Phytochemical Screening and Mineral Content Assessment of the Extract of *Pachyrhizus erosus*

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ABSTRACT

Preliminary phytochemical Screening of the water, methanol and n-hexane extract of the of *pachyrhizus erosus* and the Mineral Content determination was carried out using standard methods. The results show the presence of alkaloids, tannins, flavonoids, cardiac glycoside, steroid in the water extract, anthraquinone, carbohydrate, cardiac glycosides and steroid in the methanol extract while carbohydrate, cardiac glycosides and steroids in the n-hexane extract. The Atomic Absorption Spectroscopy of the extract in aquaregia revealed that it contains K (45.00±0.42), Cd (0.0063±0.006), Pb (0.039±0.009), As (0.0010±0.0006), Cr (0.004±0.0004), Co (0.0010±0.0003), Cu (3.9800±0.1273) and Fe (0.0010±0.0003) in part per million(ppm). The metals detected were all found to be within the WHO permissible limits. The presence of these phytoconstituents confirmed the reasons for the use of the for the treatment of ailments by traditional medical healers.

KEYWORDS: Phytochemicals, *Pachyrhizus erosus,* Screening, Metal concentration, Permissible level.

Introduction

Photochemical are biologically active naturally occurring chemical compounds found in plants, which provide health benefits for humans other than those attributed to macronutrients and micronutrients. They protect plants from diseases and damage and contribute to the plant colour, aroma and flavour. They further protect plant cells from environmental hazards such as pollution, stress, drought, ultraviolet exposure and pathogenic attacks. Phytochemicals have been isolated and characterized from fruits, vegetables, spices and beverages. (Doughari and Obidah, 2008, Doughari *et al.,* 2009). A single plant may be used for the treatment of various disease conditions depending on the community. Several ailments such as fever, asthma, constipation, oesophageal cancer and hypertension have been treated with traditional plants (Saganuwan, 2010). The plants are applied in different forms such as poultices, concoctions of different plant mixtures, infusion as teas or tincture as component mixtures in porridges and soups administered in different ways including oral, nasal, topical, bathing or rectal. The different parts of the plants (stem, roots, bark, flowers, essential oils or combinations) have been employed in the treatment of infectious pathologies in the respiratory system, urinary tract, gastrointestinal and biliary systems as well as on the skin (Rojas *et al.,* 2001, R'ios and Recio, 2005).

Medicinal plants are increasingly gaining acceptance even among the literates in Urban settlements, probably due to the increasing inefficiency of modern drugs used for the treatment/control of many infections such as typhoid fever,

gonorrhoea and tuberculosis as well as increase in resistance by several bacteria to various antibiotics and the increasing cost of prescription drugs for the maintenance of personal health (Levy, 1998; Van den Bogard *et al.*, 2000; Smolinski *et al.*, 2003). Also, rapid explosion in human population has made it almost impossible for modern health facilities to meet health demands all over the world, therefore more demands on the use of herbal health remedies. Furthermore current problems associated with the use of antibiotics, increased prevalence of multiple drug resistant strains of a number of pathogenic bacteria such as methicilin resistant *Staphylococcus aureaus, Helicobacter pylori* and MDR *Klebsiella pneumonia* have revived interest in plants with antimicrobial properties (Voravuthikunchai and Kitpipit, 2003). In addition, the increase in cases of opportunistic infections and the advent of Acquired Immune Deficiency Syndrome (AIDS) patients and individuals on immunosuppressive chemotherapy, toxicity of many antifungal and antiviral drugs has imposed pressure on the scientific community and pharmaceutical companies to search alternative and novel drug sources.

Parchyrhizus erosus is in the family fabaceae, subfamily faoidae, tribe phaseoleae and subtribe Diocleinae (Sorensen 1988; 1996; Lackey 1977; Ingham, 1990). It is a close relative to the soybean and phaseolus bean (Ingham, 1990). It is exclusively used for its tuberous root (Sorensen, *et al.*, 1997). Rotenone, a source of natural insecticide has been extracted from the beans (Duke, 1981). It grows on deep clay to sandy loam soil with optimal day/night temperature of 30/20^{o}C. Several works revealed the importance of the tuber and beans for their nutritive value and toxic effects on aphid respectively (Hoof and Sorensen, 1989 and Hansberg *et al.*, 1946). The were found to contain chloroagenic, ferulic and caffeic acid which are known to provide an antioxidant effect (Gruneberg *et al.*, 1999) and also Environmental Protection Agency (1993) reported that the contain phytochemical compounds that show evidence of antibacterial and antifungal actions in laboratory test.

The present research work seeks to find out the bio-active phyto-constituents responsible for the treatment of diseases, also to ascertain the medicinal values of the to both human and animals. The mineral concentrations of heavy metals associated with the are assessed to ensure that toxic elements are not introduced into human system in the course of treating ailments.

Materials and Methods:

The *parchyrhizus erosus* samples were collected from Nchiya village in Mangu Local Government Area of Plateau State, Nigeria and identified at the Federal College of Forestry Jos, Herbarium. The sample was thoroughly washed and spread in the laboratory to dry at room temperature for nine (9) days. The dried leaves samples were pounded into powder using pestle and mortar, sieved with a local mesh and the powder collected and stored for further used.

The extract was prepared by weighing the dried powdered leaves and subjected to cold extraction using three solvents; methanol, water and n-hexane.5.0g of the sample was weighed into reagent bottles and soaked for 72 hours, using 50ml of each solvent (1:10). The reagent bottles containing the mixtures were shaken intermittently and sometimes mechanically to hasten the extraction process. The

extracts were filtered using vacuum filtration apparatus. The filtrates were then kept for phytochemical screening. Standard methods were used for the determination of alkaloid, tannin, flavonoid, saponin, anthraquinone, cardiac glycosides, carbohydrates and steroids. (Odebiyi and Sofowara, 1978; Sofowara, 1982; Trease and Evans, 1987; Onwukeme *et al*., 2007).

For the Atomic Absorption Spectroscopy (AAS) 2.0g of the powdered *parchyrhizus erosus* leavess were weighed and poured into beaker, 5.00ml of concentrated HNO_3 and 15ml HCl in 1:3 (aquaregia) were added into the beaker containing the sample and heated. The solution was filtered warm into bottles using a filter paper and funnel. The bottles were labelled and stored for Atomic Absorption spectroscopic analysis.

Results and Discussion

The results for the phytochemical screening carried out on *Parchyrhizus erosus* as shown in Table 1 revealed the presence of alkaloids, carbohydrates, cardiac glycosides, flavonoids, steroids, anthraquinone, tannins in the different extracts and absence of saponins.

Table 1: Phytochemical analysis carried out on the water, methanol and n-hexane extracts of the of *Parchyrhizus erosus*.

Phytochemicals	Water Extract	Methanol Extract	n-hexane extract
Alkaloid	++	_	_
Anthraquinone	_	+	_
Carbohydrates	++	++	+
Cardiac Glycosides	+	+++	++
Flavonoids	+++	+++	_
Saponins	_	_	_
Steroids	+	+++	++
Tannins	++	++	_

Keys: - = Absent
+ = slightly present
++ = more present
+++ = highly present

Cardiac glycosides are slightly present in water extract, more present in the n-hexane extract and highly present in the methanol extract. It works by inhibiting the Na^+/K^+ pump. This inhibition increases the amount of Ca^{2+} ions available for the contraction of the heart muscle, which improve cardiac output and reduces distension of the heart, therefore they are used in the treatment of congestive heart failure and cardiac arrhythmia and strengthen a weakened heart (Denwick, 2002).

Tannin which was reported present in the water and methanol extract but absent in the n-hexane extract. Tannin exhibits antiviral, antibacterial and antitumor activities. They have been recognised for their pharmacological properties and are known to makes trees and shrubs a difficult meal for caterpillars (Henslen, 1989). Its protein precipitation and vasoconstriction effect could be advantageous in preventing ulcer development (Aguwa *et al.,* 1988). This confirmed why the plant is used by herbal practitioners in Nchiya, Mangu Local Government Area, Plateau State for treating Ulcer.

Flavonoids shows anti-allergic, anti-inflammatory, antimicrobial and anti cancer activities also offer some protection in ulcer increasing capillary resistance improve micro-circulation which renders cell less injurious to precipitation factor (Cacerus *et al.,* 1991). Flavonoid is reported present in all the extracts.

Steroids is known for their cardiotonic activities, possess insecticidal and antimicrobial properties. They are also used in nutrition, herbal medicine and cosmetics (Callow, 1936).

Anthraquinone, used as dyes and antibacterial agents was slightly present in only the methanol extract.

Contamination of traditional medicines by heavy metals is a major concern because of the toxicity, persistence and bio-accumulative nature of such metals (Ikem *et al.,* 2003). Table 2 shows presence of K, Cr, Fe and Cu. These metals plays both curative and preventive roles in combating diseases. All the elements are within the WHO permissible level which shows that there is no contamination of the plant by heavy elements/metals. The absence or low concentration of these heavy metals suggests that the plant natural habitats are unpolluted (Obiajunwa *et al.,* 2002). Also the environmental factors including atmosphere and pollution, season of collection, age of plant and soil conditions affects the concentration of trace elements.

Table 2: Metal concentration in the of *Parchyrhizus erosus* by wet digestion

Metal	Concentration (ppm)	WHO permissible limit (ppm)
Arsenic (As)	0.0010±0.0006	0.10
Cadmium (Cd)	0.0063±0.0006	0.10
Chromium (Cr)	0.0041±0.0004	0.20
Cobalt (Co)	0.0010±0.0003	0.05
Copper (Cu)	2.9800±0.1273	3.00
Iron (Fe)	1.9600±0.1131	15.0
Lead (Pb)	0.0395±0.009	0.20
Potassium (K)	45.00±0.42	_

Conclusion

The extracts of *Parchyrhizus erosus* show presence of various phytochemical groups. The water and methanol extracts had more bioactive constituents with therapeutic potentials. This agreed with the reason why the herbal practitioners usually soaked the of *P. erosus* either in water or methanol. The presence of elements such as Fe, Cu and K are of vital importance in man's metabolism that is needed for growth, development, prevention and treatment of many diseases. We wish to recommend that pharmaco-vigilance be done to improve the quality, safety and efficacy of herbal drugs, generally not only during their growth but also during their sampling, processing and storage by traditional healers in order to avoid heavy metals contamination. Also the compounds present in the leaves sample could be harnessed for industrial and medicinal science utilization.

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