Phytochemical and Elemental Analysis of *Acalypha wilkesiana* Leaf

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ABSTRACT: Phytochemical and Elemental determination of *Acalyphy wilkesiana* was conducted. The result of the Phytochemical analysis of the aqueous leaf extract of *A. wilkesiana* revealed a high presence of carbohydrates, Tannins and Flavonoid, a moderate presence of Phlobatannins, Saponins. Alkaloids and Cardiac glycosides and minute quanity of Terpenes and Steroids. Anthraquinone derivatives was not present. The Elemental analysis showed presence of chloride, sodium, potassium, calcium, iron, magnesium, zinc copper and mangenese in moderate quantity while cadmium and lead were not detected. It is therefore concluded that the aqueous leaf extract of *A. wilkesiana* contains Pharmacologically useful active principles elements. Thus the aqueous leaf extract of the plant could play vital roles in health and disease.
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Key words: *Acalyphy wilkesiana,* aqueous leaf extract , Phytochemical analysis, Elemental analysis

INTRODUCTION

Acalypha wilkesiana Muell Arg (copper leaf) is a plant from the family Euphorbiacaece. The genus Acalypha comprises about 570 species (Riley, (1963), a large proportion of which are weeds while the others are ornamental plants. The plants are found all-over the world especially in the tropics of Africa, America and Asia. The weeds are wild and can be found growing everywhere, while the ornamental species must have been introduced into West Africa from other parts of the world and are cultivated as foliage plants in gardens and greenhouses (Abiodun, (2005). It's a fast growing evergreen shrubs which provides a splash of colour in the landscape with bronze red to muted red, the leaves appear as heart shaped with combination of colour like green, purple, yellow, orange, pink or white depending on cultivation.

Some of the species are well known in traditional medicine and a few have actually appeared in the homeopathic pharmacoploeia of United States (1941) and India (1971). *A. wilkesiana* was reported to be used in the treatment of hypertension, especially in Managing the abnormal sodium and potassium metabolism that accompany hypertension (Ikewuchi et al, 2005).

However few studies have mentioned the phytochemical constituents and elemental studies of *A. wilkesiana*. Akinde (1986) reported the presence of sesquiterpense, monoterpenes, triterpenoids and polyphenols. Adesina *et al* (2000) reported the presence of gallic acid, corilagin, geranin, quercentin, 3-0-rutinoside and Kaempferol in the leaves of *A. wilkesiana*.

In another study, Oladunmoye (2006) reported the presence of saponins, tannins, anthraquinan and glycoside in the leaves of *A. wilkesiana*. *A. wilkesiana* has antibacterial and antifungal properties (Akinde, 1986, Alade and Irobi, 1993; Adesina et al, 2000, Ogundaina 2005, Oladunmoye 2006).

The leaves of *A. wilkesiana* are popularly used in the north eastern Africa in the treatment of skin infections. This study is therefore designed to investigate the phytochemical and elemental constituent of *A. wilkesiana* obtained from Maiduguri, Nigeria.

MATERIALS AND METHODS

Plant collection and identification

Fresh leaves of *A.wilkesiana* were collected in the month of June from University of Maiduguri staff quarters. It was identified and authenticated by a botanist from the Department of Forestry, University of Agriculture Markurdi, Benue State. The Plant was then air dried under room temperature for two weeks after which it was pulverized using wooden mortar and pestle.

Aqueous Extract Preparation

The powdered sample (200g) was mixed with 1 litre of distilled water in a round bottom flask. A reflux condenser was attached to the flask and inserted with a heating mantle. The mixture was reflux for one hour and filtered with Watman filter paper No. 1. The reflux was done twice again using new distilled water at each stage. The filtrate was then evaporated to dryness using oven at 50^0C to a dark viscous substance. The yield was 22.85% w/w.

The resultant extract was concentrated *and* stored in a specimen bottle at room temperature until used.

Determination of the Phytochemical constituent

The extract was evaluated for the presence of Carbohydrate, tannins, flavonoids, phlobatannins, cardiac glycosides, saponins, alkaloids, terpenes, steroids and anthraquinone using simple qualitative and quantitative methods of Trease and Evans (1989) and Sofowora (1993)

Determination of the elemental constituent of *A.wilkesiana* leaf.

Air dried sample (15grams) of *A. wilkesiana* was put in a labeled crucible and heated in a hotspot furnace at 550^0C for 3 hours. The sample was removed and cooled in a dessicator. Half (0.5) gram of the ashed sample was digested in a250mls beaker with $20cm^3$ of aqua-regia (mixture of HCL and HNO_3 in a ratio 3:1) and 10 cm^3 of 30% H_2O_2 was added. The beaker was then covered with watch glass and heated on a hot plate at 90^0C for about 1 hour so that the volume is reduced to $2cm^3$ in Fume cupboard until a clear digest was obtained. The content was then filtered after cooling and deionized water added and made up to 100mls in volumetric flask. The elemental analysis was done using Sp-9-single beam atomic absorption spectrophotometer (Philip/pye Unicom Ltd, England). The elemental concentrations were determined by a standard calibration curve method (Sunderman, 1973; Kolthoff and Elving 1976).

RESULT

The result of the Phytochemical analysis obtained from the aqueous leave extract of *A. wilkesiania* indicated that carborhydrates, tannins and flavonoids were highly present in the extract. Phlobatanins, cardiac glycosides, saponins and alkaloids were present in medium quantity while terpenes and steroids occurred in minute quantity. Anthroaquinone were not present in the extract. (Table 1).

The result of the elemental analysis of the leave of *A. wilkesiana* showed a very high concentration of chloride, sodium and potassium ions. Calcium, iron, magnesium and zinc were in medium concentration while copper and manganese were in minute concentration. Lead and cadmium were not detected. (Table 2).

Table 1: Phytochemical constituents of *A. wilkesiana* aqueous leaf extract

	Chemical Components		Extract
1.	**Test for Carbohydrates**		
	i)	Molisch's test	+
	ii)	Barfoed's test-for monosaccharide	-
	iii)	Fetiling's test for free reducing sugar	+++
	iv)	Standard test for combined reducing sugar	++
	v)	Test for Ketones	+
	vi)	Test for Pentoses	-
2.	**Test for Tannins**		
	i)	Ferric Chloride test	+
	ii)	Formaldehyde Test	-
	iii)	Chlorogenic acid test	-
3.	**Test for Flavonoid**		
	i)	Lead acetate test	+++
	ii)	Sodium Hydroxide	-
	iii)	Ferric Chloride	+++
	iv)	Pew test	+++
4.	**Test for Saponins**		
	i)	Froth test	++
5.	**Test for Phlobatannins**		
	i)	Hydrochloride acid test	-
	ii)	Lime Water Test	++
6.	**Test for Cardiac glycosides**		++
7.	**Test for Alkaloid**		
	i)	With meger's reagent	+
	ii)	With Dragendorff's reagent	++
8.	**Test for Terpenes and Steroids**		

	i)	Lieberman – Burchard test -	+
	ii)	Salkowski's test	-
9.	**Test for Anthraguinone derivatives**		
	i)	Brontrager's test – to show the presence of free anthraquinone	-
	ii)	To show the presence of free and or combined anthraquinone	-
	iii)	To show the presence of anthraquinone derivatives In a reduced form which are not easily hydrolysed	-

Table 2: Elemental Concentration of *A. wilkesiana* Leaf

	Elements	Concentration Mg/L	WHO Standard Concentration Mg/L
1.	Chloride (Cl)	3550	-
2.	Sodium (Na)	2530	4 – 5
3.	Potassium (K)	390	0.1 - 1.0
4.	Calcium (Ca)	30.8855	360 - 800
5.	Iron (Fe)	9.6728	0.5 – 50
6.	Magnesium (Mg)	5.4068	-
7.	Zinc (Zn)	1.9787	15 - 50
8.	Copper (Cu)	0.4720	1 - 3
9.	Manganese (Mn)	0.0825	10 - 20
10.	Cadmium (Cd)	0.00	10 - 35
11.	Lead (Pb)	0.00	1 - 2

DISCUSSION

The Phytochemical test result indicated the presence of carbohydrate in the extract; carbohydrate is reported to have numerous roles in living things, such as the storage and transport of energy (starch, Glycogen) and structural components (cellulose in plants, chitin in animals). Additionally carbohydrates and their derivatives play major roles in the working process of the immune system, fertilization , pathogenesis, blood clotting and development (Maton *et a* ., 1993).

The presence of tannins in the aqueous extract of *A. wilkesiana* leaf implies that the extract can be pharmacologically useful as astringents. Tyler (1988) reported that the astringent activity of tannins is by precipitating proteins, thereby protecting the underlying tissue leading to improvement of wound healing.

Tannins inhibit microbial proliferation by denaturation of enzymes involved in microbial metabolism (Awosika, 1991). Tannins also have shown potential antiviral (stephone *et al*., 2004 and Lin *al et* .,2004), antibacterial (Akiyama *et al* .,2001and Funatogawa *et el*., 2004) antiparasitic and anticancer effects (Bhagavathi *et al*.,1999; Ling-lihy *et al*.,2000 and Susumu *et al*., 2005,) Tannins including gallo and ellagic acid (epigallitannins) are inhibitors of HIV replication. Flavonoids have been referred to as nature's biological response modifiers because of its ability to modify the body's reaction to

allergies, viruses, and carcinogens. They show anti-allergic, anti-inflammatory microbial and anti-cancer activity (Yamamato and Gaynor , 2002). However some research indicated that only small amount of flavonoids are necessary to see its medical benefits. Taking large dietary supplements provides no extra benefit and may pose some risks (David stauth, 2007). Cardiac glycosides have been used in the treatment of congestive heart failure, constipation, edema and microbial infections (Robinson, 1967 and Franstisk, 1991). It may be possible that the aqueous extract of *A. wilkesiana* could be useful in the treatment of this ailment since it contains cardiac glycoside.

In dogs and cats, cardiac glycosides are indicated for their negative chronotropic effect in supraventricular arrhythmias such as atrial fibrillation. They slow the rate of impulse conduction through the A.V. node and allow the ventricular rate to fall below the atrial and so restore more efficient pumping (Aliu, 2007). Saponins have expectorant properties which have been used in the treatment of upper respiratory tract infection (Trease and Evans, 1989). They also have antibacterial activities (Birk and Petri, 1980) thus have been used in the treatment of microbial infections.

Alkaloids are pharmacologically useful. They are the local anaesthetic, CNS stimulant (Cocaine, nicotine, coffiene, etc), analgesic e.g. Morphine and antimalarials e.g. guanine (httpillen. Whipedia.org/wiki/Alkaloid).

Steroids (anabolic steroids) have been observed to promote nitrogen retention in Osteoporosis and in animals with wasting illness (Aliu, 2007).

The result of the elemental analysis of the aqueous extract of *A.wilkesiana* indicated the presence of macro and micro nutrients. Macro nutrients such as sodium, potassium and calcium regulate the fluid balance of the body and thereby influence cardiac output (Sanni , 2007). Restriction of sodium intake or an increase in Potassium intake exert remarkable anti-hypertensive effect (Schroever , 1976). Calcium ions plays an important physiological and biochemical processes such as neuromuscular excitability blood coagulation, secretary processes etc (Sanni, 2007).

Proper extracellular fluid and periosteal concentration of calcium and phosphate ions are required for bone mineralization (Robert *et al.,* 2000).

Elements such as iron, zinc and manganese are essential because they are important in several enzyme reactions as co-factors (Robert *et al.,* 2000). Potassium has an oxidizing effect, it act as astringent and can destroy organic poisons especially alkaloids (Aliu, 2005).

CONCLUSION

This study shows that *A. wilkesiana* contains pharmacologically active principles and elements which are used extensively in chemotherapy and which are useful in health and disease in humans and animals. Therefore the aqueous extract of this plant could be of immense medicinal value.

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