http://dx.doi.org/10.4314/jpb.v13i1.8
Vol. 13 no. 1, pp. 53-57 (March 2016)
http://ajol.info/index.php/jpb

Journal of
PHARMACY AND BIORESOURCES

Studies on phenolic content and proximate analysis of the leaves of *Cadaba farinosa* (Capparaceae) grown in Lake Chad Research Institute, Borno State, Nigeria

Nasir K. Askira[1], Hassan B. Yesufu[2*], Garba T. Mohammed[2], Hananiyyah Hamza[2] and Samiu A. Yusuff[1]

[1]Department of Chemistry; Faculty of Science; [2]Department of Pharmaceutical Chemistry, Faculty of Pharmacy. University of Maiduguri, P.M.B 1069, Maiduguri. Nigeria.

Received 10th February 2016; Accepted 14th March 2016

Abstract
The study aimed at investigating the total phenolic content and the proximate composition of the leaves of *Cadaba farinosa*. with a view to validate its nutritional and medicinal benefit to man. The plant material was collected from the Lake Chad Research Institute in Borno State, Nigeria. Proximate analysis was conducted following methods of Association of Official Analytical Chemists. The percentage values of moisture, ash, protein, fibre and carbohydrate available were 4.40, 25.32, 13.39, 7.25 and 36.76 respectively. The total phenolic content of the plant was 173.91 mg/g GAE. Phytochemicals such as alkaloids, flavonoids, terpenoids and anthraquinones were found present in the plant material. In conclusion, the study of the leaves of *C. farinosa* revealed moderate to high composition of very important food nutrients.

Keywords: Proximate analysis; Phyto-constituents; Phenolic content; *Cadaba farinosa*

INTRODUCTION

Food and Agricultural Organization (FAO) reported that at least one billion people use wild foods in their diets (Burhingame, 2000). In Ghana alone, the leaves of over 300 species of wild plants and fruits are consumed while about 150 wild plant species have been identified as sources of emergency food in India, Malaysia and Thailand (Umar *et al.*, 2007). Similarly, in South Africa about 1400 edible plant species are used (Hassan and Umar, 2004). The diet of many rural and urban dwellers is deficient in protein resulting in high incidence of malnutrition and increase in dietary diseases; a situation in which children and especially pregnant and lactating women are most vulnerable (Black, 2004). It is therefore worthwhile to note that the incorporation of edible wild and semi-cultivated plants could be beneficial to nutritionally marginal populations, or to certain vulnerable groups within populations, especially in developing countries where poverty and climatic changes are causing havoc to the rural populace (Aberoumand and Deokule, 2009). The young leaves and twines of *Cadaba farinosa* are edible and also used in spicing and flavouring food. Twines with leaves are pounded with cereals and eaten as cake or pudding in Nigeria. They are also

* Corresponding author. *E-mail*: mallamasan@yahoo.com *Tel*: +234 (0) 8054035629
ISSN 0189-8442

boiled and made into gruel. The whole plant is used as fodder by all livestock except horses and donkeys, particularly during the dry season. Camels are the main consumers, since other species find it difficult to reach the foliage. Buffalo, black rhino and hartebeests also seek the foliage. The whole plant is a purgative, anthelmintic, antisyphilitic, emmenagogue, aperients, stimulant, anti-scorbutic, anti-phlogistic (Anonymous, 1986). It is also used in treatment of cough, fever, dysentery and as antidote against poisoning. Leaves are externally used to relieve rheumatic pain and the boiled leaves are eaten as an anthelmintic; decoction with other ingredients is employed in the treatment of amenorrhea, dysmenorrheal and uterine obstruction, decoction of leaves with myrobalans and ginger or with senna and Epsom salt given as purgative and anti-phlogistic in syphilis, scrofula and rheumatism. The root of plant possesses similar medicinal properties like leaves, the root preparation is used in anthrax. The flower buds are stimulant, antiscorbutic, purgative, emmogogue, antiphlogistic and anthelmintic especially for round worm (Nadkarni, 2002). The ash of plants is rubbed into skin to relieve general body pains (Amber, 1990). Despite its use as food and medicine in this region, there has been little report on its proximate composition. Therefore, this work is aimed at evaluating the nutritional content of *C. farinosa leaves* obtained from lake Chad research Institute, with the hope of justifying its consumption as a food source.

EXPERIMENTAL

Sample collection and preparation. The leaves of *C. farinosa* were collected from the Lake Chad research institute, Kaga Local Government Area, Borno State, Nigeria. West Africa. The samples were transported to the laboratory in air-tight polyethylene bags.

Analytical procedure. The samples were air dried and pulverised with porcelain mortar and pestle to fine particles and stored in plastic containers. Chemical analyses were carried out on the ground samples. Moisture and Protein contents were determined by the method adopted by Anhwange *et al*. (2002) ash and crude fibre contents by AOAC (1980) and carbohydrate content by AOAC (1990). Phytochemical screening was carried out in accordance with standard procedures (Sofowora, 1993; Evans, 2009).

Total Phenolic Content was determined using Folin-Ciocalteu reagent (Antolovich *et al.*, 2002). 5 ml Folin-Ciocalteu and 4 ml Na_2CO_3 (7% w/v) were added to standard serial dilutions (25, 50, 75, 100, 125, 150, 175 and 200 mg/l) and shaken. The solution was allowed to stand for 30 minutes in the dark at room temperature, after which absorbance was measured at 765 nm using a spectrophotometer. The amount of phenolic was expressed as gallic acid equivalent (GAE) in milligram per gram dry plant extract using the formula:

$C_{1/4}c \% V = m$;

C = Total content of phenolic compounds, mg g^{-1} plant extract in (GAE)

C = The concentration of gallic acid established from the calibration curve (mg mL^{-1})

V = The volume of extract (mL)

M = The weight of pure plant extract

RESULTS AND DISCUSSION

Proximate analyses: The results of proximate composition of *C. farinosa* leaves are shown in Table1. Pearson (1994) reported that moisture content is a measure of the water content in samples, if moderate, it is an indication that it can be stored for a long time without the development of moulds. The moisture content of *C. farinosa* was 4.40% (Table 1) which falls within the range of values required as safe storage limit for plant food materials (Umar *et al.*, 2007). The value was lower compared to 27.86% reported for *Cadaba trifoliata leaves* (Aradhana *et al.*, 2012) which belongs to the same family of

plant as C. *farinosa*. Crude protein of *C. farinosa* was 13.39 %, which is higher than 8.32% reported for C. *farinosa stem* and lower than 14.80 % reported for *C. farinosa* leaves (Hussain *et al.*, 2009). Carbohydrate content of *C. farinosa* leaves was 36.76 %. The value was higher when compared to *Spinacia oleraceae* leaf (32.56 %) but lower than the carbohydrate content obtained for *Amaranthus viridus leaves* (52.68 %) and Chenopodium *album* leaves (41.58 %) respectively (Glew *et al.*, 2010).

Table 1. Proximate composition of the leaves of *C. farinosa*

Parameter	Concentration (% DW)
Moisture content	4.41 ± 0.002
Ash content	25.32 ± 0.01
Crude protein	13.39 ± 0.08
Crude fibre	7.25± 0.02
Carbohydrate content	36.76 ± 0.09

The data are Mean values ± Standard deviation (SD) of three replicates. DW = Dry weight

Table 2. Phytochemical Screening of the ethanol leaf extract of *C. farinosa*

	Phytochemicals	Test	Ethanol extract
1	Anthraquinones	Borntrager	+
2	Flavonoids	Shinoda's	+
		Lead acetate	+
3	Terpenoid	Liebermann-Burchard	+
4	Saponin	Frothing	-
5	Alkaloids	Dragendorff	-

+ = Present - = Absent

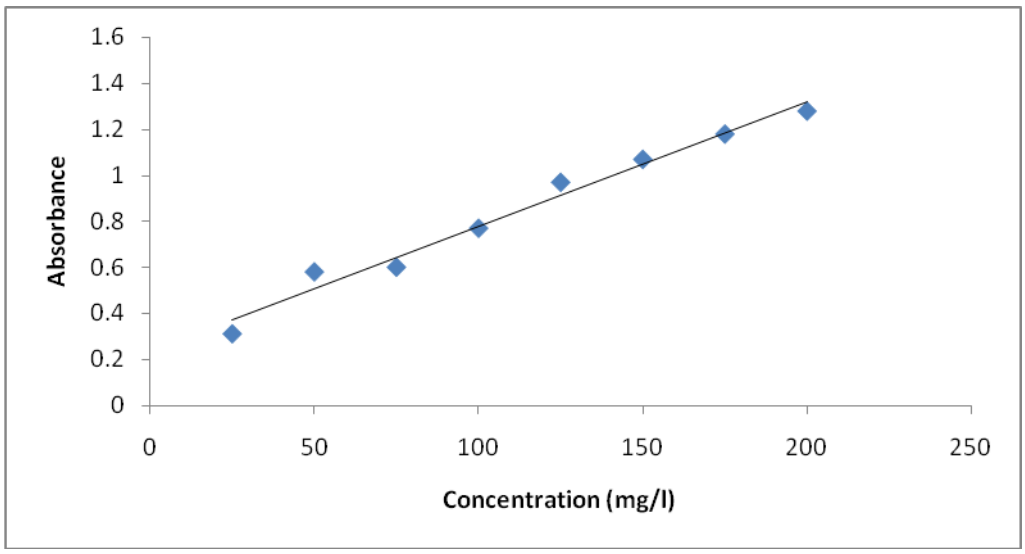

Fig. 1. Calibration plot of Gallic Acid Equivalence (GAE) Reference Standard

Ash content is a measure of the total mineral content of a food. *C. farinosa* leaves showed ash content of 25.32 % which was higher than 12.5 % reported for *Cadaba trifoliata* Leaves (Arokiyaraj *et al.*, 2008). It was found to be within the range recorded for *S. oleraceae* (23.97%), *A. viridus* (22.84%) and *C. album* (22.15%) indicating its richness in mineral element. Crude fibre obtained from *C. farinosa* leaves (7.26%) was lower than that reported for *C. trifoliata* (35%) leaves. Also, it falls within the range recorded for *S. oleraceae* (7.92%) *A. viridus* (10.13%) and *C. album* (9.76) *fruit* (Pearson, 1994). The fibre

RDA values for children, adults, pregnant and breast feeding mothers are 19-25%, 21-38%, 28% and 29% respectively.

In Table 2, The alcohol extract of *C. farinosa* revealed the presence of anthraquinones, flavonoids and terpenoids. Alkaloids and saponins were absent. Similar phytochemicals were reported by Arokiyaraj *et al.* (2008) in his study of *C. farinosa* with the presence of alkaloids and saponin and absence of anthraquinones. A different species of the same family, *C. trifoliata*, showed the presence of alkaloids in its leaves but saponin and anthraquinones were absent (Aradhana *et al.*, 2012).

In the determination of total phenolic content, standard method according to Shahidi and Naczk (1995) was employed. Eight (8) different reference standard ranging from 25, 50, 75, 100, 125, 150, 175 and 200 mg/l and the absorbance were taken using a spectrophotometer. The absorbance of the sample was also measured as shown in Fig 1.

From the Plot, the total phenolic in the sample extract was extrapolated as 230 mg/l. Therefore, the total phenolic content in mg/g gallic acid equivalent (GAE) was obtained as 173.91 mg/g. Phenolic compounds such as flavonoids, phenolic acid and tannins possess diverse biological activities such as anti-inflammatory, anti-carcinogenic and anti-atherosclerotic activities. These activities might be related to their antioxidant activity (Velioghu *et al.*, 1998). Phenols are very important plant constituents because of their scavenging ability owing to their hydroxyl groups (Switzerland *et al.*, 2002).

Conclusion. The leaves of *Cadaba farinosa* is nutritive judging from its proximate content. This justifies its usage as spices in local delicacies such as Kunun zaki. The phenolic content which could be associated with the presence of flavonoids, coumarins, tannins etc as well as other phytochemicals reported could be responsible for the medicinal properties reported in the leaves of *C. farinosa*.

Acknowledgement. The authors wish to acknowledge the contribution of Mr. Mohammed Isiyaka for helping out with the spectrophometric data information.

REFERENCES

Aberoumand, A and Deokule, S.S. (2009). Proximate and Mineral Composition of wild coco (*Eulophia ochreata*) tubers in Iran. *Asian J. Food Agroindust.* **2**(2): 203-209.

Amber, Rehman A. (1990) Studies on the Chemical Constituents of *Cadaba Farinosa*, PhD thesis (University of Karachi, Pakisthan), P. 1-147.

Anhwange, B.A., Ajibola, V.O. and Oniye, S.J. (2004). Amino Acid Composition of the Seed of *Moringa oleifera* (Lam), *Detarium microcarpum* (Guill & Sperr) and *Bauhinnia monandra* (Linn); *Chemclass J.* p. 9 - 13.

Anonymous (1986). The useful plants of India, Council of Scientific and Industrial Research, Publications and information Directorate. New Delhi. P. 93.

Antolovich M, Prenzler P.D, Patsalides E, McDonald S, Robards K. (2002) Methods for Testing Antioxidant Activity. ***Analyst***; 127(1):183- 98.

AOAC. (1980). Association of Official Analytical Chemists, Official Method of Analysis 13th (ed.) Washington DC, U.S.A. p. 125 - 127

AOAC. (1990). Association of Official Analytical Chemists, Washington DC U.S.A. p. 77

Aradhana, R. Sanjay, P. Rajender, K. Ragini, C. Vijay, K. and Raju, G. (2012). Pharmacognostic Studies of *Cadaba trifoliata* Roxb. (Capparaceae). *International Journal of Pharmacognosy and Phytochemical Research*, 4(3): 151-156.

Arokiyaraj, S. Radha, R. Martin, S. Perinbam, K. (2008) Phytochemical analysis and anti-diabetic activity of *Cadaba farinosa* R.Br. *Ind J Sci & Tech.* 1(6): 1-4.

Black, R. (2003). Micronutrient Deficiency: An Underlying Cause of Morbidity and Mortality; *Bull. World Health Organis.* **8**(2)**:** 79.

Burhingame, B. (2000). Comparison of Total Lipids, Fatty Acids, Sugars and Non Volatile Organic Acids in Nuts from *Castanea species. J. Food Comp. Anal.* **13**: 99 - 100.

Evans, W.C. (2009). Trease and Evans Pharmacognosy, 16th edn. Elsevier Company, Philadelphia, U.S.A. 18:138-148.

Glew, R.H, John, K.G, Hernandez, M. Pastuszyn, A. Ernst, J and Djomdi, N. (2010). The amino acid, Mineral and Fatty acid content of three species of human plant foods in Cameroun. *Food* ;4(1):1-6.

Hassan L.G and Umar K.J. (2004). Proximate and Mineral Compositions of Seed and Pulp of African Locusts Beans (*Parkia biglobosa l.*). *Nig. J. Basic appl. Sci.* **13**:15 - 17.

Hussain, J. Khan, A.L. Naseeb, R. Hamayun, M. Tahir, S Nisar, M. Bano, T. Shinwari, Z.K and Lee, J. (2009). Proximate and Nutrient analysis odf selected vegetable species; A case study of Karak region, Pakistan. African Journal of Biotechnology, 8(12): 2725-2729.

Nadkarni, A.K. (2002). Indian Materia Medica- 1, 3ed., Popular Prakashan, Bombay; 22526.

Pearson A. (1994). Vitamins in Fruits. The Biochemistry of Fruit and Other Products. New York: Academic press, p. 369-384.

Shahidi, F and Naczk, M. (1995). Method of Analysis and Quantification of Phenolic Compounds. Technomic Publishing Company, Lanchester. pp. 287-293

Sofowora, A. (1993). Medicinal plant and Traditional Medicine in Africa. John Wiley and sons, New York. pp. 142-146.

Switzerland. Proteggente, A. R., Pannala, A. S., Paganga, G., van Buren, L., Wagner, S., Wiseman, F., van de Put., Dacombe, C., and Rice-Evans. (2002). The antioxidant activity of regularly consumed fruit and vegetables reflect their phenolic and vitamin C composition. *Free Radical Res*., 36: 217-233.

Umar KJ, Hassan LG and Ado Y. (2007). Mineral Composition of *Detarium microcarpum* Grown in Kwatarkwashi, Zamfara State, Nigeria. *Inter. J. Pure Appl. Sci.* **1**(2): 43 - 48.

Velioglu, Y. S., Mazza, G., Cao, L., and Oomah, B. D. (1998). Antioxidant activity and total phenolics in selected fruits, vegetables, and grain products. J. Agric. Food Chem., 45, 4113-4117.