



CHEMICAL PROFILES OF LEAF, STEM AND FLOWER  
OF *THEVETIA PERUVIANA* (PERS.) K. SCHUM

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ABSTRACT

*Thevetia peruviana* (Pers.) K. Schum belong to the family Apocynaceae. The leaves, stems and flowers of *T. peruviana* were investigated for phytoconstituents, quantitative evaluation, nutritional values and antinutrient. Phytochemical screening revealed the presence of alkaloids, saponins, tannins, cardiac glycosides and anthraquinones. Flavonoids and terpenes were found to be present in leaves and stems but not detected in flowers of *T. peruviana*. However, phlobatannins

was completely absent in the three parts. Quantitative evaluation shows moistures content (7.9%, 9.3% and 18%), total ash (6%, 9% and 4.7%), sulphated ash (0.5%, 0.8% and 0.2%) and acid insoluble (0.1%, 0.5% and 0.5%) respectively for the leaves, stems and flowers of *T. peruviana*. Nutritional analysis revealed protein content (8.10%, 4.21% and 1.2%), fat content (22%, 8% and 43%), crude fibre (10%, 12% and 2%, and carbohydrate content (55.9%, 66.8% and 49.1%). Anti-nutrient revealed hydrogen cyanide (0.011%, 0.201% and 0.301%), soluble oxalate (40%, 30% and 35%, total oxalate (10.00%, 5.00% and 7.00%) and tannins acid (1.21%, 0.9% and 1.50%) respectively for the leaves, stems and flowers of *T. peruviana*. The results of the present study further confirm the use of *T. peruviana* leaves, stems and flowers traditionally for the treatment of different ailments.

**KEYWORDS:** *Thevetia peruviana*, chemical profile, leaves, stems, flowers, phytoconstituents.

## INTRODUCTION

Traditional medicine is defined 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 exclusively on past experience and observation handed down from generation to generation to generation, verbally or in writing <sup>[1]</sup>. Traditional medicine preparation is prescribed in several forms. They can be in liquid (e.g. decoctions, infusion, only mixtures gargles, etc), solid (e.g. powder kaolin, ointments, powdered dried herbs for internal administration) semi-solid (e.g. steam inhalation preparation, fumigation like increase, etc) <sup>[1]</sup>.

*Thevetia peruviana* (Pers.) K. Schum is a small ornamental shrub belonging to the family Apocynaceae, (Local name called mmon-eba). It is commonly called be still tree, Digoxin, lucky nut, Nerium oleander, yellow oleander and milk bush. It is an evergreen, dicotyledonous shrub, with origin from the forest of tropical America and now widely spread out in various tropical and sub-tropical regions of the world <sup>[2]</sup>. It grows to a height of about 10 to 15 feet and continues its blooming throughout the year. The flowers are bright yellow and funnel shaped with 5 petals spirally twisted. The fruits are green in color and changes from green to brownish black when it achieves maturity. Each fruit contains a nut which is longitudinally and transversely divided. Propagate is primarily by means of seeds, can also propagate from cuttings in spring early summer with hardwoods cuttings <sup>[3]</sup>.

*Thevetia peruviana* is used medicinally throughout the tropics in spite of its toxicity. A bark or leaf decoction is taken to loosen the bowels, as an emetic, and is said to be an effective cure for intermittent fevers <sup>[4]</sup>. In India and Sri Lanka, seeds have been used for committing suicide or homicide <sup>[5]</sup>. The use of peruvoside in antherpes drugs has been patented <sup>[6]</sup>. In current medicine, cardiac glycosides are only applied in special forms of heart disease. Its seeds, leaves, fruits and roots are being used in traditional medicine as an acrid purgatives, as emetic and for intermittent fever treatment <sup>[7]</sup>.

It has been used, for example, in the treatment of hemorrhoids, ulcers, leprosy, snake bites, in the induction of abortion and also reported to have anticancerous properties <sup>[8]</sup>. The plant or its individual parts can be used for the treatment of various disorders in human being such as, diabetes, liver toxicity, fungal infection, microbial infection and inflammation. Tincture is cathartic emetic and febiuge seeds are used as abortifacient and purgative in rheumatism and dropsy. The tincture has been recommended as a peruvoside in the treatment of mild cardiac

insufficiency and weak heart<sup>[9]</sup>. This drug shows relatively high degree of therapeutic index compared to digoxin.

In recent years the plant has been reported to have strong anti-HIV activity also<sup>[10]</sup>. Such diverse medicinal applications of the plant clearly indicate towards presence of diverse secondary metabolites in various parts. Oleanderin is reported to be a potent inhibitor of human tumor cell growth<sup>[11]</sup>. It has also been regarded as a potential source of biologically active compounds, namely insecticides, rodenticide, fungicides and bactericides<sup>[8]</sup>. Ingestion of the seeds produces a clinical picture very similar to the digoxin poisoning: vomiting, diarrhoea, dizziness, brady cardiac, sinus and Avnode block and other cardiac dysrhythmias. The anti-cancer effects of oleander extracts are being investigated largely in invitro cell models<sup>[12]</sup>. The significance of this study is to justify and ascertain that *Thevetia peruviana* has various therapeutic uses for the synthesis of drugs and medicinal plants.

## MATERIALS AND METHODS

**Collection of Plant Materials:** The plant materials of *Thevetia peruviana* were collected in September, 2012 from a farm land in Ikono local Government Area, Akwa Ibom State, Nigeria. The plant was identified and authenticated by Dr. (Mrs.) U. A. Essiett, a taxonomist in the Department of Botany and Ecological Studies, University of Uyo, Uyo, Nigeria.

**Preparation of the Extract:** The leaves, stems and flowers were cut separately 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<sup>[1]</sup>. The liquid extract was recovered by filtration using cotton wool and glass funnel. The filtrate obtained was concentrated in a vacuo at 40<sup>0</sup>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<sup>[1]</sup>.

**Quantitative Microscopy/Proximate Analysis:** The moisture content of the powdered samples were determined by weight loss on drying method<sup>[13]</sup>. The ash value, acid insoluble ash, water-soluble ash and sulphated ash were determined as described by British Pharmacopeia<sup>[14]</sup>, African Pharmacopeia<sup>[13]</sup>. The water and alcohol extractive values were obtained using the method outlined by Brain and Tuner<sup>[15]</sup> and British Pharmacopeia<sup>[14]</sup>. The

fat (lipids), crude protein, crude fibre and carbohydrate were obtained using the method outlined by Pearson <sup>[16]</sup>, Okon <sup>[17]</sup> and AOAC <sup>[18]</sup>. Oxalate was determined using the method of Day and Underwood <sup>[19]</sup>. Phytate was determined using the method of Wheeler and Ferrell <sup>[20]</sup> and AOAC <sup>[21]</sup>. Tannin was determined according to Official method of analysis described by AOAC <sup>[21]</sup>. Cyanogenic glycosides were determined using the method as described by Onwuka <sup>[22]</sup>.

## RESULTS

The result of the preliminary phytochemical screening of the leaves, stems and flowers of *Thevetia peruviana*. Alkaloid was abundantly present in quantity in the three parts. Saponins was also abundantly presence in three parts. Tannins was moderately presence in the three parts. Flavonoids was to be trace in leaves and stems but absent in flowers. Anthraquinones was moderately presence in leaves but trace in stems and flowers. Phlobatannins was completely absent in the three parts. Terpenes was moderately present in leaves, trace in stems but absent in flowers of *T. peruviana*. Also, cardiac glycosides was abundantly present in leaves, moderately present in stems but trace in flowers of *T. peruviana* (Table 1).

**Table 1: Results of the phytochemical screening of *T. peruviana* leaves, stems and flowers.**

TEST	INFLUENCE		
	LEAVES	STEMS	FLOWERS
<b>Alkaloids</b>			
Dragendorff's	+++	+++	+++
Mayer's reagent	+++	+++	-
Picric acid	-	-	-
<b>Saponins</b>			
Frothing Test	+++	+++	+++
<b>Flavonoids</b>			
Magnesium metal Conc. Hcl acid	+	+	+
<b>Tannins</b>			
Ferric chloride	++	++	++
<b>Anthraquinones</b>			
Benzene and 10% NH <sub>3</sub> solution	+	+	+
<b>Phlobatannins</b>			
% Hcl	-	-	-
<b>Terpenes</b>			
10 drops of conc. H <sub>2</sub> SO <sub>4</sub>	++	+	-
<b>Cardiac glycosides</b>	+++	++	+

**Legend:** - = Not detectable, + = Trace, ++ = Moderate, +++ = Abundance

The results of the quantitative evaluation of the leaves stems and flowers of *T. peruviana* showed moisture contents of 7.9%, 9.30% and 18%; total ash of 6%, 9% and 4.7%; sulphated ash of 0.5%, 0.8% and 0.2%; Acid-insoluble ash of 0.1%, 0.5% and 0.5% respectively (Table 2). The results of the nutritional analysis of the leaves, stems and flowers of *T. peruviana* showed crude fibre of 10%, 12% and 2%; fat content of 22%, 8% and 43%; protein content of 8.10%, 4.21% and 1.2%; carbohydrate content of 55.9%, 66.8% and 49.1% respectively (Table 3). The results of the anti-nutrient of the leaves, stems and flowers of *T. peruviana* showed hydrogen cyanide of 0.011%, 0.201% and 0.301%; soluble oxalate of 40%, 30% and 35%; total oxalate of 10.00%, 5.00% and 7.00%, and tannins acid of 1.21%, 0.9 and 1.50% respectively (Table 4).

**Table 2: The Results of Quantitative Evaluation of leaves, stems and flowers of *T. peruviana*.**

Parameters	Values w/w		
	Leaves (%)	Stems (%)	Flowers (%)
Moisture content	7.9	9.3	18.0
Total ash	6.0	9.0	4.7
Sulphated ash	0.5	0.8	0.2
Acid-insoluble ash	0.1	0.5	0.5

**Table 3: The Results for the Nutritional Analysis of the leaves, stems and flowers of *T. peruviana*.**

Parameters	Values w/w		
	Leaves (%)	Stems (%)	Flowers (%)
Crude fibre	10.0	12.0	2.0
Fat content	22.0	8.0	43.0
Protein content	8.10	4.21	1.2
Carbohydrate content	55.9	66.8	49.1

**Table 4: The Results for the Anti-nutrient of the leaves, stems and flowers of *T. peruviana*.**

Parameters	Values w/w		
	Leaves (%)	Stems (%)	Flowers (%)
Hydrogen cyanide	0.011	0.201	0.301
Soluble oxalate	40.0	30.0	35.0
Total oxalate	10.00	5.00	7.00
Tannins acid	1.21	0.9	1.50

## DISCUSSION

The result of phytochemical screening of *T. peruviana* revealed the presence of alkaloids, tannins, saponins, cardiac glycosides and anthraquinones in leaves, stems and flowers except

phlobatannins which have been shown to have medicinal and pharmaceutical uses. The usefulness of the active constituents of plants, as the main serious in-road into the medicinal profession<sup>[1]</sup>. Alkaloids act as poisonous agent and protect the plants against insects and herbivores<sup>[23]</sup>. Alkaloids are known to exhibit emetic, amoebicides expectorant, anaesthetics, anti-puretics, analgesics, antihelminthic and can be used for the treatment of stomach problem<sup>[24]</sup>. Thus *T. peruviana* (leaves, stems and flowers) containing this compound justifies the reports of Gata-Goncaive *et al.*<sup>[7]</sup> that the leaves act as an acrid purgative, as emetic and for intermittent fever treatment. Tannins have astringent properties, hasten the healing of wounds and inflamed mucous membranes<sup>[25]</sup>. Tannins were present in moderate concentration in the leaves, stems and flowers studied, and this plant can equally be applied in such cases.

The presence of saponins confirms the fact this plant materials containing saponins have long been used in many part of the World for their detergent properties and when injected into the stream are highly toxic because of their reaction with enzymes, but when administered orally, become comparatively harmless<sup>[24]</sup>. They also react with the cholesterol rich membranes of cancer cells, preventing these cells from growing. Further protection from cancer and heart disease comes from the saponins component of the compounds, which has anti-oxidant properties. The presence of cardiac glycosides could also make this plant effective of heart related problems like hypertension. Therapeutics uses of cardiac glycosides primarily involve the treatment of cardiac failure. This corroborates with reported works<sup>[7, 26]</sup>. Anthraquinone were detected in the leaf, stem and flowers of *T. peruviana* studied. Anthraquinone are naturally occurring aromatic organic compound which can be found in some plants, fungi and insect, anthraquinone contributes to the colouring pigment of these organisms and is therefore used commercially for the manufacturer of dyes. It also reduces inflammation in arthritis patients and also inhibits the growth of cancer cells. Anthraquinone are used for medical purposes found to be naturally occurring implants and are not made through chemical reaction<sup>[27]</sup>.

The total ash content mainly is a measure of the presence of inorganic compounds in a drug. A larger value indicates that the plant materials contain more of inorganic compounds<sup>[13]</sup>. The total ash content of *T. peruviana* stems is higher than of leaf and flowers and they fall within the accepted range of 22% for standard drug which implies that the plants has normal complex of inorganic and organic component<sup>[14]</sup>. Moisture content if too high indicates chances of microbial degradation of the drugs during storage. Therefore, moisture content for the leaves, stems and flowers of *T. peruviana* respectively fall within the accepted range of

14% for standard drugs <sup>[14]</sup>. Sulphated ash content gives an estimate of the lignin contents that remain after treatment with concentrated sulphuric acid. Sulphated ash shows that the three parts extract is moderately pure, thus, sulphated ash is a good criterium use to judge the identify and purity of crude drugs. Acid-insoluble ash of *T. peruviana* indicated that stems and flowers is more digestible than leaf since high value indicates high digestibility when consumed <sup>[13]</sup>.

The present of protein content for the leaves, of *T. peruviana* indicated higher protein content than stems and flowers but it contribute to the formation of hormones which controls a variety of body functions such as growth, repair and maintenance of the protein <sup>[28]</sup>. These corroborate the work of Antia *et al.*<sup>[29]</sup> on *I. batatas*. Fat content *T. peruviana* flowers have high source of energy than the stems and leaves and this high energy are needed especially by growing animals. By definition, fat is the materials soluble in certain organic solvent but the presence of bound fat such as lipoprotein, create problems <sup>[17]</sup>. The present of carbohydrate in the leaves, stems and flowers of *T. peruviana* also showed that they are good source of energy. However, it is a better source of energy. The present of tannins in the three parts indicates that this plant could be useful as anti-fungal activity when used against diarrhea and malaria <sup>[30]</sup> Tannins are known to cause a growth depressing effect in living systems <sup>[31]</sup>. Therefore tannins content is not unrelated with high protein content of these species. The hydrogen cyanide, soluble oxalate, total oxalate, tannins acid values in the leaves, stems and flowers of *T. peruviana* were relatively high, this indicated that they are toxic and regarded as undesirable constituent of the diet, reducing assimilation of calcium, flavouring the formation of renal calculi <sup>[31]</sup>.

## CONCLUSION

It is quite evident from the research that *T. peruviana* contains a number of phytoconstituents and nutritive value which reveals its uses for various therapeutic purposes and for dietary uses. Looking upon wide prospects and potentials of *T. peruviana* for various treatments of various ailments. Still, so much work is required with *T. peruviana* to investigate the mechanism of actions with other therapeutic activities. Anti-nutritional factors were found to be present in *T. peruviana* but within tolerable limits. *T. peruviana* could be compounded in drug formulation for the treatment of different ailments.

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