Phytochemical and Elemental Analysis of *Acalypha wilkesiana* Leaf

*Madziga, H. A.*¹, *Sanni S.*² and *Sandabe U. K.*¹

¹Department of Veterinary Physiology, Pharmacology and Biochemistry, Faculty of Veterinary Medicine, University of Maiduguri, Nigeria. ²Department of Veterinary Pharmacology, University of Abuja, Nigeria.

**ABSTRACT:** Phytochemical and Elemental determination of *Acalypha 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, Sapopnin, Alkaloids and Cardiac glycosides and minute quantity 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.

**Key words:** *Acalypha wilkesiana*, aqueous leaf extract, Phytochemical analysis, Elemental analysis

**INTRODUCTION**

*Acalypha wilkesiana* Muell Arg (copper leaf) is a plant from the family Euphorbiaceae. 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 pharmacopoeia 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, geramin, quercentin, 3-O-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, Ogundainia 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.
RESEARCH ARTICLE

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°C 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°C 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 20cm³ of aqua-regia (mixture of HCL and HNO₃ in a ratio 3:1) and 10 cm³ of 30% H₂O₂ was added. The beaker was then covered with watch glass and heated on a hot plate at 90°C for about 1 hour so that the volume is reduced to 2cm³ 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. wilkesiana* 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. Anthraquinone 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 Flavonoids          |                   |
| i) Lead acetate test            | +++               |
| ii) Sodium Hydroxide            | -                 |
| iii) Ferric Chloride            | +++               |
RESEARCH ARTICLE

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 Anthraquinone 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

<table>
<thead>
<tr>
<th>Elements</th>
<th>Concentration Mg/L</th>
<th>WHO Standard Concentration Mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride (Cl)</td>
<td>3550</td>
<td>-</td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>2530</td>
<td>4 – 5</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>390</td>
<td>0.1 – 1.0</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>30.8855</td>
<td>360 – 800</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>9.6728</td>
<td>0.5 – 50</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>5.4068</td>
<td>-</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>1.9787</td>
<td>15 – 50</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>0.4720</td>
<td>1 – 3</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>0.0825</td>
<td>10 – 20</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>0.00</td>
<td>10 – 35</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>0.00</td>
<td>1 – 2</td>
</tr>
</tbody>
</table>
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 al., 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 et al.,2004), antibacterial (Akiyama et al.,2001and Funatogawa et al., 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 (Yamamoto 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 staught, 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, caffeine, etc), analgesic e.g. Morphine and antimalarials e.g. guanine (http://en.wikipedia.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 (Schroover, 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.

REFERENCE
RESEARCH ARTICLE


Homeopathic Pharmacopoeia of India (1971) Vol. 1 Pg. 33


