

Phytochemical And Physicochemical Properties Of Leaves Of *Hewittia Malabarica* (L.) Suresh

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ABSTRACT

Studies were carried out on the leaves Hewittia malabarica (L.) Suresh. The leaf extracts were analysed for phytochemical composition, quantitative evaluation, nutritional and anti-nutritional properties. The phytochemical screening for bioactive components revealed the presence of alkaloids, tannins, saponins and flavonoids. Combined anthraquinones was found in trace while free anthraquinones and cyanogenic glycosides were not detected. Proximate analysis revealed that moisture content of the plant to be 0.65%, total ash was 6.54%, crude fibre 8.33%, crude protein 12.71% , lipid 3.52%, carbohydrate of 67.22% and caloric value of 351.42 Kcal. The anti-nutrients were hydrogen cyanide (2.01mg/100g), phytic acid (1.10 mg/100g), oxalic acid (0.05 mg/100g) and tannin (5.0 mg/100g), the non-volatile ether extract was 0.90% and volatile ether extract 99.10%. The results of this study showed the substances responsible for the health related properties of the plant and its usage in traditional medicine as well as in human nutrition.

Keywords: *Hewittia malabarica*,

phytochemicals, Leaves, anti-nutrients,

nutrients.

INTRODUCTION

The use of plants as medicines predates written human history. Ethnobotany is recognized as an effective way to discover future medicines. In 2001, researchers identified 122 compounds used in modern medicine which were derived from ethnomedical plant sources, 80% of these have had an ethnomedical use identical or related to the current use of the active elements of the plant (Fabricant and Farnsworth, 2001). More than two thirds of the world's plant species, at least 35,000 of which are estimated to have medicinal value comes from the developing countries. Phytochemical screening is the study of plants to discover medicinal benefits. Phytochemicals are naturally occurring chemical in plant that provides flavor, colour, texture and smell. Phytochemicals have potential health effects, as they may boost enzymes production or activity which may in turn block carcinogens (Meskin, 2002).

Many herbs have shown positive results in-vitro, animals model or small-scale clinical tests, while studies on some herbal treatments have found negative results. In a 2010 survey of 1000 plants, 356 had clinical trails published evaluating their pharmacological activities and therapeutic applications while 12% of the plants, although available in the Western Market, had no substantial studies of their properties (Cravatto *et al.*, 2010). Wink (2009) stated that a typical feature of Plant

secondary metabolites is their storage in relatively high concentrations, sometimes in organs which do not produce them or as inactive prodrugs that are enzymatically activated in case of danger. As a consequence of the pharmacological properties of secondary metabolites, several of them are used in medicine to treat disorders and infections. Tapsell *et al.* (2006) recorded that chemical compounds in plants mediate their effects on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in terms of how they work. This enables herbal medicines but also gives them the same potential to cause harmful side effects. Mlambo (2008) reported that during extraction of the leaves of *H. malabarica* using several methods and solvents. Results of the entire plant of *H. malabarica* showed that saponins were present in the plant. Other secondary metabolites such as Alkaloids, anthraquinones, cardiac glycosides, flavonoids and tannins showed a negative result or weren't identified when the entire plant (Roots, stem and leaves) was screened. The leaves are said to be eaten in the Mombasa area of Kenya. Onitsha Igbo rub the leaves onto sores. A root decoction is drunk in the republic of Tanzania for Oxyuris thread worm (Ken, 2012). *H. malabarica* is one of the plants being used to treat wounds traditionally (Mwangazi, 2012). The present investigation was aimed at the evaluation of phytochemical and physicochemical properties of the leaves of *Hewittia malabarica* (L.) Suresh.

MATERIALS AND METHODS

Collection and Identification of Plant

Material

The leaves of *Hewittia malabarica* were collected from a farmland in Ete, Ikot Abasi Local Government Area of Akwa Ibom State on 12th July, 2013. The plant was 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 70% 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°C 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 was determined by weight loss on drying method (African Pharmacopoeia, 1989). The ash value, acid insoluble ash, water-soluble ash and sulphated ash were determined as described by British Pharmacopoeia (1980), African Pharmacopoeia (1989). 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 as 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

Phytochemical screening of *H. malabarica* leaves revealed the presence of Alkaloids, saponins and tannins in abundant quantities. Flavonoids was moderately present, while combined

anthraquinone and phlobatanins were found in trace. There was total absence of free anthraquinone and cyanogenic glycoside (Table 1). The leaf powder was screened to determine the percentage of moisture content, total ash, acid insoluble ash, alcohol extractive value as well, water extractive, value, volatile ether soluble extractive and non-volatile ether soluble extractive value (Table 2). The nutritional analysis of the leaves of *H. malabarica* gave (12.72%), lipid (3.52%), carbohydrate (67.23%) and Energy value of 351.42 Kcal (Table 3). The anti-nutritional analysis of the leaves were hydrogen cyanide (2.01mg/100g), phytic acid (1.10mg/100g), oxalic acid (0.05mg/100g) and tannins (5.0mg/100g) respectively (Table 4).

Table 1: Results of the Phytochemical Screening of the Ethanolic of *H. malabarica* Leaves

Compound	Test	Observation	Inferences
Alkaloids	Dragendroff	A Reddish brown colour was observed and indicated the presence of alkaloid	+++
Flavonoids	Shinoda test	Orange of red colour was observed, indicating the presence of flavonoids	++
Anthraquinones (Free)	Frothing test	A clear solution was observed which showed the absence of anthraquinones	ND
Saponins	Ferric chloride test	Frothing observed when shaken and persisted for more than 10minutes which indicated the presence of saponins	+++
Tannins	Ferric chloride test	A blue black colour was observed, indicating the presence of tannins	+++
Phlobatannins		A formation of reddish precipitate was observed	+
Cyanogenic glycoside	ND	ND	ND

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

Table 2: Results for the Quantitative Analysis of *H. malabarica* Leaves

Parameter	Percentage (%)
Moisture content	0.65
Acid insoluble ash	0.0224
Alcohol extractive value	1.97
Water extractive value	8.27
Non-volatile ether soluble extractive value	0.90
Volatile ether soluble extractive value	99.10

Table 3: Results of Nutritional Analysis of *H. malabarica* Leaves

Ash (%)	Fibre (%)	Protein (%)	Lipid (%)	CHO (%)	Caloric value (Kcal)
6.54	8.33	12.71	3.52	67.22	351.42

Table 4: Results of the Anti-Nutrient Analysis of *H. malabarica* Leaves

Parameters	(mg/100g)
HCN (Hydrogen cyanide)	2.01
Phytic acid	1.10
Oxalic acid	0.05
Tannin	5.0

DISCUSSION

The extraction method used was maceration, which yielded least as compared to alcohol to method which could have yielded the most as stated by Mlambo (2008). This is safe when considering the usage as a drug since

traces of alcohol in the body could be toxic to the normal body physiology. The phytochemical screening revealed that *H. malabarica* leaves contain abundant quantities of alkaloids. Alkaloid is one of the major plant constituents of medicinal importance (Essiett *et al.*, 2011). It has been reported that the presence of

alkaloids in plant parts serves as a feeding repellent and toxin to herbivores since it directly interacts with special molecules at sites within the nervous system (Harborne, 1993 and Wink, 2009).

Tannins were in abundance and this does not agree with Mlambo (2008) where it was absent. The presence of tannin in the leaves of the plant supports its usage in ulcers and wound cut to accelerate their healing. Tannins are also among the class of secondary metabolites that bear great nutritional values. Foods rich in tannin can be used in the treatment of heredity hormones chromatists, a heredity disease characterized by excessive absorption of dietary iron, resulting in a pathological increase in total body iron stores (Berkow, 1992). Tannins have shown potential antiviral, antibacterials and antiparasitic effects (Liu *et al.*, 2004; Akiyama *et al.*, 2001; Kolodiez and Kiedeslen, 2005).

Saponins were found in high concentration and this agrees with Mlambo (2008) where saponin was in traces. Saponins are a class of chemical compounds, one of the many secondary metabolites. It is used in complexation with cholesterol to form pores in cell membrane where complexation leads to red blood cell lysis on intravenous injection (Francis *et al.*, 2002). This suggests that the plant can be used for internal wound healing. Saponins also serve as a surfactant that can be used to enhance penetration of macromolecules such as protein through cell membranes (Xu *et al.*, 1996). Saponins have also been used as pharmacological or immunological agent that modifies the effect of other drug or vaccine.

The presence of flavonoids in moderate amount shows that it can be useful in the production of anti-microbial, anti-parasitic, anti-allergy, anticancer and anti-inflammatory drugs. Flavonoids are the most common group of polyphenolic compounds in the human diet. Preliminary research indicates that flavonoids may

modify allergens, viruses and carcinogens and so may be biological “response modifiers” (Schuier *et al.*, 2005).

The proximate analysis is directly related to stability of drugs which directly affect drug action and drug effects. Drug solubility has its own importance in pharmaceuticals and medical sciences because specific, non-specific and physicochemical interactions like lipid solubility, osmolarity membrane penetration of drugs etc depend on these results. These results directly hamper the drug effect, drug activities, stabilities of drug and drug potency, also the side effects of the drug depends upon transport of drug across cell membranes and through blood in the body (Rajesh *et al.*, 2012).

Free anthraquinones were absent while combined anthraquinones were found in traces. Anthraquinones are a class of natural compounds that differ in the nature and positions of substituent groups (Shripsema *et al.*, 1999). This class of compounds contain derivatives that consist of the basic structure of 9, 10 anthraquinone (Bajaj *et al.*, 1999). Anthraquinones are widely applied in medicine, food and dye industry. The natural and synthetic derivatives of 9, 10 anthraquinones are beneficial to mammals as they can display antibacterial, antitrypanosomal and antineoplastic activities (Heyman *et al.*, 2009; Tarus *et al.*, 2002). Studies have shown that the substances aid digestion, reduce inflammation in arthritis patients and also inhibit the growth of cancer cells.

Phlobatanins were found in traces. Phlobatanins and other secondary metabolites in leaves extract of *Voacanga africana* and *Prosopis africana* suggested the use in the concoction of “Nimoalasis” in the remediation of body pains, rheumatism, insomnia and headache (Aina and Wada, 2012). Okwu (2001) stated that steroidal compounds such as phlobatanins and steroids are of importance and interest in pharmacy due to their relationship with such compounds as sex hormones. This

suggest that the plant can be used for such purpose. The ash content was 6.54% which is low. The accepted ash range is 22% for a plant to be used as drug (British Pharmacopoeia, 1980). Ash is the inorganic residue remaining after water and organic matter have removed by heating, which provides a measure of the total amount of minerals within the plant. Minerals are not destroyed by heating and they have very low volatility as compared to other plant components (Arulpriya and Lalitha, 2013). Ash value gives us an idea of the mineral matter contained in a plant. Measuring it is essential, because mineral matter might be a cause for pharmacological effect (Lethika *et al.*, 2002). It should be noted that high ash content will lower the amount of active ingredients.

The quantitative analysis also showed that the leaves of *H. malabarica* contain low acid insoluble ash. Acid insoluble ash indicates the amount of silica present in a given sample. The low acid insoluble ash value indicates that it will be easily absorbed as drug by the body in the presence of gastric enzymes which are acidic.

Conclusion

The phytochemical screening showed that leaves of *H. malabarica* contain Alkaloids, tannins flavonoids and saponins. The nutrient value shows that appreciable amounts of carbohydrate and protein are present in the plant. It is low in fibre and lipid content. It should be noted that the moisture content of the leaves is considerably high and should be reduced to make it effective when using as medicine, as well as to avoid microbial spoilage. It contains moderate amount of hydrogen cyanide and low oxalic acid as anti-nutrients therefore it is safe for usage.

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