

## Full Length Research Paper

# Micronutrient and phyto-chemical composition of root bark and twig extracts of *Gongronema latifolium*

Egbung Godwin Eneji\*, Atangwho Item Justin, Iwara Iwara Arikpo and Eyong Ubana Eyong

Department of Biochemistry, College of Medical Sciences, University of Calabar, P.M.B 1115, Calabar, Nigeria.

Accepted 08 September, 2011

In traditional setting, *Gongronema latifolium* root and twig are used in the management of different ailments. The present study therefore evaluated their chemical constituents: phytochemicals (tannins, saponins, alkaloids, flavonoids and hydrocyanide), proximate, (crude fat, ash, fat and protein), mineral elements (Cr, Cu, Se, Zn and Fe) and vitamins (A, C, E, riboflavin, niacin and thiamine) using standard methods. Results show high levels of Vitamin A and C in the twig extract compared to the root extract, while vitamin E was found to be present in the root extract only. However, the flavonoids ( $3.50 \pm 0.01$ ), alkaloids ( $14.02 \pm 0.01$ ), HCN ( $7.81 \pm 0.05$ ) and tannins ( $0.25 \pm 0.01$ ) were observed to be significantly high ( $P < 0.05$ ) in the root extract relative to the twig extract. *G. latifolium* was revealed in trace concentrations, Se, Cu, Fe, Zn and Cr. Conclusively, the findings from this work therefore indicate that the twig and root bark extracts may be a good source of medically active phytochemicals and micronutrients relevant in human and animal nutrition.

**Keywords:** *G. latifolium*, phytochemicals, micronutrient, vitamins.

## INTRODUCTION

*Gongronema latifolium*, commonly called 'utazi' and 'aroake' in South eastern and South western parts of Nigeria respectively, is a tropical rainforest plant primarily used as spice and vegetable in traditional folk medicine (Ugochukwu and Babady, 2002; Ugochukwu et al., 2003; Morebise et al., 2002). The leaves extract is rich in proteins (27.2%DM) which compared well with values reported for chickpea (24.0%DM) and other protein rich plants (Glew et al., 1997; Akwaowo et al., 2000; Ajayi et al., 2006; Iqbal et al., 2006). Phytochemical analysis of leaves extract of *G. latifolium* reveals the presence of essential oil, saponins, alkaloids, minerals like calcium, phosphorus, magnesium, copper and potassium (Morebise et al., 2002; Schneider et al., 2003; Eleyinmi and Bressler, 2007; Atangwho et al., 2009). It is a tropical rainforest plant which has been traditionally used in the South eastern part of Nigeria for the management of diseases such as diabetes, high blood pressure etc. (Ugochukwu et al., 2003). Various authors such as Ugochukwu and Babady (2003), Ugochukwu et al. (2003) and Ogundipe et al. (2003) reported that aqueous and

ethanolic extracts of *G. latifolium* had hypoglycemic, hypolipidemic and antioxidative properties while Morebise et al. (2002) showed that it has anti-inflammatory action and Akuodor et al. (2010) reported it as an antimalaria agent.

However, credence has been given to the leaf part of this plant but there is no available phytochemicals, proximate and micronutrient information on the twig and root of the plant, which have been reported to play an important role in tradi-medicine. Tiwari and Rao (2002) reported that the different composition of the active principle in plants give medicinal plants an edge as a better therapeutic agents than chemotherapy in management of different ailments such as atherosclerosis, hypertension and diabetes. Therefore, in this study we evaluated the quantitative analysis of the phytochemicals, proximate and mineral composition of the twig and root bark of *G. latifolium* for possible use as supplement in human and animal nutrition.

## MATERIALS AND METHODS

### Sample collection and preparation

*G. latifolium* plants were identified and authenticated by a

\*Corresponding Author E-mail: [eneji6@yahoo.com](mailto:eneji6@yahoo.com).

Botanist, Dr Mike Eko of the Department of Botany, University of Calabar. Fresh roots were excavated and twigs of the plant harvested from Akpabuyo Local Government Area of Cross River State, Nigeria. The roots and twig were thoroughly washed to remove debris and the earth remains. From these the barks were divested and thereafter chopped into bits and allowed to dry under shade. They were blended into fine powder using a Q-link electrical blender Model QBL-18L40. Three hundred and ten point eight (310.8 g) of the blended stem bark and three hundred and sixty (360 g) of the blended root were separately soaked in 1200 ml of ethyl alcohol (80% BDH) each and agitated. And then allowed to stay in refrigerator for 48 h at 4°C. The mixtures were first filtered with cheese cloth, then with Whatman No 1 filter paper (24cm). The filtrates were then separately concentrated *in vacuo* using Rotary Evaporator (Model RE52A, China) to 10% of its original volume at 37°C - 40°C. These were concentrated to complete dryness in water bath, yielding 37.1g (11.96%) of stem bark and 49.1g (13.6%) of root extracts. The extracts were stored in a refrigerator from where aliquots were used for the proximate, phytochemical and micronutrients analyses.

### Phytochemical analysis

Quantitative phytochemical composition of the leaves were determined using the methods variously described by Harbone (1973) and Trease and Evans (2002) and Sofowara (2008) including percentage composition of saponins, alkaloids, flavonoids, hydrocyanide and tannins (Atangwho et al., 2009).

### Proximate analysis

Moisture content was determined using the gravimetric methods (AOAC, 2002) and crude protein determined by the Kjeldhal method described and adapted by Chang (2003). Crude fat was extracted using the solvent extraction gravimetric method and ash content determined using the incineration gravimetric method of the Association of Official Analytical Chemists (AOAC, 2002).

### Vitamins and mineral elements determination

The Perkin Elmer Atomic Absorption spectrophotometer (Model 306 UK) was used for the determination of Se, Zn, Fe, Cu and Cr using the methods of AOAC (2002) and James (1995). Vitamin A, C and E contents were determined spectrophotometrically, again using the standard methods of AOAC (2000). Thiamine, niacin and riboflavin contents were determined using the colorimetric method (Okwu and Ndu, 1996).

### RESULTS

The qualitative phytochemical screening showed the presence of tannins, saponins, alkaloids, flavonoids and hydrocyanide. The chemical compositions of the twig and root ethanolic extract of *G. latifolium* viz: vitamin, mineral element, proximate composition (crude fat, ash and protein) and phytochemicals (saponin, flavonoids, alkaloids, tannins and hydrocyanide) are shown in Table 1a-1d respectively. Vitamin A ( $43.07 \pm 0.10$ ) and vitamin C ( $63.27 \pm 3.14$ ) contents were observed to be significantly high ( $p < 0.05$ ) in the twig compared to the root extract while vitamin E was not detected in the twig bark extract but present in the root bark at a concentration of ( $40.33 \pm 1.17$ ). Also, the proximate composition: moisture ( $18.50 \pm 0.10$ ) and ash ( $17.99 \pm 0.02$ ) values were significantly high ( $p < 0.05$ ) in the root extract compared to the twig extract. However, the phytochemicals: flavonoids ( $3.50 \pm 0.01$ ), alkaloids ( $14.02 \pm 0.01$ ), HCN ( $7.81 \pm 0.05$ ) and tannins ( $0.25 \pm 0.01$ ) were observed to be significantly high ( $p < 0.05$ ) in the root extract compared to the twig extracts. Trace concentrations of Se, Cu, Fe, Zn and Cr minerals were observed to be present in these plant parts. It appears there is a complementary distribution of these chemicals in the twig and root of these plant parts.

### DISCUSSION

The phytochemical screening of the twig and root bark extracts of *G. latifolium* revealed the presence of alkaloids, tannins, flavonoid, saponins and hydrocyanide. However, the concentration of these phytochemicals

**Table 1a:** Vitamin composition of twig and root extract of *Gongronema latifolium*.

	<b>Thiamine (mg/100 g)</b>	<b>Niacin (mg/100 g)</b>	<b>Vit. E (IU/100 g)</b>	<b>Vit. C (mg/100 g)</b>	<b>Vit. A (IU/100 g)</b>
Root extract	0.63±0.00	0.04±0.00	40.33±1.17	62.27±3.14	21.53±0.18
Twig bark extract	0.62±0.00	0.08±0.00*	Not detected	86.53±1.47*	43.07±0.10*

\*P&lt;0.05 vs stem bark extract.

**Table 1b:** Proximate composition of twig and root extract of *Gongronema latifolium*.

	<b>Moisture(%)</b>	<b>Ash (%)</b>	<b>Fat (%)</b>	<b>Protein (%)</b>
Root extract	6.50±0.01	3.50±0.02	20.09±0.03	0.47±0.06
Twig extract	17.50±0.01*	6.02±0.05*	29.05±0.04*	2.39±0.06*

\*P&lt;0.05 vs stem bark extract.

**Table 1c:** Phytochemicals composition of twig and root extract of *Gongronema latifolium*.

	<b>HCN (mg/kg)</b>	<b>Saponin (%)</b>	<b>Flavonoids (%)</b>	<b>Alkaloids (%)</b>	<b>Tannin (%)</b>
Root extract	7.81±0.05	17.00±0.03	3.50±0.01	14.02±0.01	0.25±0.01
Twig extract	1.19±0.04*	17.50±0.01	0.52±0.01*	8.07±0.03*	0.24±0.00

\*P&lt;0.05 vs stem bark extract.

**Table 1d:** Micronutrient composition of root bark and twig extracts of *G. latifolium*.

	<b>Cr (mg/100 g)</b>	<b>Cu (mg/100 g)</b>	<b>Se (mg/100 g)</b>	<b>Zn (mg/100 g)</b>	<b>Fe (mg/100 g)</b>
Root Bark extract	0.008	0.021	0.002	0.14	0.12
Twig extract	0.009	0.022	0.016	0.26	0.09

varies between these plant parts. The presence of saponins in the root bark and twig extracts of these plants may corroborate to the use of the leaf part in lowering plasma cholesterol level and therefore serving as a potential remedy for the management of atherosclerosis and other related disorders like diabetes and obesity (Atangwho et al., 2009). More so, flavonoid and alkaloids have been found in most plants at different concentrations and reported to have antimicrobial effects

in various studies involving plant extracts (Nwaogu et al., 2007). Also reported by Vita (2005), flavonoids have antioxidants with good effects on endothelial function namely reducing the oxidation of LDL.

Tannins in this study were indicated to be present but in low concentration in both plant parts. This bioactive compound is known to have potential anti-viral activity (Cheng et al., 2002) as well as potential prophylactic and therapeutic effect against cancer cells, but via different

mechanisms (Narayanan et al., 1999). Nutritionally, tannins have been observed to form complexation with protein, thereby preventing protein absorption. Moisture content, crude protein, crude fat and crude ash and Vitamin A, C, E, riboflavin, thiamine and niacin were also reported in this study, although at small concentrations. The broad distribution of nutrients and phytochemicals in the extracts studied provides basic information as a rationale for its possible use as tonic, appetizer in folk medicine (Eleyinmi et al., 2007). The reported vitamins have variously been shown to possess antioxidant activities particularly A, C and E (Yeh et al., 2003). The findings from above work therefore indicate that the root bark and twig extracts of *G. latifolium*, may be a good source of medically active phytochemicals and micronutrients relevant in human and animal nutrition.

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