

Comparative Study of the Vitamin Composition of Some Common Nigerian Medicinal Plants.

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ABSTRACT

The vitamin composition of three Nigerian medicinal plants (*Acalypha wilkesiana*, *Chromolaena odorata*, and *Tridax procumbens*) was investigated. Our result shows that *C. odorata* is comparatively richer in vitamins than the other two plants, with very high biotin, ascorbic acid, and vitamin K content. Only biotin and ascorbic acid were found in high concentrations in *Acalypha wilkesiana*, while all the eleven vitamins analyzed, were found only in low concentrations in *T. procumbens*. However, the relative proportion of the vitamins were greatly improved by dehydration or drying, especially in the case of *T. procumbens*.

(Keywords: *Acalypha wilkesiana*, *Chromolaena odorata*, *Tridax procumbens*, vitamin composition).

INTRODUCTION

Vitamins are organic molecules that function in a wide variety of capacities within the body. The most prominent, are cofactors for enzyme-catalyzed reactions. They generally cannot be synthesized by mammalian cells and, therefore, must be supplied in the diet [FC&A, 1997; Crook, 2006; King, 2003, 2007]. The vitamins are of two distinct types:

- Water soluble: Thiamin (B₁), Riboflavin (B₂), Niacin (B₃), Pantothenic acid (B₅), Pyridoxal (B₆), Biotin, Cobalamin (B₁₂), Folic acid, and Ascorbic acid (C).
- Lipid soluble: vitamin A, vitamin D, vitamin E, and vitamin K [FC&A, 1997; Crook, 2006; King, 2003, 2007].

Inadequate intake/absorption, excess loss, or enhanced utilization, results in vitamin deficiencies, which sometimes may manifest as disease conditions [Crook, 2006]. Amongst the various sources of vitamins are plant leaves, some of which are very rich sources of some vitamins.

In Nigeria, *Acalypha wilkesiana*, *Chromolaena odorata*, and *Tridax procumbens* are commonly used in traditional medicine. *Acalypha wilkesiana* Muell Arg belongs to the family Euphorbiaceae (spurge family). It is commonly called copperleaf, Joseph's coat, fire dragon, beef steak plant and match-me-if-you-can [http://www.floridata.com/ref/A/acal_wil.cfm].

Chromolaena odorata (formerly *Eupatorium odoratum* (L)) belongs to the family Asteraceae (alt. Compositae). It is commonly called "Akintola", "Awolowo", independence weed, siam weed, trifid weed, bitter bush or jack-in-the-bush [Okon and Amalu, 2003; <http://www.ehs.cdu.edu.au/chromolaena/pubs/friend.html>]. The Ibo people of South Eastern Nigeria call it "obiarakara or ahiiha eliza".

Tridax procumbens Linn belongs to the family Asteraceae (alt. Compositae). Its common names are coat buttons, wild daisy, erva-de-touro, cadillo chisaca, tridax [http://www.lucidcentral.org/keys/FNW/FNW_seeds/html/fact_sheets/Tridax_procumbens.htm; <http://www.ars-grin.gov/cgi-bin/npgs/html/family.pl>]. It is called "mbūli" by the Ibo people of South Eastern Nigeria.

All three plants have established antimicrobial and antihypertensive properties [Akinde, 1986; Alade and Irobi, 1993; Iwu, 1993; Adesina *et al.*, 2000; Phan *et al.*, 2001; Salahdeen *et al.*, 2004;

Edeoga *et al.*, 2005 Ogundaini, 2005; Ravikumar *et al.*, 2005; Saxena and Albert, 2005; Akinyemi *et al.*, 2006; Oladunmoye, 2006; Akinmoladun *et al.*, 2007; Ikewuchi *et al.*, 2008]. Thus as a result of their widespread occurrence and prevalence (especially in Southern Nigeria) there is need to harness their likely potentials as food source. In line with this, the present study was designed to investigate the vitamin composition of three Nigerian medicinal plants (*Acalypha wilkesiana*, *Chromolaena odorata*, and *Tridax procumbens*) with a view of finding any nutritional or nutraceutical potential.

MATERIALS AND METHODS

Samples of fresh *Acalypha wilkesiana*, *Chromolaena odorata*, and *Tridax procumbens* were collected from within the Abuja and Choba Campuses of University of Port Harcourt, Port Harcourt, Nigeria. The collected samples were identified at the University of Port Harcourt Herbarium, Port Harcourt, Nigeria. After ridding them of dirt, the leaves were removed and stored for subsequent use in the analysis. These dirt free samples were weighed and pulverized into fine powder, using Janke and Kunkel (IKA-LABORTECHNIC) grinder. The pulverized samples were then extracted by refluxing with methanol, for 6 hours at very low temperature. The process was repeated twice, using fresh solvents, to ensure that most of the vitamins in the pulverized samples were removed. The extract was then esterified to remove traces of fatty acids, after which it was poured into a rotary evaporator to dry. Water was then removed by adding anhydrous sodium sulphate, after which it was subjected to gas chromatography analysis, using pulse flame photometric detector, for the determination of the component vitamins

RESULTS, DISCUSSION, AND CONCLUSION

The vitamin composition of *Acalypha wilkesiana*, *Chromolaena odorata*, and *Tridax procumbens* is shown in Table 1. As in the table, drying or dehydration produced the highest effect of improving the relative proportion of the vitamins, in *T. procumbens*, while having the least effect on *A. wilkesiana*. *A. wilkesiana* has the highest content of thiamine per 100g wet weight, while *T. procumbens* has the highest content per dry weight. Their thiamine content is less than those reported for *A. hybridus*, *G. africanum*, *T.*

triangulare, *T. occidentalis*, and *V. amygdalina* [Oguntona, 1998], groundnut [Elegbede, 2008] and cashew nut [Nandi, 1998; NutritionData, 2008], and comparable to that of *S. Mombin* Leaves [Njoku and Akumefula, 2007]. *A. wilkesiana* and *C. odorata* both have approximately equal contents of riboflavin, which is higher than that of *T. procumbens*. Their riboflavin content is less than those of *A. hybridus*, *T. triangulare*, *T. occidentalis*, *P. guineense*, *V. amygdalina* [Oguntona, 1998], and cashew nut [Nandi, 1998; NutritionData, 2008], but comparable to those of *G. africanum* [Oguntona, 1998], groundnut [Elegbede, 1998] and *S. Mombin* Leaves [Njoku and Akumefula, 2007]. A 100g serving of *A. wilkesiana* can provide about 4.77-11.25% of the RDA, while those of *C. odorata* and *T. procumbens* are 4.66-11.50 and 2.54-25.52% respectively (Table 1).

C. odorata has the highest niacin content, while *T. procumbens* is the least. All three plants have lower niacin content than cashew nut [Nandi, 1998; NutritionData, 2008], while dry *C. odorata* and *T. procumbens* have higher niacin content than groundnut [Elegbede, 1998], with a %DV of about 4.87-6.24 per 100g serving. *C. odorata* has the highest pyridoxine content per 100g wet weight, while *T. procumbens* has the least. All three plants have lower pyridoxine content than *Amarantus hybridus*, *Piper guineense*, *Talinum triangulare*, *Telferia occidentalis*, *Vernonia amygdalina* [Oguntona, 1998], groundnut [Elegbede, 1998], and cashew nut [NutritionData, 2008]. A 100g serving of all of them, whether dry or wet can provide less than 1.00% of the RDA (except dry *T. procumbens*, with a %DV of 2.04, Table 1).

C. odorata has the highest vitamin C content per 100g wet weight, while *A. wilkesiana* is the least. All three plants have lower vitamin C content than *A. hybridus*, *T. triangulare*, *T. occidentalis*, *P. guineense*, and *V. amygdalina* [Oguntona, 1998; Ejoh *et al.*, 2007], but greater than those of groundnut [Elegbede, 1998], cashew nut [NutritionData, 2008] and *Spondias Mombin* Leaves [Njoku and Akumefula, 2007]. *C. odorata* and *T. procumbens* has a comparable ascorbic acid content to *Gnetum africanum*, while that of *A. wilkesiana* is lower [Oguntona, 1998]. A 100g serving of these leaves can provide about 36.67-136.21% of the RDA (Table 1). This means that 100g of fresh/dry *C. odorata* can meet the RDA (60mcg) [FC&A, 1997] for vitamin C, while only the dry samples of the other two can.

Table 1: The Vitamin Composition of *Acalypha wilkesiana*, *Chromolaena odorata*, and *Tridax procumbens*.

Element	Composition											
	<i>Acalypha wilkesiana</i>				<i>Chromolaena odorata</i>				<i>Tridax procumbens</i>			
	Fresh		Dry		Fresh		Dry		Fresh		Dry	
	Amount mg/100g	% DV	Amount mg/100g	% DV	Amount mg/100g	% DV	Amount mg/100g	% DV	Amount mg/100g	% DV	Amount mg/100g	% DV
a. Water Soluble												
Vitamin B1 (thiamine)	0.0206	1.28	0.0487	3.02	0.0053	0.33	0.0131	0.81	0.0053	0.33	0.0535	3.32
Vitamin B2 (riboflavin)	0.0842	4.77	0.1986	11.25	0.0822	4.66	0.2030	11.50	0.0448	2.54	0.4503	25.52
Vitamin B3 (Niacin)	0.1673	0.84	0.3946	1.97	0.3945	1.97	0.9741	4.87	0.1241	0.62	1.2472	6.24
Vitamin B6 (pyridoxine)	0.0073	0.38	0.0172	0.90	0.0060	0.32	0.0148	0.78	0.0039	0.20	0.0389	2.04
Vitamin C	33.0061	36.67	77.8445	86.49	49.6490	55.17	122.5901	136.21	10.6247	11.81	106.7807	118.65
Biotin	0.0241	80.33	0.0568	189.33	0.0299	99.67	0.0738	246.00	0.0042	14.00	0.0426	142.00
Folic acid	0.0053	1.30	0.0125	3.10	0.0125	3.10	0.0309	7.70	0.0014	0.30	0.0137	3.40
b. Fat Soluble												
Vitamin A	0.0002	0.03	0.0004	0.05	0.0104	1.30	0.0257	3.21	0.0051	0.64	0.0513	6.41
Vitamin D	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
Vitamin E	0.0071	0.04	0.0168	0.08	0.0163	0.08	0.0402	0.201	0.0019	0.01	0.0191	0.10
Vitamin K	0.0001	0.13	0.0003	0.38	0.0436	54.50	0.1077	134.63	0.0058	7.25	0.0581	72.63

Comparatively, *C. odorata* has the highest biotin content, while *T. procumbens* has the least. Their biotin content is comparable to that of groundnut [Elegbede, 1998]. A 100g serving of *A. wilkesiana* can provide about 80.33-189.33% of the RDA, while those of *C. odorata* and *T. procumbens* are 99.67-246% and 14.00-142.00% respectively (Table 1).

C. odorata has the highest folic acid content, followed by *A. wilkesiana* and then *T. procumbens*. They all have lower folic acid content than groundnut [Elegbede, 2008]. The folic acid content of *A. wilkesiana* and *T. procumbens* are lower than that of cashew nut [NutritionData, 2008], while that of *C. odorata* is comparable to it. A 100g serving of *A. wilkesiana* can provide about 1.30-3.10% of the RDA, while those of *C. odorata* and *T. procumbens* are 3.10-7.70 and 0.30-3.40% respectively (Table 1).

C. odorata has the highest content of vitamin A per 100g wet weight, while *T. procumbens* has the highest content per dry weight. *C. odorata* has the highest vitamin E content per 100g wet weight, while *T. procumbens* has the least. Their vitamin E content is lower than those of groundnut [Elegbede, 1998] and cashew nut [NutritionData, 2008]. It means that 100g of

fresh/dry *A. wilkesiana* and *C. odorata* can meet the recommended daily allowance (RDA) for vitamin E (8mcg) [FC&A, 1997], while only the dry samples of *T. procumbens* can.

Comparatively, *C. odorata* has the highest vitamin K content, while *A. wilkesiana* has the least. *C. odorata* has higher vitamin K content than cashew nut [NutritionData, 2008], that of *T. procumbens* is comparable, while that of *A. wilkesiana* is lower. A 100g serving of *A. wilkesiana* can provide about 0.13-0.38% of the RDA, while those of *C. odorata* and *T. procumbens* are 54.50-134.63% and 7.25-72.63% respectively (Table 1). Thus, 100g of dry *Chromolaena odorata* can meet the RDA for vitamin K (80mcg) [FC&A, 1997].

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