



Nutritional Potential of the Leaves of *Acalypha wilkesiana* 'Godseffiana' Muell Arg

*IKEWUCHI, C J; IKEWUCHI, C C; ONYEIKE, E N; UWAKWE, A A

Department of Biochemistry, Faculty of Science, University of Port Harcourt, P.M.B. 5323, Choba, Nigeria. E-mail: ecoli240733@yahoo.com; Telephone: +2348033715662

ABSTRACT: The proximate and phytochemical composition of the leaves of *Acalypha wilkesiana* Muell Arg was investigated. The proximate composition includes moisture (57.60%), crude fibre (21.66% wet weight and 51.08% dry weight), total carbohydrate (12.50% wet weight and 29.48% dry weight), crude protein (3.94% wet weight and 9.29% dry weight), total ash (3.90% wet weight and 9.20% dry weight), crude fat (0.40% wet weight and 0.94% dry weight) and caloric value of (69.36% wet weight and 163.58% dry weight). The phytochemical screening revealed the presence of alkaloids, carotenoids, flavonoids (catechins and flavones), saponins and tannins; with 19.05mg/100g wet weight and 44.93mg/100g dry weight carotenoids, 7.15mg/100g wet weight and 16.86mg/100g dry weight saponins, and 1.82mg/100g wet weight and 4.29mg/100g dry weight tannins. This result support the medicinal use of the plant, and in addition, unveils the possibility of its acting as a potential source of food nutrients and nutraceuticals. @ JASEM

Acalypha wilkesiana Muell Arg belongs to the family Euphorbiaceae (spurge family). Its other names include *A. amentaceae* and *A. tricolor*, while its common names are copperleaf, Joseph's coat, fire dragon, beef steak plant and match-me-if-you-can (Christman, 2004). The Hausas of Northern Nigeria call it "Jiwene" and "Jinwinini", while the Yoruba of Southern Nigeria call it "aworoso". It is native to Fiji and nearby islands in the South Pacific, and is a popular outdoor plant that provides color throughout the year, although it is also grown indoors as a container plant. It is propagated by stem cuttings at any time of the year. Under ideal conditions, it grows as a spreading evergreen shrub with upright branches that tend to originate near the base and can get up to 3.1m tall with a similar spread. It has leaves (12.7-20.3cm long) that are alternate, elliptic to oval, serrate and multi-colored, and small inconspicuous flowers (10.2-20.3cm) that hangs in catkin-like racemes beneath the foliage. Many cultivars are available with different leaf forms and colors: *A. wilkesiana* 'Godseffiana' has narrow, drooping, green leaves with creamy-white margins, 'Marginata' has coppery-green leaves with pink or crimson margins, 'Macrophylla' has larger leaves, variegated with bronze, cream, yellow and red, while 'Musaica' has green leaves that are mottled with orange and red (Gilman, 1999; Christman, 2004).

A. wilkesiana has antimicrobial properties (Ogundaini, 2005). According to Ogundaini (2005), the expressed juice or boiled decoction is used for the treatment of gastrointestinal disorders and fungal skin infections such as Pityriasis versicolor, Impetigo contagiosa, Candida intertrigo, Tinea versicolor, Tinea corporis and Tinea pedis. In Southern Nigeria, the leaves of this plant are eaten as vegetables in the management of hypertension, consequent upon which we had earlier monitored the effect of the plants'

leaves on plasma sodium and potassium levels of normal rabbits (Ikewuchi *et al.*, 2008); as well as its effect on the plasma and urine chemistry of salt-loaded rats (Ikewuchi *et al.*, 2009a). In the present study, we investigated the proximate and phytochemical composition of *A. wilkesiana* 'Godseffiana' with a view to unveiling its nutritional potential.

MATERIALS AND METHODS

Collection of Plant Samples: Samples of fresh leaves of *Acalypha wilkesiana* were collected from within the Choba Campus of University of Port Harcourt, Port Harcourt, Nigeria. After due identification at the University of Port Harcourt Herbarium, Port Harcourt, Nigeria, they were rid of dirt and stored for subsequent use.

Determination of the proximate composition: A part was immediately used for determining the proximate composition of the plant. The moisture, crude protein, fat, ash, fiber and total carbohydrate contents of the samples were determined in triplicates according to standard methods (AOAC, 2006). The energy value was calculated using the Atwater factors of 4, 9 and 4 for protein, fat and carbohydrate respectively (FAO/WHO/UNU, 1991).

Preliminary screening of the phytochemical profile: The phytochemical screening of the sample was carried out as described by Harbone (1973), and Sofowora (1980). It was screened for alkaloids, carotenoids, flavonoids (catechins and flavones), saponins and tannins. Quantitative determination of carotenoids, saponins and tannins were carried out in triplicates, using the method of AOAC (2006).

RESULTS AND DISCUSSION

The proximate composition of *A. wilkesiana* is given in Table 1. Its moisture content is less than those of *Amarantus hybridus*, *Talinum triangulare*, *Telferia occidentalis* (Oguntona, 1998), *Pennisetum purpureum* (Okaraonye and Ikewuchi, 2009) and *Tridax procumbens* (Ikewuchi *et al.*, 2009b). The moisture content of any food is an index of its water activity (Olutiola *et al.*, 1991), and is used as a measure of stability and the susceptibility to microbial contamination (Uraih and Izuagbe, 1990). This implies that:

- *A. wilkesiana* may have a relatively longer shelf-life than these other plants.
- Dehydration would increase the relative concentrations of the other food nutrients (Table 1) and improve the shelf-life/durability of harvested *A. wilkesiana*.

The crude protein content of *A. wilkesiana* is greater than those of *A. hybridus*, *T. triangulare*, *T. occidentalis* (Oguntona, 1998) and *P. purpureum* (Okaraonye and Ikewuchi, 2009). A 100g serving of *A. wilkesiana* can provide about 7-19% of the recommended dietary allowance (RDA) (Table 1). It has lower total fat content than *A. hybridus*, *T. triangulare*, *T. occidentalis* (Oguntona, 1998), *P. purpureum* (Okaraonye and Ikewuchi, 2009) and *T. procumbens* (Ikewuchi *et al.*, 2009b). We found a higher total carbohydrate content in *A. wilkesiana* than was reported for *A. hybridus*, *T. triangulare* (Oguntona, 1998), *P. purpureum* (Okaraonye and Ikewuchi, 2009) and *T. procumbens* (Ikewuchi *et al.*, 2009b). A 100g serving of *A. wilkesiana* can provide about 5-10% of the recommended dietary allowance

(RDA) (Table 1). It has very high crude fibre content, which is higher than those of *A. hybridus*, *T. triangulare*, *T. occidentalis* (Oguntona, 1998), *P. purpureum* (Okaraonye and Ikewuchi, 2009) and *T. procumbens* (Ikewuchi *et al.*, 2009b). A 100g serving of *A. wilkesiana* can provide about 85-201% of the recommended dietary allowance (RDA) (Table 1). Epidemiological evidences suggest that increased fibre consumption may contribute to a reduction in the incidence of certain diseases including colon cancer, coronary heart disease, diabetes, high blood pressure, obesity, and various digestive disorders (SACN, 2008). Dietary fiber has been associated with alterations of the colonic environment that protect against colorectal diseases. Among the theories on colonic carcinogenesis are those that involve increased concentrations of bile acids and their metabolites, alterations in colonic pH, low Ca^{2+} , elevated NH_3 and long-chain fatty acid concentrations, and alterations in bacterial profiles. Fiber may also provide protection by increasing fecal bulk, which dilutes the increased colonic bile acid concentrations that occur with a high-fat diet (Dillard and German, 2000). So, herein lays a likely benefit derivable from the consumption of this plant. The ash content of *A. wilkesiana* is less than those of *A. hybridus* and *T. occidentalis*, but greater than those of *T. triangulare* (Oguntona, 1998), *P. purpureum* (Okaraonye and Ikewuchi, 2009) and *T. procumbens* (Ikewuchi *et al.*, 2009b). It has higher caloric value than *A. hybridus*, *T. triangulare* (Oguntona, 1998) and *P. purpureum* (Okaraonye and Ikewuchi, 2009).

Table 1: Proximate compositions of the leaves of *Acalypha wilkesiana*

Parameter	Composition			
	/100g Wet weight		/100g Dry weight	
	Amount	%DV	Amount	%DV
Moisture (g)	57.600	-	-	-
Dry matter (g)	42.400	-	100.000	-
Total ash (g)	3.900	-	9.200	-
Crude protein (g)	3.940	7.810	9.290	18.410
Crude lipid (g)	0.400	0.620	0.940	1.450
Total carbohydrate (g)	12.500	4.220	29.480	9.950
Reducing sugar (g)	0.580	-	1.370	-
Crude fiber (g)	21.660	85.630	51.080	201.190
Caloric value (kcal)	69.360	3.430	163.580	8.090

Values are means of triplicate determinations. Percent daily values (%DV) are for adults or children aged 4 or older, and are based on a 2,000 calorie reference diet. The daily values may be higher or lower based on individual needs (NutritionData, 2008).

Table 2: Result of the Preliminary Qualitative Phytochemical Screening of *Acalypha wilkesiana*

Phytochemical	Status
Alkaloids	+
Carotenoids	++
Flavonoids	
Catechin	+
Flavone	+
Saponins	++
Tannins	+

Key: += moderately present; +++ highly present

Table 3: Result of the Preliminary Quantitative Phytochemical Screening of *Acalypha wilkesiana*

Phytochemical	Composition (mg/100g)	
	/Wet weight	/Dry weight
Carotenoids	19.05	44.93
Saponins	7.15	16.86
Tannins	1.82	4.29

Values are means of triplicate determinations.

The preliminary phytochemical screening of the leaves of *A. wilkesiana* revealed the presence of alkaloids, carotenoids, flavonoids (catechins and flavones), saponins and tannins (Table 2), all of which have potential health promoting effects, at least under some circumstances (Basu *et al.*, 2007). The result of the preliminary quantitative analysis for carotenoids, saponins and tannins is shown in Table 3. The carotenoid content is greater than that reported for *Vernonia amygdalina* (Ejoh *et al.*, 2007). Carotenoids provide many brilliant animal colors, as in the flamingo, starfish, lobster and sea urchin (Harbone, 1973; Best, 2006). They are antioxidants, protect against cancer, cataract and radiation damage, boost the immune system (Basu, 2007; Best, 2006), and are precursors of vitamin A (Chaney, 2006). β -Carotene is used as a food colorant. Our results show that *A. wilkesiana* has higher saponin content than *V. amygdalina* (Ejoh, 2007), but lower content than *P. purpureum* (Okaraonye and Ikewuchi, 2009) and *T. procumbens* (Ikewuchi *et al.*, 2009b). Saponins are known to reduce the uptake of certain nutrients like glucose and cholesterol, and so may help in lessening the metabolic burden that would have been placed on the liver (Basu *et al.*, 2007). They are also effective against colon cancer (Best, 2006). We found low tannin content in this plant. Its tannin content is lower than those of *Chromolaena odorata* (Apori *et al.*, 2000) and *Trichosanthes anguina* fruits (Ojiako and Igwe, 2008), although higher than that of *T. procumbens* (Ikewuchi *et al.*, 2009b). Tannins reduce blood cholesterol (Basu *et al.*, 2007). Thus from the foregoing, it can be seen that this plant can serve as a potential source of food nutrients and nutraceuticals.

REFERENCES

- AOAC (Association of Official Analytical Chemists) (2006). Official Methods of Analysis of the AOAC (Horwitz W, Editor), 18th edn. Association of Official Analytical Chemists, Washington DC, U.S.A
- Apori, SO; Long, RJ; Castro, FB; Ørskov, ER (2000). Chemical composition and nutritive value of leaves and stems of tropical weed *Chromolaena odorata*. *Grass Forage Sci*, 55(1): 77–81. Doi: 10.1046/j.1365-2494.2000.
- Basu, SK; Thomas, JE; Acharya, SN (2007). Prospects for Growth in Global Nutraceutical and Functional Food Markets: A Canadian Perspective. *Aust J Basic Appl Sci*, 1(4): 637-649. <http://www.insinet.net/ajbas/637-649.pdf>
- Best, B (2006). Phytochemicals as Nutraceuticals. <http://www.benbest.com/nutraceut/phytochemicals.html>
- Chaney, SG (2006). Principles of Nutrition II: Micronutrients. In: Devlin TM (ed), "Textbook of Biochemistry, with Clinical Correlation", 6th edn. John Wiley and sons, New York. pp: 1091-1120. ISBN 10 0-471-67808-2
- Christman, S (2004). *Acalypha wilkesiana*. Floridata.com LC, Florida. http://www.floridata.com/ref/A/acal_wil.cfm
- Dillard, CJ; German, JB (2000). Phytochemicals: nutraceuticals and human health. *J Sci Food Agric*, 80(12):1744-1756.
- Ejoh, RA; Nkonga, DV; Inocent, G; Moses, MC (2007). Nutritional Components of Some Non-Conventional Leafy Vegetables Consumed in Cameroon. *Pak J Nutr*, 6(6): 712-717. <http://www.pjbs.org/pjnonline/fin813.pdf>
- FAO/WHO/UNU (1991). Energy and Protein Requirements: Report of a Joint FAO/WHO/UNU Expert Consultation. WHO Technical Report Series 724.
- Gilman, EF (1999). *Acalypha wilkesiana*. Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Fact Sheet FPS-6. October, 1999. 3p.
- Harbone, JB (1973). *Phytochemical Methods, a Guide to Modern Technique of Plant Analysis*, 2nd edn. Chapman and Hall, New York.
- Ikewuchi, JC; Anyadiegwu, A; Ugono, EY; Okungbowa, SO (2008). Effect of *Acalypha wilkesiana* Muell. Arg. on Plasma Sodium and Potassium Concentration of Normal Rabbits. *Pak J Nutr*, 7(1): 130-132.
- Ikewuchi, JC; Ikewuchi, CC; Igboh, MN (2009b). Chemical Profile of *Tridax procumbens* Linn. *Pak J Nutr*, 8(5): 548-550.
- Ikewuchi, JC; Ikewuchi, CC; Onwuka, FC (2009a). *Acalypha wilkesiana* Muell Arg Induced Diuresis in Salt-Loaded Rats: Implications for the Management of Edema, Obesity and Hypertension. *J Appl Sci Environ Manage*, 13(4) 51 – 54.

- NutritionData (2008). Know what you eat: Nuts, cashew nuts, oil roasted, without salt added. Retrieved June 25, 2008 from: <http://www.nutritiondata.com/>
- Ogundaini, AO (2005). From Greens Into Medicine: Taking a Lead From Nature. An Inaugural Lecture Delivered at Oduduwa Hall, Obafemi Awolowo University, Ile-Ife, Nigeria. Inaugural Lecture Series 176. OAU Press Limited, Ile-Ife, Nigeria. pp 12-15. <http://www.oauife.edu.ng/faculties/pharmacy/aogund.pdf>
- Oguntona, T (1998). Green Leafy Vegetables. In: Osagie AU and OU Eka (Eds), "Nutritional Quality of Plant Foods. Post Harvest Research Unit, Department of Biochemistry, University of Benin, Benin City, Nigeria. pp: 120-133. ISBN: 978-2120-02-2.
- Ojiako, OA; Igwe, CU (2008). The Nutritive, Anti-Nutritive and Hepatotoxic Properties of *Trichosanthes anguina* (Snake Tomato) Fruits from Nigeria. Pak J Nutr, 7(1): 85-89. <http://www.pjbs.org/pjonline/fin657.pdf>
- Okaraonye, CC; Ikewuchi, JC (2009). Nutritional and Antinutritional Components of *Pennisetum purpureum* (Schumach). Pak J Nutr, 8(1): 32-34.
- Olutiola, PO; Famurewa, O; Sonntag, H-G (1991). An Introduction to General Microbiology, A Practical Approach. Heidelberger Verlagsanstalt und Druckerei GmbH Heidelberg, Germany. ISBN: 3-89426-042-4
- SACN (2008). Draft SACN position statement on dietary fibre & health and the dietary fibre definition - August 2008. SACN/08/20. http://www.sacn.gov.uk/pdfs/final_draft_sacnstatement_on_dietary_fibre_for_website.pdf
- Sofowora, A (1980). Guidelines for research promotion and development in traditional medicine. Nig J Pharmacy, 11: 117-118.
- Uraih, N; Izuagbe, Y (1990). Public Health, Food and Industrial Microbiology. Uniben Press, Nigeria. ISBN: 978-2027-00-6.