



Phytochemical Constituents and Aromatic Content of Methanol and Aqueous Extracts of *Dissotis rotundifolia* Whole Plant

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Authors' contributions

This work was carried out in collaboration between all authors. Author DWK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors DWK and MA managed the analyses of the study. Authors DWK, MA and AW managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Phytochemicals existence in natural sources helps to scavenge free radicals hence, offer health benefits. The study reports the phytochemical constituents of methanol and aqueous extracts of *Dissotis rotundifolia* whole plant. The objective of this research was to use standard procedures to screen the phytochemical presence to determine phenolic and some other organic substances in various extracts of *D. rotundifolia*. Organic substances of plant extracts with concentration from 0.02 to 0.10 mg/ml were prepared and mixed with appropriate volumes of reagents to read absorbance at the respective wavelength. Methanol extract had the highest content of phenolic substances as compared to aqueous extract and the standard, ascorbic acid. The outcome of this investigation put out that extracts of *D. rotundifolia* whole plant consist of a variety of phytochemical compounds that can expertly defend the body against oxidative stress caused by free radicals and might consequently be used as a source of potent natural medicinal compounds or food product.

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1. INTRODUCTION

Research has shown that people who take in a diet rich in fruits and vegetables, and therefore in phytochemicals, have a lower occurrence of many ailments, including cardiovascular diseases, diabetes, and other kinds of cancer [1].

Phytochemicals have an antioxidant influence that shields cells from cancer and heart-related diseases, in addition to urinary tract infections and reduced immunity. Consumption of at least five rations of fruits and vegetables daily is required to get plenty of phytochemicals in the human body system [2,1].

Phytochemicals have been identified in both edible and non-edible plants [3]. These compounds were found in different types in several parts of plants [4]. Phenolic substances have engrossed increasing thought for their antioxidant conduct and beneficial health-promoting possessions. It has been established that many phenolic compounds are usually present in a covalently-bound arrangement [5]. These compounds can act as antioxidants by giving hydrogen to extremely reactive radicals, therefore preventing further radical formation [6].

Despite extensive research on the phytochemical analysis of most plants, little is known about the many tropical underutilized plants in developing nations especially Ghana. One such plant is *Dissotis rotundifolia* which is a versatile perennial slender creeping herb. *Dissotis rotundifolia* a native of tropical West Africa belongs to the Melastomataceae family, it comprises of 140 species native to Africa. The common names include Pink lady (English), Ebafo (Bini), and Awede (Yoruba) [7]. *Dissotis rotundifolia* also has the potential to be used as a specialty crop for medicinal purposes. In its native range in Africa, *D. rotundifolia* is used as a medicinal plant to treat several illnesses. *Dissotis rotundifolia* is used mainly for the treatment of rheumatism and painful swellings, and the leaves decoction is used to relieve stomach ache, diarrhoea, dysentery, cough, stop abortion, conjunctivitis, circulatory problems and venereal diseases [7, 8].

In this study, to assess the potential protective benefits of *D. rotundifolia* plant against oxidative

diseases the qualitative phytochemical analysis of methanol and aqueous extracts of this plant was performed compared to the standard solution of ascorbic acid.

2. MATERIALS AND METHODS

2.1 Plant Material

Fresh *Dissotis rotundifolia* whole plant was collected from the University of Cape Coast botanical garden, Cape Coast, Ghana with voucher number UCCBG000348. The taxonomic character of the plant was determined on 2nd January, 2015 by a plant taxonomist at the Department of Botany, University of Cape Coast, Ghana. *Dissotis rotundifolia* whole plant was then washed with water to get rid of undesirable dirt and other external constituents. The sample was parched under shade until no moisture left. The parched sample then was ground into powder using a blender.

2.2 Preparation of Plant Extracts

2.3 Methanol Extraction

The methanol extract was prepared by drenching 60 g of powdered sample of *Dissotis rotundifolia* in 210 ml of methanol (70%) for 72 hours at room temperature at the Department of Biochemistry Research Laboratory, University of Cape Coast, Ghana. The mixture was then filtered using Whatman filter paper No 1. The filtrate was concentrated under decreased pressure using rotary evaporator at a temperature of 46°C. The resulting prepared extract was then weighed and kept in sealed bottles at room temperature for further analysis.

$$yield (\%) = \left(\frac{A_1}{A_0} \right) \times 100$$

Where A_0 was the mass of the sample and A_1 was the mass of the crude extract.

2.4 Aqueous Extraction

The aqueous extract from *Dissotis rotundifolia* was also prepared by soaking 60 g of the ground plant sample in 600 mL of disinfected distilled water for 2 hours in 90°C water bath at the Department of Biochemistry Research

Laboratory, University of Cape Coast, Ghana. The mixture was then filtered using Whatman filter paper No 1. The filtrate was concentrated under a decreased pressure using a rotary evaporator at a temperature of 90°C. The resulting extract was weighed and put in storage in impermeable bottles at room temperature for further analysis.

$$yield (\%) = \left(\frac{A_1}{A_0} \right) \times 100$$

Where A_0 was the mass of the sample and A_1 was the mass of the crude extract.

2.5 Phytochemical Qualitative Analysis

Qualitative phytochemical test of methanolic and aqueous extracts of *D. rotundifolia* was performed per standard protocols [2,9,1] to reveal the existence of glycosides, terpenoids, flavonoids, carbohydrates, proteins, alkaloids, phenolic compounds, tannins, saponins and phytosterols.

2.6 Determination of Total Content of Phenolic Compounds

The total content of phenolic compounds was estimated using the Folin-Ciocalteu assay designated by [1]. Concisely, 0.5 mL of extract (1 mg/mL) and 2.5 mL of 10 % Folin-Ciocalteu's reagent solution were varied. After incubation for 2 min at room temperature, extra 2.5 mL of 7.5 % sodium carbonate solution was then added. The mixture was incubated at 45°C for 45 min, and then absorbance was measured at 760 nm using Jenway Genova spectrophotometer. Solutions of standard gallic acid with concentration from 0 to 100 µg/mL were used to yield the calibration curve. The average of three readings was used and the total content of phenolic compounds was stated in milligrams of gallic acid equivalents (GAE) per gram of plant extract.

3. RESULTS AND DISCUSSION

It appears that methanol and aqueous extracts from *D. rotundifolia* whole plant possesses a percentage yield of 5.6 % and 10.0 % respectively. Thus, it was identified that aqueous extract had higher yield of organic substances than the methanol extract. The aberrations may be qualified to the diverse solvents. So, phenolic compounds have been testified to be either hydrophilic and/ or lipophilic [10].

3.1 Phytochemical Analysis

Phytochemical analysis of both the methanol and aqueous extracts of *D. rotundifolia* revealed the existence of reducing sugars, proteins, phenolic compounds, flavonoids, tannins, saponins, alkaloids, terpenoids and cardiac glycosides, while phytosterols were absent (Table 1). The extracts prepared with aqueous solution of standard ascorbic acid also disclosed the presence of reducing sugars, proteins, phenolic compounds, flavonoids, tannins, saponins, alkaloids, terpenoids and cardiac glycosides, and phytosterols (Table 1). The existence of the bioactive compounds in all extracts shows a perspective of *D. rotundifolia* plant for medical application. The presence of flavonoids and phenolic compounds in natural products improves the chance of antioxidant activity, because many studies have revealed a robust positive correlation between phytochemicals and the antioxidant actions of extracts [11,12,10]. Diverse ways of exploit of phytochemicals have been considered. Thus, the bioactive phytochemicals may prevent microbes, impede some metabolic processes or may control gene expression and signal transduction pathways [13, 14].

Table 1. Phytochemical constituents of extracts with solution of standard ascorbic acid (AA), methanol and aqueous extracts of *D. rotundifolia*

Phytochemicals	Methanol extract	Aqueous extract	AA
Alkaloids	+++	+	+
Tannins	++	+++	++
Saponins	++	+	+++
Glycosides	++	++	++++
Reducing sugars	++++	++	+++
Flavonoids	++	+	+
Terpenoids	+	+	++
Phenols	+++	++	+++
Proteins	++	+++	+++
Phytosterols	-	-	+++

Present (+), absent (-) and AA represents Ascorbic Acid

Phenolic compounds, flavonoids, alkaloids and tannins are well known to retain high antioxidant properties which can be used in diseases, such as cancer, prevention or treatments [15].

3.2 Phenolic Content

Phytochemicals such as phenols possess the capability to bind to cellular receptors and

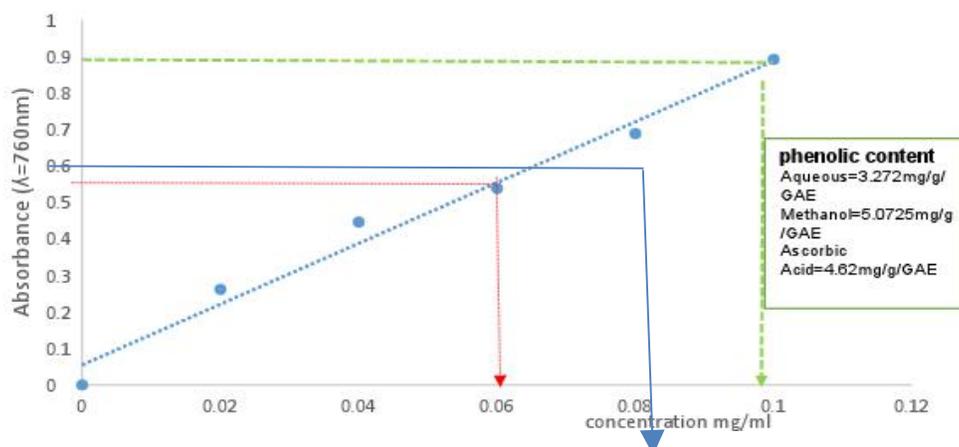


Fig. 1. Calibration curve for assay of total content of phenolic substances

transporters, which consequently influence gene expression, cell signaling and cell adhesion [16]. The capacity of phenolic compounds to impede free radicals is the prime mechanism used by phenolic compounds protect the cells from free radical attack [17].

Fig. 1 is a graph demonstrating the assessment of the total content of phenolic substances in methanol and aqueous extracts of *Dissotis rotundifolia* whole plant. Methanol extract of the plant had the higher content of phenolic substances as compared to aqueous extract. These substances are the largest group of phytochemicals and have been touted as accounting for most of the antioxidant activity of plants or plant products.

The total content of phenolic substances in methanol extract of *D. rotundifolia* (5.07 mg GAE/g) was higher than both the standard ascorbic acid (4.62 mg GAE/g) and the aqueous extract (3.27 mg GAE/g). The deviations may be ascribed to the different solvents used as phenolic constituents of plants have been reported to be either hydrophilic and/ or lipophilic [10]. Phenolic compounds are considered to possess high antioxidant activities, which can prevent or treat many diseases, including cancer [15]. The current study also shows that extraction of the plant with methanol has higher potential to isolate the phenolic compounds as compared to extraction with water. Furthermore, data of [18] are consistent with results of the current study.

4. CONCLUSION

The results of this study clearly reveal that extracts of *D. rotundifolia* whole plant contain

different phytochemical compounds including the appreciable content of phenolic compounds, which possess high antioxidant properties protecting the body against oxidative stress caused by free radicals and **can** be used to treat many diseases. The isolated bioactive substances might be used as components of natural medicinal remedies or food additives.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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