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CHEMICAL PROFILE OF AQUEOUS EXTRACT OF *CALOTROPIS PROCERA* LEAF

[1*]Ajiboso, S.O., [2]Yakubu, M. T. and [3]Oladiji, A.T

[2,3]Toxicology, Phytomedicine and Nutrition Research Laboratories, Biochemistry Department, University of Ilorin, Kwara State Nigeria.

[1*]Biochemistry Research Laboratory, the Federal Polytechnic Bida, Niger State, Nigeria.

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***Correspondence for Author**
Ajiboso, S.O.
Biochemistry Research Laboratory, the Federal Polytechnic Bida, Niger State, Nigeria.

ABSTRACT

This study was carried out to determine the chemical profile of aqueous extract of *Calotropis procera* leaf. The results showed the values of the proximate composition as: moisture content (10.92%), crude protein (28.53%), fat (20.42%) and carbohydrate (24.13%). Ash and crude fibre were 6.50% and 9.40% respectively. Magnesium was found high in the extract 36.5ppm followed by potassium 24.5ppm, calcium 17.0ppm, sodium 12.5ppm and Zinc 2.10ppm while phosphorus 0.40ppm was found least. 11 phytochemicals of pharmacological importance were detected at different amounts. The amount of alkaloids (2.05%) in the extract was 50.3 times and 2.3 times the amounts of other trace (steroids, anthraquinone, terpenoids, phlobatannin, cardenolides and chalcones) – 0.004%-0.04% and moderately (tannin, glycosides and saponin)- 0.05%-0.88% detected phytochemicals respectively while phenol amount (1.15%) was 1.3 times and 28.8 times higher than moderately and trace detected phytochemicals respectively in the extract. However, flavonoids were completely absent in the extract The amino acids profile showed the presence of 17 amino acids out of the 20 important amino acids, 50% of essential amino acds were detected high (arginine, lysine, leucine, isoleucine and phenylalanine); 30% were detected moderate (histidine, threonine and valine). Methionine and tryptophan were detected low and absent respectively. From the work carried out, *Calotropis procera* leaf is a good source of vegetable protein, oils essential minerals and amino acids for human consumption aside its medicinal properties and folklore tradition belief of its use by the Fulanis in the northern part of Nigeria as cheese coagulum.

KEYWORDS: *Calotropis procera*, steroids, anthraquinones, terpenoids, phlobatannins, cardenolides and chalcones.

INTRODUCTION

Calotropis procera (Ait.) R. Br., a wild growing plant of family *Asclepiadaceae*, is distributed in tropical and subtropical regions of Asia and Africa. It is represented by two species viz. *C. procera* and *C. gigantean.* It is found in most parts of the world in dry, sandy and alkaline soils and warm climate and is more common in north central and northern Nigeria. Yoruba (in Nigeria) call it 'bomubomu'; Hausa (in Nigeria) call it 'tumfafiya' and Nupe (in Nigeria) call it 'epuko'. It is used for coagulating cheese by Fulanis in northern Nigeria (Ogunlesi *et al.,* 2008).

Traditionally *Calotropis* is used alone or in combination to treat common diseases such as fevers, rheumatism, indigestion, cough, cold, eczema, asthma, elephantiasis, nausea, vomiting, diarrhoea in treatment of cold, asthma, catarrh, anorexia, inflammations and tumours. It is well known for its medicinal properties, different parts of this plant have been reported to exhibit analgesic and antioxidant properties (Anis *et al.,* 2000).

The ethnobotanical pharmacology of the plant is as old as man himself. These medicines have less side effects and man can get the herbs easily from nature. The herbal medicines occupy distinct position right from the primitive period to present day. Nigeria being a tropical country is blessed with vast natural resources and ancient knowledge for its judicious utilization. The plant yields valuable hydrocarbons which could be converted into diesel substitutes (Bhatti *et al.,* 1998), but there are limited works on the chemical composition and uses of *Calotropis procera* as food.

Therefore, this study was designed to determine the phytochemical analysis and nutritional compositions (proximate, mineral and amino acids profile) of aqueous extract of *Calotropis procera* leaf.

MATERIALS AND METHODS

Collection of *Calotropis procera* leaves- Matured fresh leaves of *Calotropis procera* were collected from the plant in the Botanical garden of the Federal Polytechnic Bida, Niger State and were authenticated at the Biology Unit of Science Laboratory Technology Department, the Federal Polytechnic Bida, Niger state - Nigeria.

Chemicals and Reagents- All chemicals and reagents used were of analytical grade (Poole-England.

Methods`- Chemicals tests were carried out on the extract using standard procedures to identify the constituents as described by Harbone (1998) and Trease and Evans (1989) for qualitative and quantitative tests respectively.

Extraction- Aqueous extraction was carried out according to the method described by Okerulu and Ani (2001). 100ml of distilled water was added to 20g of the powder in conical flask.it was allowed to stand for 24hrs and filtered using sterile Whatman No. 1 filter paper. The filterate was concentrated to 10ml on water bath. It was cooled and used for the analysis.

Quanlitative Determinations of Phytochemicals

The extracts were evaluated for the presence of alkaloids, tannins, glycosides, saponins, steroids, phlobatannins terpenoids, cardiac glycosides, cardenolides, anthraquinone, chalcones, phenol and flavonoids.

Quantitative Determinations of Phytochemicals

Proximate Analysis- Proximate composition (fat, moisture, protein, crude fibre, ash and carbohydrate) were determined according to the methods of AOAC (2006).

Mineral contents Determination- The methods described by AOAC (2006) were used to determine the concentrations of zinc, calcium, potassium, sodium, magnesium and phosphorus in the sample.

Determination of Amino Acid Profile- The amino acid profile in the known sample was determined using methods described by Speckman *et al.*, (1958).

Statistical Analysis- Values obtained were subjected to descriptive statistical analysis of Murray and Larry (1999) and presented as Mean±SD.

RESULTS AND DISCUSSION

The extract contained appreciable amounts of the phytochemicals. 11 phytochemicals which include alkaloids, tannins, glycosides, saponins, steroids, antraquinones, terpenoids, phenols, phlobatannins, cardenolides and chalcones were detected in different amounts in the aqueous extract of *Calotropis procera* leaf. Medicinal properties of plants are normally dependent on

the presence of certain phytochemcial principles such as alkaloids, anthraquinones, glycosides, saponins, tannins and flavonoids which are the bioactive bases responsible for the pharmacological property (Ebana *et al.*, 1993). Medicinal plants contain these pharmacologically active principles which over the years have been exploited in traditional medical practice for the treatment of various ailments (Adebanjo *et al., 1*983).

Tannins have been reported to prevent the development of microorganisms by precipitating microbial protein and making nutritional proteins unavailable for them (Egwim *et al.*, 2002). Tannins have been found to form irreversible complexes with prolinerich protein (Shimada, 2006) resulting in the inhibition of cell protein synthesis. Parekh and Chanda (2007) reported that tannins are known to react with proteins to provide the typical tanning effect which is important for the treatment of inflamed or ulcerated tissues. Herbs that have tannins as their main components are astringent in nature and are used for treating intestinal disorders such as diarrhea and dysentery (Dharmananda, 2003). These observations therefore suggest the use of aqueous extract of *Calotropis procera* leaf in herbal cure remedies for diarrhea and dysentery. The biological activities of tannins showed that tannins have anticancer activity and can be used in cancer prevention, thus suggesting that aqueous extract of *Calotropis procera* leaf has potential as a source of important bioactive molecules for the treatment and prevention of cancer.

Alkaloid is another secondary metabolite compound that is of medicinal importance. classes of alkaloids are among the highest poisons known, some classes of alkaloids have also been proved to be useful in correcting some renal disordes (Egwin *et al.*, 2002). One of the most common biological properties of alkaloids is their toxicity against cells of foreign organisms. These activities have been widely studied for their potential use in the elimination and reduction of human cancer cell lines (Nobori *et al.*, 1994). Alkaloids which are one of the largest groups of phytochemicals in plants have amazing effects on humans and this has led to the development of powerful pain killer medications. According to Just *et al.*, (1998) saponins possess inhibitory effect on inflamed cells. Saponin was found to be present in aqueous extract of *Calotropis procera* leaf and has supported the usefulness of this plant in managing inflammation. Steroidal compounds present in aqueous extract of *Calotropis procera* leaf are of importance and interest due to possible relationship they may have with various anabolic hormones including sex hormones (Okwu, 2001). Earlier study of Quinlan *et al.*, (2000) on steroidal extracts from some medicinal plants revealed antibacterial activities

on some bacterial isolates. antiviral property of steroids was also confirmed by Neumann *et al.*, (2004). The appreciable amounts of phytochemicals of pharmacological importance observed in this study in the aqueous extract of *Calotropis procera* leaf had established the scientific basis of folklore tradition and belief behind the use of *Calotropis procera* plant in the treatment of various diseases. To buttress this point, *Calotorpis procera* in India holds a pride of place largely because of its multiple uses such as pharmacological uses and economic values. *Calotropis procera* plant is known as '*The wealth of India*' in India.

The moisture content of aqueous leaf extract of *Calotropis procera* was 10.92%. The low moisture content of aqueous leaf extract of *Calotropis procera* indicates its low perishablility. Protein content value was 28.53%. This value showed that the leaves have appreciable amount of protein which are good for growth and repair of worn out tissues. The high fat content obtained (20.42%) showed that the leaves contained appreciable amount of oil. The value obtained for carbohydrate (24.13%) and energy value (8.02 KJ/g) indicate that the extract was low in calorific value compared to crude protein content.

The high K, Mg, Na and Ca contents in the extract is an indication that the extract is rich in these important minerals. According to Taylor *et al.*, (1998), K and Na are important enzymes co-factors and also regulate osmotic balance in the cell; Mg is a constituent of chlorophyll; Ca is a major constituent of cell walls; second messenger in metabolic regulation, cell permeability and blood clotting. Zn is important in immune response, protein synthesis, enzyme systems and stress management. The detection of 17 amino acids in the extract is an indication that aqueous leaf extract of *Calotropis procera* contains all the known categories of amino acids such as neutral (hydrophobic and hydrophilic), basic, acidic and essential (Taylor *et al.*, 1998).

The essential amino acids are arginine, histidine, lysine, threonine, methionine, isoleucine, leucine, valine, phenylalanine and tryptophan. These are termed essential amino acids because they can not be synthesized in human body but can only be obtained through the diets (Taylor *et al.*, 1998). According to Yudkin and Holford (1998) the end products of metabolism of these essential amino acids are oxoglutarate, succinylcoA and acetylcoA which are important substrates in important biochemical processes such as ATP (carrier of chemical energy) and nucleic acids (important components of genetic material) synthesis. The high amino acids particularly essential amino acids content of the extract is associated with its high crude protein (>28%) in its proximate composition.

Calotropis procera leaf offers a complete protein profile that contains significant amount of all essential amino acids. The value (28.53%) of crude protein of the extract as obtained in this study was within the acceptable range of values of wheat-cowpea cake reported by Akubor (2004). The detection of essential amino acids in high amounts in the extract agrees with the report of Alabi (2008) on soyabean amino acids profile. Unlike many other plant sources of protein, soyabean is low in saturated fat and is cholesterol free and has a superior amino acid profile but is deficient in sulphur containing amino acid (methionine and cysteine) (Osho and Dashielli,1995). Low levels of methionine and cysteine detected in the extract is an indication that the extract has a better amino acids profile than a known proteinous food such as soyabean.

Similar trends with high amino acids in form of positive correlation were observed on crude protein, crude fibre, ash and fat contents of the extract. The amino acids rich nature of the extract made it proteinous and may perform the nutritional roles of many proteinous foods such as structural, hormonal, enzymatic, antibody, transport, regulation and metabolic (Yudkin and Holford, 1998).

CONCLUSION

This study has shown that aqueous extract of bomubomu (*Calotropis procera*) leaf contains appreciable amounts of essential amino acids, vegetable protein, fat, mineral contents and phytochemicals of pharmacological importance. Low moisture content of the leaf denotes high quality due to low perishability.

REFERENCES

1. Ajiboso, S. O. O. Comparative study of Calorific value and Combustion time of wastes. *International Journal of Bioscience.*, 2007; 1(1): 6-10.
2. Akubor, P .I and Badifu, G. I. O. Chemical composition, functional properties and baking potential of African bread fruit kernel and wheat flour blends. *International Journal of Food Science and Technology*, 2004; 39: 223-229.
3. Alabi, M. O. *Processing and Utilization of Selected Crops in Nigeria*. Peace House Publication, Peace House Press Gboko.PP., 2008; 55: 102.
4. Anis, M. Sharma, M.P. and Muhammad, I. Herbal ethno-medicine of the Gwaliar Forest Division in Madhya Pradesh, India, *Pharmaceutical Biology*, 2000; 38(4): 241-253.
5. Association of Official Analytical Chemist (2006). *Official method of the AOAC (w.horwitz edition) Eighteen edition*, Washington; D.C.

6. Bhatti, G.R., Qureshi, R. and Shah, M. Ethnobotany of C*alotropis procera* with especial reference to the people of Nara Desert, *Scientific Sindh*, Pub. Salu, Khairpur, 1998; 5: 13-22.
7. Dharmananda S (2003). Gallnuts and the uses of Tannins in Chinese Medicine. In: Proceedings of Institute for Traditional Medicine, Portland, Oregon.
8. Ebana, R.U.B, Madunagu, B.E. and Etok, C.A. Antimicrobial Efect of of Strophantus Secamone Afzeli on Some Pathogenic Bacteria and their Drug Research Strain. *Nigerian Journal of Botany*, 1993; 6: 27 – 31.
9. Harborne JB. Phytochemical Methods - A Guide to Modern Techniques of Plant Analysis. Chapman and Hall, London., 1998; 182-190.
10. McGraw- Hill Publishing Company Ltd. New Delhi., 1998; 242-244.
11. Just MJ, Recio MC, Giner RM, Cueller MJ, Manez S, Bilia AR, Rios JL. Anti-inflammatory activity of unusual lupine saponins from Bupleurum fruticescens. Planta Medica., 1998; 64: 404-407.
12. Murray RS, SJ Larry. Schaum's Outlines Statistics, 3rd edn. Tata McGraw- Hill Publishing Company Ltd. New Delhi., 1999; 242-244.
13. Neumann UP, Berg T, Baha M, Puhl G, Guckelbeger O, Langreh JM, neuhaus P. Long-term outcome of liver transplant for hepatitis C: A 10 year follow-up. Transplantation., 2004; 77(2): 226-231.
14. Nobori T, Miurak K, Wu DJ, Takabayashik LA, Carson DA. Deletion of the cyclin-dependent kinase-4 inhibitor gene in multiple human cancers. Nature., 1994; 368(6473): 753-756.
15. Ogunlesi M, OKiei W and Ademoye M. Medicinal plants used in treating eye infections in Nigeria. In: *A textbook of medicinal plants from Nigeria.* (Ed: Tolu Odugbemi). University of Lagos press, 2008; 303-304.
16. Okerulu, O. I and Ani, J. C. The phytochemical analysis and antibacterial screening of *Tetracarpidium conophorum. Journal Chemical Society of Nigeria*, 2001; 26(1): 53-55.
17. Okwu DE. Evaluation of the chemical composition of indigenousSpices and flavouring agents. Global J. Appl. Sci., 2001; 7(3): 455-459.
18. Osho, S. M and Dashielli. k (1995). Expanding Soybean production, processing and utilization in Millet processing 1930 and1964-67 and all literature on other minor Cereals. The Scre press inc. Metuchen. P. 56x.
19. Parekh J, Chanda S. *In vitro* antibacterial activity of crudemethanol extract of Woodfordia fruticosa Kurz flower (Lythacease). Braz. J. Microbiol., 2007; 38: 2.

20. Quinlan MB, Quinlan RJ, Nolan JM. Ethnophysiology and herbal treatments of intestinal worms in Dominica, West Indies. J.Ethanopharmacol., 2000; 80: 75-83.
21. Shimada T. Salivary proteins as a defense against dietarytannins. J. Chem. Ecol., 2006; 32(6): 1149-1163.
22. Speckman, D. H., Stein, E. H and Moore, S. Automatic recording apparatus for use in the chromatography of amino acids. *Analytical Chemistry*, 1958; 30: 1191.
23. Taylor, P. J., Green, N. P. O. and Stout, G. W. *Biological Science*, Cambridge, UK. Low price ed., 1998; 213- 216.
24. Trease GE, Evans WC (1989) Textbook of Pharmacognosy. 12th Edn. Balliere, Tinadl London.
25. Yudkin, M and Holfford, R. *Comprehensible Biochemistry*. Longman Group Limited, Oxford., 1998; 282.