proximate composition of plant under investigation (Table 2) revealed that ash content is in agreement with a previous study by (Yusuf *et al*., 2020). The values recorded for ash in this study indicated that the plant is good source of minerals. Ash content of proximate composition could be used as an indicative major of minerals constituents in food samples. Minerals elements plays a vital role in many body's physiologic processes (Sanni and Oladipo, 2008). Values of crude lipid were more than those for ash and crude protein. This could be attributed to the characteristics oily watery property exhibited by plant when cut. The carbohydrate content was found to be high among the proximate composition. Carbohydrate is essential for production of energy as well as prevention from depletion of body tissues. This indicated the plant leaves can be used as source of energy, even though the plant leaves was reported to have been used in making vegetable soup for people with stroke, diabetes and elderly people in local communities (Idris *et al*., 2018).

The result of some selected minerals of public health importance indicate the amount of K, Na, Mg, Fe, Ca, Cu, P, Zn and Mn. These elements play a vital role in regulation of biochemical processes in the body. K and P level reported in this study were high than values reported by Richard *et al.*, (2004). However, Richard *et al*., (2004) and Yusuf *et al*., (2020) reported high values of Cu, Fe and Zn than the current study. Previous studies indicated that optimal consumption of minerals can reduce individuals risk for so many health related diseases and clinical conditions (Mohammed and Sulaiman, 2009). Furthermore, this study reported the level of β-carotene and ascobate which the precursors for synthesis of vitamin A and C higher than values recorded in previous studies by Adeniyi *et al*., (2012) and Biljana (2012). This indicated that the plant may be regarded as a good source of antioxidant.

CONCLUSION

The current study has revealed the phytochemical and nutritional composition of methanolic extract of *Cnidoscolus aconitifoliu* leaves. The result of selected minerals and vitamins suggest that the plant is a reservoir of vitamins and other micronutrients. Furthermore, the study also revealed that plant is rich in carbohydrate; thus it an excellent source of energy. Therefore, this plant may be use as a means of supplement for micro and macronutrients.

Conflict of Interest: The Authors declare no conflict of Interest.

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