Free Radical Scavenging Potential of *Sarcocephalus latifolius* (African peach) Leaf and Screening for Possible Contamination with Some Heavy Metals

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**ABSTRACT**

Leaves of *Sarcocephalus latifolius* (Synonym - *Nauclea latifolia*) were subjected to analyses to ascertain the capacity of the leaves to help in prevention of damages caused by free radicals. Various antioxidant substances including vitamins, minerals and phytochemicals were purposefully focused. Certain heavy metals of toxicity importance were also analysed. Appropriate phytochemical methods were used for determination of phytochemical composition while vitamins were analysed by colorimetric and titration methods as appropriate. Minerals were assessed by the use of Atomic Absorption Spectrophotometer (AAS). Some phytochemicals with antioxidant properties such as flavonoids and saponins, together with alkaloids and cardiac glycosides, were significantly present. Vitamins A and C were present in significant concentrations while vitamin E and the B vitamins were only slightly detected. Heavy mineral contaminants – lead, chromium, cadmium, and mercury were either absent or of insignificant value. Sodium, magnesium, aluminium and zinc (an antioxidant mineral) were fairly present. The findings confirm that the well known medicinal plant, *Sarcocephalus latifolius*, has high potential for free radical scavenging in addition to its potential for the control and management of various illnesses. Furthermore, it is free of accumulation of toxic metal contaminants.

**Keywords:** *Sarcocephalus latifolius*, free radical, heavy metal, contaminant.

**Introduction**

*Sarcocephalus latifolius* is one of the medicinal plants commonly growing freely in Nigeria, with a widespread distribution from the south through the north regions of the Country. Reference to literatures has shown that the plant can be found in most parts of the world. *Sarcocephalus latifolius* grows luxuriantly throughout the seasons of the year in the tropics. The leaves are many, deep green in colour and generally very attractive. Almost every part of the *Sarcocephalus latifolius* plant is valued as useful medicine source or component of mixtures of herbal medicines. There are many uses of the plant in traditional healthcare delivery (Enemor et al, 2013) including malaria, dysentery, fever, hypertension (Amos et al., 2005; Ngo Bum et al., 2009; Abbah et al., 2010). Leaves of *Sarcocephalus latifolius* have been linked with anti-diabetic effects (Gidado et al, 2009); earlier reports had shown hypoglycaemic activity of the leaves of the plant in alloxan-induced diabetic rats (Gidado et al, 2005). *Sarcocephalus latifolius* have also been cited useful in the treatment of GIT disorders (Madubunyi, 1995), sleeping sickness (Kerharo, 1974) and hypertension (Akabue, *et al*, 1982). It is also used for treating filariasis and rashes.
(ASICUMPON, 2005). The plant may have been successfully applied in Nigeria for control of premature uterine contraction during pregnancy (Duke, 2008). Another report claimed a significant decrease in oxytocin- and acetylcholine-induced contraction of the uterus in experimental animals (Nworgu, et al, 2010). Other medicinal values of Sarcocephalus latifolius include its usefulness against stomach upset, measles, cough, cold, and general weakness of the body (Gill, 1992). The fruit is reported to be useful in conditions such as piles, dysentery, colic, emetic and menstrual disorders while the root is chewed as chew-stick (Gill, 1992).

The numerous applications of herbal materials of Sarcocephalus latifolius in the control and management of health challenges are sufficient to arouse curiosity over its safety. While attempting to optimize the many advantages of the herbal materials of the plant, it is as important to examine its safety. It is now global knowledge that medicinal plants or their products are prone to contamination with heavy metals as well as other classes of contaminants. The World Health organization (WHO, 2007) had stated thus “With the ever-increasing use of herbal medicines worldwide and the rapid expansion of the global market for these products, the safety and quality of medicinal plant materials and finished herbal medicinal products have become a major concern for health authorities, pharmaceutical industries and the public”. Consequently, many research interests have been focusing on identifying contaminants in medicinal plants and their products (Bempah et al, 2012/13, Soni et al, 2012; Hina et al, 2011). This study focuses on identifying and establishing the antioxidant potentials of Sarcocephalus latifolius as well as screening same for possible contamination with heavy metallic elements.

**Materials and Methods**

**Collection of plant materials and processing**

Leaves of Sarcocephalus latifolius were harvested fresh from locations in Awka, Anambra State, Nigeria and air dried under shade for five days. The dry leaves were then crushed to fine texture. The powdered sample was stored at room temperature and later used for all analyses in this study.

**Phytochemical analyses**

The sample was analyzed for some important phytochemicals including alkaloids, flavonoids, cardiac glycosides, saponins, tannins, phytate and oxalates. Alkaloids and saponins were determined according to the methods of Harborne, 1973; Obadoni and Ochuko, 2001). Determination of flavonoid was done by repeated extraction with 80% aqueous methanol at room temperature, as contained in Boham and Kocipai (1994). Analysis of Tannin was carried out by the Follins – Dennis titration method as described by Pearson (1974). The determination of cardiac glycosides was done as described by Osagie (1998). The total oxalate content was determined according to the method of Dye (1956) and described by Akpabio (2012). Phytic acid (phytate) contents were determined using the method of Young and Greaves (1940) as adopted by Lucas and Markakes (1975).

**Analysis of Vitamins**

Vitamin A and vitamin E were assayed by the colorimetric method of Kirk and Sawyer (1991) with absorbance read in a spectrophotometer (JENWAY 60610) at 325nm and 410nm, for A and B, respectively. Ascorbic acid (vitamin C) analysis was done by the titration method reported by (Kirk and Sawyer 1991). The B – complex vitamins, including thiamine (vitamin B1), riboflavin (vitamin B2), and cobalamine (vitamin B12) were colorimetrically assayed with absorbance read at 261nm, 242nm, and 361nm,
respectively, while niacin (vitamin B$_3$), was assayed by titration according to the guidelines of the British Pharmacopoeia (1993).

**Analyses of minerals**
Analyses were carried out to quantitatively identify the presence of certain minerals in *Sarcocephalus latifolius*, especially heavy metals. Determination of the concentrations of various elements was done by means of the Varian Atomic Absorption Spectrophotometer (FS 240). The presence and concentration of some pharmacologically important metallic elements including lead, mercury, chromium, cadmium, zinc, iron, etc, were determined. Wet digestion of sample with HNO$_3$/ HClO$_4$/ H$_2$SO$_4$ mixture was done according to method of Adrian (1973).

**Statistical Analyses**
Data obtained from this study were analysed using the statistical package for social sciences (SPSS) version 18.0 for windows. Analyses of variance (ANOVA) were used to compare means; values were considered significant at p <0.05.

**Results**
The results obtained from analysis of the sample for phytochemical compounds showed that the major concentrations (in increasing order), were cardiac glycosides, saponins, flavanoids, and alkaloids (figure 1). Tannins, oxalate and phytate were all below 0.5 mg/100g concentration.

**Figure 1:** Mean concentrations of phytochemical compounds in *Sarcocephalus latifolius* leaf (Data represented as mean ± SEM).

Leaves of *Sarcocephalus latifolius* contain high concentrations of ascorbic acid (vitamin C) as well as fairly significant levels of vitamin A (caroteinoids) as can be seen from figure 2. The content of vitamin E was insignificant as well as the B type vitamins.
The major heavy metals studied including lead, cadmium, mercury, chromium, were virtually absent or of very infinitesimal value (figure 3). Sodium was of higher significance in concentration, followed by magnesium, zinc and aluminium. Others were at 0.5mg/100g or much lower in concentration.

**Figure 2:** Mean concentrations (mg/100g) of vitamins in *Sarcocephalus latifolius* leaf (Data represented as mean ± SEM).
Figure 3: Mean concentrations (mg/100g) of heavy metals and other minerals in Sarcocephalus latifolius leaf (Data represented as mean ± SEM).

Discussion
High quality is ascribed to herbal materials and (foods) that express high concentrations of vitamins including beta carotene (as vitamin A), vitamin C, vitamin E as well as minerals such as selenium, zinc, copper, iron and manganese. The presence of one or more of these substances, collectively referred to as antioxidants, in herbal materials and/or products translates to added pharmacological advantage. In the same vein, they mean added nutritional advantage in foods that contain them. These antioxidants protect the body from adverse effects of free radicals that predispose to critical conditions such as cancer, heart diseases, arthritis, atherosclerosis, etc.

Herbal materials of Sarcocephalus latifolius have expansive reports of efficacy in the control, treatment or management of many illnesses (Asase et al, 2009; Amos et al, 2005; Gidado et al, 2009; Enemor et al, 2003), just to mention a few. The high content of cardiac glycoside revealed in this study indicates potential activity against heart diseases. The significant levels of flavonoids, along with other phytochemicals – alkaloids, saponins also credit the plant with pharmacological potentials. The free radical scavenging capacity of leaves of Sarcocephalus latifolius is convincingly proven by the presence of high levels of vitamins A, C, and traces of vitamin E. The antioxidant properties are further strengthened by its content of mineral antioxidants such as zinc, iron, and traces of copper as well as flavonoids earlier mentioned.

The results showed that heavy metal contaminants were absent in the leaves of Sarcocephalus latifolius harvested from Awka, the study area. This study would maintain that the herbal material is free of heavy metal contaminants and in this consideration safe.

Conclusion
We conclude that Sarcocephalus latifolius remains useful for healthcare delivery and more importantly, a promising source for development of useful modern medicines. To a reasonable extent, the plant is safe with regard to the parameters tested. Nevertheless, caution must continue to be applied in the use of crude plant extracts. Tests must continue to be conducted on other indices relevant for the assessment of toxicity of herbal materials.

References
Adrian, W.J. (1973). A comparison of a wet pressure digestion method with other


