Phytochemical, Nutrients And Antinutrients Of The *Ipomoea Triloba, Ipomoea Batatas, Ipomoea Involucrata* Leaves.

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ABSTRACT

The leaves of Ipomoea triloba, Ipomoea batatas, Ipomoea involucrata were screened for their phytochemical constituents, nutritional and antinutritional properties. The phytochemical evaluations of these plants species revealed the presence of saponins, tannins, flavonoids, alkaloids, cardiac glycosides, anthraquinones and terpenes were present in these plants. Proximate analysis revealed that moisture content of these plant were 6.10% for Ipomoea triloba 2.1%, for Ipomoea batatas, 3.11% for Ipomoea involucrata respectively. Total ash 1.0% for Ipomoea tribola, 1.5% for Ipomoea batatas, 1.9% for Ipomoea involucrata respectively. Crude fibre 20% for Ipomoea triloba, 22% for Ipomoea batatas, 27% for Ipomoea involucrata respectively. Crude protein 10.80% for Ipomoea triloba 7.30% for Ipomoea batatas, 7.99% for Ipomoea Involucrata respectively. Lipid 2.1% for Ipomoea triloba 3.1% for Ipomoea batatas, 5.0% for Ipomoea involucrata respectively.Carbohydrate 60% for Ipomoea triloba 64% for Ipomoea batatas, 55% for Ipomoea involucrata respectively. The antinutrients for tannic acid were 0.210mg/100g, 0.150mg/100g and 0.215mg/100g respectively. Phytate of 0.0007mg/100g, 0.0001mg/100g and 0.0004mg/100g respectively. Oxalate for 0.001mg/100g, 0.0009mg/100g and 0.002mg/100g in I. triloba, I. batatas and I. involucrata respectively. The results of this study further confirm traditional medicinal uses.

Keyword: *Ipomoea triloba, Ipomoea batatas, Ipomoea involucrata,* phytochemical, leaves, proximate analysis.

INTRODUCTION

Plants have great importance due to their nutritive value and continue to be a major source for medicines as they have been found throughout human history. 30 to 40% of today's conventional drugs used in the medicinal and curative properties of various plants are employed in herbal

supplements, botanicals, nutraceuticals and drugs. All human beings require number of complex organic compounds as added caloric requirements to meet the need for their muscular activities, carbohydrates, fats and proteins, while minerals and vitamins form comparatively a smaller part, plant materials form major protein of the diet, their nutritive value is important (Indrayan *et al.,* 2000 and Williams, 1972). Human body comprises chemical compounds such as water, proteins, fatty acids, nucleic acids and carbohydrates, these in turn consist of elements such as carbon, hydrogen, oxygen, nitrogen and phosphorus and may or may not contains minerals such as calcium, Iron, magnesium and zinc. The moisture value of plant play great role in plant and human being, so material extracted from the natural plants through chemical or biotechnology (Katzmarzyk and Waist, 2004). Hiroshi *et al*. (2000), Ifon and Bassir (1979) revealed the value of sweet potato leaf as containing protein and crude fibre which are important for addressing deficiency diseases and colon diseases. Ojeniyi and Terre (2001) revealed the nutritive value of sweet potato. Sweet potatoes is a folk remedy for asthma, bugbites, burns, catarrh, ciguatera, convalescence, diarrhea, dyslactea, fever, nausea, renosis, splenosis, stomach distress, tumors, and whitlows (Duke and Wain, 1981). *Ipomoea triloba* is used for antibacterial and anti-fungal purposes as well as for wound healing acceleration (Yoshimoto, 2001). *Ipomoea involucrata* is made into an infusion, drunk as a stimulant, or preventative of fever and in Sierra Leone a decoction of the fresh sap is taken as a remedy for gonorrhea. The leaves are used in Nigeria for asthma. In Ivory Coast, a plant preparation is added to baths or made into a lotion for treating jaundice (Bouquet, 1969).

Anti-oxidant help prevent molecular damage caused by oxidation; this protection, it may help fend off not only cancer, stroke, and coronary heart disease but also arthritis, asthma, cataracts and macular degeneration, the leading cause of blindness after age 65 years (Kris-Etherton *et al.,* 2002).

Health workers and scientist are encouraging the intake of fruits and vegetables with high polyphenolics and therefore high antioxidant content because these, as well as nutrients are best absorbed and used by the body when they are derived from natural sources (plants and animals). These are present in naturally occurring complex compounds, and not as separate compounds as formulated in pills. *Ipomoea batatas* leaves, according to Islam *et al.* (2002) are also an excellent sources of antioxidative polyphenols such as caffeoylquinic and, anthrocyanins, as well as beta carotene. As reported by Marcu (2004), excess consumption of the leaves does not lead to toxicity since the polyphenols can be eliminated or deposited in the fat tissues. The plant phenols, because of their diversity and extensive distribution, are the most important group of nutrient antioxidants, and they contribute to the organoleptic and

nutritional qualities of fruits and vegetable (Islam *et al.,* 2002). The aim of this present research was to evaluate the phytochemical, nutritional and selected antinutritional contents in three *Ipomoea* species.

MATERIALS AND METHODS

I. triloba, I. batatas and *I. involucrata* leaves were collected from a farmland in Abak Ishiet village in Onna Local Government Area of Akwa Ibom State. The plants were identified by Dr. (Mrs.) U. A. Essiett from the Department of Botany and Ecological Studies, University of Uyo, Nigeria.

Preparation of the Extract

The leaves were separated from the plants. The leaves were cut into smaller pieces dried and weighed. It was macerated in 50% aqueous ethanol for 72 hrs at room temperature following the method suggested by Sofowora (1993). The liquid extract was recovered by filtration using cotton wool and glass funnel. The filtrate obtained was concentrated in a vacuo at 40^0C to yield semi- solid mass. The extract obtained was accurately weighed and then used for phytochemical screening.

Phytochemical Screening

Phytochemical screening was carried out on ethanolic extract for the qualitative determination of phytochemicals constituents using the procedures as described by Sofowora (1993).

Quantitative Microscopy/Proximate Analysis

The moisture content of the powdered leaves were determined by weight loss on drying method (African Pharmacopeia, 1986). The ash value, acid insoluble ash, water-soluble ash and sulphated ash were determined as described by British Pharmacopeia (1980), African Pharmacopeia (1986). The water and alcohol extractive values were obtained using the method outlined by Brain and Tuner (1975) and British Pharmacopeia (1980). The fat (lipids), crude protein, crude fibre and carbohydrate were obtained using the method outlined by Pearson (1976), Okon (2005) and AOAC (2000). Oxalate was determined using the method of Day and Underwood (1986). Phytate was determined using the method of Wheeler and Ferrell (1971) and AOAC (1994). Tannin was determined according to Official method of analysis described by AOAC (1994). Cyanogenic glycosides were determined using the method as described by Onwuka (2005).

RESULTS

The result of the preliminary phytochemical screening of the leaves of *Ipomoea triloba, Ipomoea batatas, Ipomoea involucrata* are summarized in Table 1. The leaves of *Ipomoea triloba, Ipomoea batatas,* reveals the abundantly presence of tannins in all three species and

absence in combined anthraquinones in all three species.

However, flavonoids was moderately present in all three species. Terpenes was present in trace in *Ipomoea involucrata.* Alkaloids was absent in *Ipomoea triloba* but present in trace in *Ipomoea batatas* and absent in *Ipomoea involucrata*. Cardiac glycosides (Lieberman's) was present in trace in all three species. Free anthraquinones was moderately present in *Ipomoea triloba* but absent in *Ipomoea batatas* and *Ipomoea involucrata.* Cardiac glycosides (Salkowski test) was present in trace in *Ipomoea triloba* and abundantly present in *Ipomoea batatas* but absent in *Ipomoea involucrata.* Cardiac glycosides (Keller Killiani test) was present in trace in *Ipomoea triloba* but absent in *Ipomoea batatas* and *Ipomoea involucrata.*

The proximate analysis of the powdered leaves of *Ipomoea triloba, Ipomoea batatas, Ipomoea involucrata* are: Moisture content (%) 0.10, 2.1, 3.11; Ash content (%) 1.0, 1.5, 1.9 respectively (Table 2). The nutritional analysis of the powdered leaves of *Ipomoea triloba, Ipomoea batatas, Ipomoea involucrata* are: protein (%) 10.80, 7.30, 7.99; Fats (%) 2.1, 3.1, 5.0; Fibre (%) 29.0, 22.0, 29.0; Carbohydrate (%) 60.0, 64.0, 55.0 respectively (Table 3). The antinutritional analysis of the powdered leaves of *Ipomoea triloba, Ipomoea batatas, Ipomoea involucrata* are: Tannic acid (%) 0.210, 0.150 and 0.215; phytate acid (%) 0.0007, 0.0001 and 0.0004; oxalate acid (%) 0.001, 0.0009 and 0.002 (Table 4).

Table 1: Result of Phytochemical Screening metabolites in leaves of *Ipomoea triloba, Ipomoea batatas* and *Ipomoea involucrata*

Metabolites	Inferences		
	Ipomoea triloba	***Ipomoea batatas***	***Ipomoea involucrata***
Alkaloids	-	+	-
Saponins	++	+	+
Tannins	+++	+++	+++
Flavonoids	++	++	++
Terpenes	+	+++	+
Cardiac glycoside			
(a) Salkowski test	+	+++	ND
(b) Keller Killiani test	+	ND	ND
(c) Lieberman's test	+	+	ND
Anthraquinones free	++	ND	ND

Anthraquinones combined	ND	ND	ND

Legend: - ND= Not detected, + = Trace, ++ = Moderate, +++ = Abundance

Table 2: Results of Nutritional Analysis of the *Ipomoea triloba, Ipomoea batatas* and *Ipomoea involucrata.*

Evaluation Parameters	Values (% W / W)		
	***Ipomoea triloba* (%)**	***Ipomoea batatas* (%)**	***Ipomoea involucrata* (%)**
Protein	10.80	7.30	7.99
Fats	2.1	3.1	5.0
Fibre	20.0	22.0	29.0
Carbohydrate	60.0	64.0	55.0
Moisture content	0.10	2.1	3.11
Ash content	1.0	1.5	1.9

Table 3: Results of Antinutritional Analysis of the *Ipomoea triloba, Ipomoea batatas,* and *Ipomoea involucrata.*

Evaluation Parameters	Values (% W / W)		
	***Ipomoea triloba* (%)**	***Ipomoea batatas* (%)**	***Ipomoea involucrata* (%)**
Tannic acid	0.210	0.150	0.215
Phylate acid	0.0007	0.0001	0.0004
Oxalate acid	0.001	0.0009	0.002

DISCUSSION

Phytochemical screening of the leaves of *Ipomoea triloba, Ipomoea batatas* and *Ipomoea involucrata* reveals the presence of various bioactive compounds such as saponins, tannins, flavonoids, terpenes, alkaloids, cardiac glycosides (Salkowski, Keller and Killiani and Lieberman's test) and anthraquinones (free and combined) which are the basis of therapeutic potentials of medicinal plants. Some saponins have anti-cancer and immune-modulatory properties (Trease and Evans, 2002).

In plants, saponin may serve as anti-feedants, and to protect the plant against microbes and fungi. Some plants saponins (e.g. from oat and spinach) may enhance nutrient absorption and aid in animal digestion. However, saponins are often bitter to taste, and so can reduce plant palatability (e.g. in livestock feeds), or even imbue them with life-threatening animal toxicity (Skene and Philip, 2006). These properties bestow high medicinal activities on the extracts of the three species.

Terpenes and terpenoids are the primary constituents of essential oils of many types of plant and flowers. Essential oils are used widely as natural flavour additives for food, as fragrances in perfumery, and in traditional and alternative medicines such as aromatherapy (Glenn, 1993). Terpenes have a unique antioxidant activity in their interaction with free radicals (Prakash and Kumar, 2011). The presence of terpenes in the three species can support their use as an antioxidant. Flavonoids have been shown to have anti-bacterial, anti-inflammatory, anti-allergic, anti-mutagenic, anti-viral, anti-neoplastic, anti-thrombotic and vasodilatory activity (Alan and Miller, 1996, Akindahunsi and Salawu, 2005, Sparg *et al.*, 2004). The leaves of plants can equally be applied in such cases. It also suggests that the plant might have diuretic properties (Jayvir *et al*., 2002). They also show tumour inhibiting activity on animals (Akindahunsi and Salawu, 2005). Alkaloids are chemical constituents from plants that can work on the nervous systems of the human body, and used as analgesic because they are capably of relieving pain. They have bactericidal and anti-spasmodic effects and can be used in the manufacture of sedatives, or can be used to achieve the same effect when given in the natural state (Trease and Evans, 1989 and Stray, 1998). *Ipomoea batatas* possessed this constituent and it suggests that the plant might have bactericidal properties.

Cardiac glycosides are primarily used as therapeutic which involves the treatment of cardiac failure. Their utility results from an increased cardiac output by increasing the force of contraction (Digoxin, 2012). Cardiac glycosides were detected in the extract of *I. triloba* and *I. batatas* and this compound could be useful in the treatment of asthma (Trease and Evans, 2002).

Anthraquinones was present in *Ipomoea triloba* and the occurrence in this plant is an indication that it is an anti-oxidant, anti-microbial, antiviral, hypotensive, analgesic, laxative, anti-malaria, and anti-tumor activities (Dermirezer *et al*., 2001, Trease and Evans, 1989).

Proximate analysis is an important parameter in setting standard for crude drugs (Trease and Evans, 2002). However, the values of solvent extractives can be a means of providing preliminary information on the quality of the drug. The results of the moisture content in *Ipomoea triloba, Ipomoea batatas* and *Ipomoea involucrata* that was not high indicate less chances of microbial degradation of the drug during storage because excess moisture can result in the breakdown of important constituents by enzymatic activity and as a result may encourage the growth of yeast and fungi during storage (African Pharmacopoeia, 1986). The general requirement for the moisture content in Crude drugs was that, it should not be more than 14%, since it was normal, and implies that the plants can be stored for a longer period with lower chances of microbial attack and growth. The total ash value (%) was 1.0, 1.5 and 1.9 for *Ipomoea triloba, Ipomoea batatas* and *Ipomoea involucrata* respectively; this implies that the plant has normal complexes of inorganic and organic compound (British Pharmacopoeia, 1980). These low content for the three species indicate low contamination when stored and implies that the plant has low inorganic components probably as salts or complexes and a high organic component.

The protein content is relatively low in *Ipomoea batatas* (7.30%) than in *Ipomoea triloba* (10.80%) and *Ipomoea involucrata* (7.99%) but it can contribute to the formation of hormones which controls a variety of body functions such as growth, repairs and maintenance of body protein (Mau *et al.,* 1999). This is not in agreement with Antia *et al*. (2006). The presence of protein in *I. batatas* corroborates with Hiroshi *et al*. (2000), Ifon and Bassir (1979). The fat content of *Ipomoea involucrata* (5.0%) was higher than that of *Ipomoea triloba* (2.1%) and *Ipomoea batatas* (3.1%) and the beneficial effect of high fat content can be used for storage and transport forms of metabolic fuel. Also, high fat content can be exploited for nutritional advantage in health (Omode *et al.,* 1995). The crude fibre content of *Ipomoea involucrata* (29%) was higher than that of *Ipomoea triloba* (20%) and *Ipomoea batatas* (22%). The crude fibre helps in the prevention and treatment of diseases such as obesity, diabetes, cancer and gastrointestinal disorder (Saldanha, 1995). There is also evidence that dietary fibre improves glucose tolerance and is therefore benefitial interesting maturity pre-set diabetes (Olusanya, 1991). The presence of crude fibre in *I. batatas* corroborates with Hiroshi *et al*. (2000), Ifon and Bassir (1979). High dietary fibre speeds up the passage of fasces through the large intestine and reduces the risk of cancer of the colon (Mazur and Harrow,

1971). The carbohydrate content was higher in *Ipomoea batatas* (64%) than in *Ipomoea triloba* (60%) and *Ipomoea involucrata* (55%). The relatively high carbohydrate content can be used as energy sources and also it is necessary in the digestion and assimilation of other food and it will reduce the rate of energy malnutrition in the society, if freely available for consumption.

The anti-nutritional contents include phytate acid, tannic acid and oxalic acid. Oxalate can complex with most essential trace metals therefore making them unavailable for enzymatic activities and other metabolic activities. Oxalate reduces assimilation of calcium, favouring the formation of renal calculi (Faboya, 1990). Tannic acid has been found to have anti-bacterial, anti-ceptic, astringent, anti-ulcer and anti-viral properties (Moerman, 1998). Phytate acid has complicated effect in human system including indigestion of food and flatulence (Maynard, 1997). The anti-nutrients is also in agreement with the work of Osagie (1998).

CONCLUSION

The analysis of this research works; *I. triloba, I. batatas* and *I. involucrata* have been distinguished on the basis of phytochemical screening, quantitative evaluation and nutritional analysis. The presence of secondary metabolites such as saponins, tannins, flavonoids, alkaloids, terpenes, cardiac glycosides, and anthraquinones, proteins, fats, fibre and carbohydrates are of great importance as a source of new useful drugs. From these studies, it can be concluded that all three species of *Ipomoea* have many beneficial effects with respect to the presence of the above secondary metabolite which are likely to combat with many disease and also boost the immune system. However, the phytochemical characterization of the extracts, the identification of responsible bioactive compound and quality of standards are necessary for future study.

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