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Phytochemical and physicochemical analysis of the leaves of *Laportea aestuans* (Linn.) Chew and *Laportea ovalifolia* (Schumach.) Chew (male and female)

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ABSTRACT

Phytochemical and physicochemical analysis of the leaves of Laportea aestuans and Laportea ovalifolia (male and female) leaves are for the treatment of urinary problems, diabetes, asthma, stroke, kidney problems and pain in Nigeria and other countries were investigated. Chemomicroscopic of the powdered leaves revealed the presence of protein, starch, calcium oxalate crystals, mucilage and tannins. Phytochemical screening revealed the presence of saponins, tannins, flavonoids, phlobatanins, alkaloids and cardiac glycosides (Salkowski's and Keller killiani test) while anthraquinones and cardiac glycosides (Lieberman's test) were completely absent in all the two species and quantitative evaluation gave the moisture contents is (12.73%) in L. aestuans, (12.2%) in L. ovalifolia (male) and (11.8%) (female), ash contents are (14.44%) in L. aestuans, (20%) in L. ovalifolia (male) and (17.2%) in L. ovalifolia (female) and insoluble ash of (1.52%) in L. aestuans, (3.99%) in L. ovalifolia (male) and (1.88%) (female). The results suggest that each of the species is highly distinct from each other.

Keywords: *Laportea aestuans, Laportea ovalifolia* Physicochemical analysis, Phytochemistry, Leaves and Urticaceae.

INTRODUCTION

Plants have provided man with all his needs in terms of shelter, clothing, food, flavours and fragrances. Plants have formed the basis of system among traditional medicine which has given rise to some important drugs still in use today. Many ancient nations have awakened to the importance of herbal medicine which brings more cures [1]. The existence and use of plants to treat diseases are as old as man. Man's dependence on plant has in no way decreased, yet there are comprehensive documentations of the plants, exploited for their medicinal uses in some parts of the plants such as leaves, stem and root. The decoctions of these plants are used in the

treatment of some diseases such as urinary problems, diabetes, asthma, stroke, stomachache, hypertension, diarrhea and wounds [2].

Since in the beginning of human civilization, people have used plants as medicine perhaps as early as Neanderthal man, plants were believed to have healing power [3]. The traditional Society in Africa and else where have always used herbs to promote healing [4]. Traditional medicine can be described as the total combination of knowledge and practices, whether explicable or not, used in diagnosing, preventing, or eliminating a physical, mental or social disease and which may rely executively on past experience and observation handed down from generation to generation, verbally in writing [5].

Even today, traditional medicine is still the predominant means of health care in developing countries where about 80% of their total population depends on it for their well being [6, 7]. Plants are the basis for the development of modern drugs and medicinal plants have been used for many years in daily life to treat disease all over the world [2, 5, 8, 9]. However, the knowledge of medicinal plant is rapidly dwindling due to the influence of Western lifestyle, reducing in number of generations to carry on the use of plant species in traditional medicine which has increased the interest throughout the world [10]. World health organization estimates that 70% of populations from many countries are using traditional or folk medicine to cure various ailments [5]. *Laportea aestuans* (Linn.) Chew, and *L. ovalifolia* (Schumach.) Chew (male and female) are perennial and annual herbs and sometimes grown to a climber native to Africa is one of the medicinal species with active function and therapeutic agents [11, 12].

The genus *Laportea* Gaud. is an element of the family Urticaceae which is composed of 22 species. It is a predominant old world genus two species have so far been reported for Southern Nigeria [13] and the two species are *Laportea aestuans* (Linn.) Chew and *Laportea ovalifolia* (Schumach.) Chew (male and female) which were formerly called *Fleurya aestuans* (Linn.) Miq. and *Fleurya ovalifolia* (Schumach. and Thonn.) Dandy which was found in certain Taiwan and Southern Nigeria that provides the additional species distribution and photographs to aid in identification [14, 15].

L. ovalifolia are of two varieties such as *L. ovalifolia* (male and female). Since they are related species, they have the same characters but different in structure [16]. *L. ovalifolia* (male) have big leaves and (female) possess small leaves. *L. ovalifolia are* herbaceous weed but more often creeping than erect which densely covered with stinging hairs scattered. The perennial stems are cylindrical, greenish to sometimes reddish or brownish in colour often prostrate with erect shoots [13]. *Laportea aestuans* is an annual herbaceous weed around waste places. The stem is often erect, angular, covered with pilose hair or stinging hairs and green in colour[17].

L. aestuans and *L. ovalifolia* are of economical importance in Nigeria, the leaves of *L. ovalifolia* are used as a harmostatic on cuts and wounds as an anti-irritant, whereas the fruits are used as a poison antidote [18]. In Gabon, the cooked leaves of *L. aestuans* are eaten as a remedy for stomach-ache and cooked with peanuts, which they are given to pregnant women [19]. In Cameroon, the fresh leaves of *L. ovalifolia* are taken to relieve headache. The leaves are used as a diuretic to cure for blenorrhoea and chest problems and also as a fish poison [20]. According to [17] an infusion prepared of *L. aestuans* by soaking leaves in water is taken to deliver the

placenta after child birth and the root infusion of *L. ovalifolia* boiled in water are taken to prevent excessive menstrual bleeding [21]. Extract leaves of *L. aestuans* can be used to treat arthritis, enemia, hay fever, kidney problems and pain and this extract contains active compounds that reduce pro-inflammatory cytokines [2].

The aim of this research paper is to establish the chemical constituents of the leaves which would eventually be useful in preparing a monograph on the plant for its identification. The significance of the study is to prove that *L. aestuans* and *L. ovalifolia* have various therapeutic uses for the synthesis of drugs and medicinal plants.

Medicinal plants are plants that established pharmacological activity. And also a substance that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs [10].

*L. aestuan*s and *L. ovalifolia*, leaves, roots and the whole plants are used to cure internal ulcers, diabetes, bronchitis and filariasi. [22]. In Nigeria, *L. aestuans* are used in urinary problems while *L. ovalifolia*, when the leaves decoction are mixed with the leaves commonly called mmeme (*Justicia schimperi*), then add ndoroenyung (*Viscum album*) and also add Iko (*Lagenaria siceraria*) the whole leaves were all cut and dry for some days, mixed the 4 (four) leaves together used 3 (three) teaspoon into 4 (four) liters of water and boiled for 10 minutes and when cool drink two times a day after meal to cure stroke, rheumatism, swelling, diabetes [23].

The people of Ibibio tribe in Nigeria used the leaves and tender shoots of the plant as pot herb or vegetables in soups. Some household use the plant as vegetables when preparing food for babies especially *L. ovalifolia* [19]. Several studies have been shown that nettles have been used to treat many infections. When administered for 30 minutes before glucose loading extract of stinging nettle (*Laportea ovalifolia*) showed a strong glucose lowering effect. The effect helps to reduce intestinal glucose absorption[24]. *L. aestuans* as a pot herb vegetables in soups and the leaves are air dried, finely shredded which are taken as tea per se and to assuage asthma attack and the local fowls peck it a lot [19].

Several authors have discussed the therapeutic components of medicinal plants [19, 21, 25, 26, 27, 28, 29] and can be found in several parts of the plants. The major plant constituents of medicinal importance are phenolic derivatives, glycosides, alkaloids, flavonoids and saponins etc. Aqueous extract of aerial parts of *L. aestuans* and *L. ovalifolia* (male and female) by [30] revealed the presence of saponins, tannins, flavonoids, cardiac glycosides, alkaloids and also revealed the absence of anthraquinones and Lieberman's test [31].

MATERIALS AND METHODS

The fresh leaves and of *L. aestuans* and *L. ovalifolia* (male and female) was collected on October, 2010, from a farmland in Mbikpong Atai village in Ibesikpo Asutan Local Government Area of Akwa Ibom State. Using the methods below: Cold extraction was carried out on the materials, which was later concentrated to dryness in vacuo at 40^0C. the dry extract was subjected to phytochemical screening according to the methods of [21, 32].

Microscopical Examination

The powdered and transverse sections of the leaves were employed for this study; to carry out quantitative and qualitative studies, using the methods employed [33]. Chemomicroscopical examination was carried out to detect the presence or absence of various chemical compounds such as starch, protein, lignin, mucilage and calcium oxalate crystals.

Quantitative microscopy

The moisture content of the powdered leaves was determined by loss on drying method [34]. The ash value and acid insoluble ash were determined as described by [35].

Phytochemical Screening

Procedures were carried out using the method of [32, 36,] this analysis determines the biologically active non-nutritive compounds that contribute to the flower, colour and other characteristics of plant parts.

RESULTS

Phytochemical Screening

Phytochemical screening of *L. aestuans* and *L. ovalifolia* (male and female) revealed the presence of saponins, tannins, flavonoids, phlobatanins and cardiac glycosides (salkowski and keller killiani test) and anthraquinones and cardiac glycosides (Lieberman's test) was absent (Table 1) and the chemo-microscopy of the studied species also revealed the presence of protein, starch, lignin, mucilage, calcium oxalate crystals and tannins (Table 2). The quantitative evaluation of the powdered leaves of *L. aestuans* and *L. ovalifolia* (male and female) are also showed in (Table 3).

Table 1: Results of Phytochemical Screening Metabolites in Leaves of *L. aestuans and L. ovalifolia* (Male and Female)

No	Metabolites	Inferences		
		L. aestuans	***L. ovalifolia* (male)**	***L. ovalifolia* (Female)**
1	**Saponins** Frothing test Sodium biocarbonate	 ++ ++	 +++ +++	 +++ +++
2	Tannins	+++	++	++
3	Phlobatanins	+++	+	+
4	Flavonoids	+++	+++	+++
5	Alkaloids	+	+	+
6	Anthraquinones	-	-	-
7	**Cardiac glycosides** (a) Salkowski test (b) Keller killiani test (c) Lieberman's test	 +++ +++ -	 +++ +++ -	 +++ +++ -

\- *Absent*
\+ *Traces*
++ *Moderately present*
+++ *Abundantly present*

Table 2: Results of Chemo-microscopy of the Leaves of *L. aestuans* and *L. ovalifolia* (male and female)

No	Test Reagent	Observations	Inferences		
			L. aestuans	***L. ovalifolia* (male)**	***L. ovalifolia* (Female)**
1	1% of picric acid	Yellow colour solution was observed	(+) Protein	(++) Protein	(++) Protein
2	50% Iodine solution	Blue black spot was observed	(+++) Starch	(+++) Starch	(+++) Starch
3	Phlorglucinol + Conc. HCl	Red colouration on the fibres of Xylem and phloem tissue	(++) Lignin	(+) Lignin	(+) Lignin
4	80% H_2SO_4	Bright crystal disappeared on the addition of reagents	(+++) Calcium oxalate crystals	(+++) Calcium oxalate crystals	(+++) Calcium oxalate crystals
5	Sudan III	Light red colouration was observed	(++) Mucilage	(++) Mucilage	(+++) Mucilage
6	5% Ferric chloride solution	Greenish black colouration in the epidermal cells and parenchyma cells	(+++) Tannins	(++) Tannins	(++) Tannins

\+ *Traces*
++ *Moderately present*
+++ *Abundantly present*

Table 3: Results of Quantitative Evaluation of the Leaves of *L. aestuans* and *L. ovalifolia* (male and female)

No	Evaluation Parameters	Values (%w/w)		
		L. aestuans	*L. ovalifolia* (male)	*L. ovalifolia* (female)
1	Moisture content	12.73	12.2	11.86
2	Ash content	14.44	20.0	17.2
3	Acid insoluble ash	1.52	3.99	1.88

DISCUSSION

Chemo-microscopical results revealed the presence of phenolic compounds which are known to possess antidote and antimicrobial activities which could justify the use of the plant in ethnomedicine. The phytochemical screening revealed the presence of various bioactive compounds such as saponins, tannins, flavonoids cardiac glycosides (salkowski and keller killiani test) are the basis of therapeutic potential of medicinal plants and the compounds as astringent action of tannins which makes the plants useful in the treatment of diabetes, rickets and saponins that is responsible for its antiyeast, antifungal, antidote, antimicrobial and antiflammatory activities that believed the roles of saponins in plants is to protect against attack by potential pathogen [37, 38]. Cardiac glycosides were detected in the extract and this compound has been useful in the treatment of asthma [32]. The presence of these compounds in *Laportea* species confirms their usefulness to traditional medicine practitioners for their antibiotic properties. Flavonoids elicit a wide of therapeutic activities as antihypertensive, antirheumatism as well as antimicrobial as identified with flavonoids [39] that many plant containing flavonoids are diuretic and the antioxidants, the leaves and stem of these plants can be equally applied in each cases, flavonoids helps in health promoting disease preventing dietary compound which can recognize that diets rich in vegetables appears to be associated with reduced frequency of cancer of various organ system [40, 41].

The quantitative evaluation is an important parameters in setting standard for crude drugs [32]. 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 *L. aestuans* and *L. ovalifolia* (male and female) that was not high indicates less chances of microbial degradation of the drug during storage, because the excess moisture can results in the breakdown of important constituents by enzymatic activity and which may encourage the growth of yeast and fungi during storage [34]. As such the moisture contents of 12.73%, 12.2% and 11.86% in *L. aestuans* and *L. ovalifolia* (male and female). 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 14.44%, 20% and 17.2% in *L. aestuans* and *L. ovalifolia* (male and female), since the accepted range was 22%, which implies that the plants has normal complexes of inorganic and organic component [35]. The high ash content is a reflection of the mineral contents preserved in the food materials. The result therefore suggests a high deposit of mineral elements in the leaves [42] but the value of the acid insoluble ash are 1.52%, 3.99% and 1.88% in *L. aestuans* and *L. ovalifolia* (male and female) which implies that the normal acid insoluble ash has a portion of the ash contents which was acid soluble and hence may be physiologically important as salts in the body when consumed. It is also indicative of high digestibility of the plant when eaten [43] since all these values are within the accepted range it could also aid in proper identification and collection of plants.

CONCLUSION

The present studies revealed that these leaves may lend credence to its use for therapeutic potentials claimed by traditional medicine practitioners which includes asthma, hypertension, rheumatism, rickets and wounds effect. As a result, several types of drugs could be produced from these plants as antidote and antibiotic drugs. The biotic agents contents in the leaves show medicinal values to man and edible as fodder to piggery.

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