



Phytochemical Screening of the Ethanol and Aqueous Extracts of *Dicliptera verticillata* Leaves

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Authors' contributions

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

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ABSTRACT

Dicliptera verticillata is an underutilized medicinal plant that grows in Akwa Ibom State South-South Nigeria. Ethanol and aqueous extracts of the leaves are sometimes used for the treatment of malaria. The phytochemical compositions of the ethanol and aqueous extract of the leaves were investigated using established analytical procedures. The qualitative phytochemical analysis of the plant extract revealed the presence of alkaloids, saponins, phlobatannins, and deoxy-sugar, in both ethanol and aqueous extracts. Steroids were absent in aqueous extract but present in the ethanol extract while terpenes and cardiac glycoside were absent in the ethanol extract but present in aqueous extract. Anthraquinones and flavonoids were absent in both extracts. The results of this study therefore revealed that the leaf extract of *Dicliptera verticillata* is a good source of phytochemicals that can be harnessed to combat some medicinal issues in the rural communities.

Keywords: *Dicliptera verticillata*; phytochemicals; ethanol and aqueous extracts.

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1. INTRODUCTION

Phytochemical is derived from the Greek word “phyto”, meaning plant. It is biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans [1]. In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic attack are known as phytochemicals [2-3]. It is clearly known that phytochemicals have roles in the protection of human health, when their dietary intake is significant [4]. Antimicrobial effects of phytochemicals have been reported [5-7], antioxidant properties and antibacterial activities and antidiabetic activities have also been investigated [8-10].

A wide-ranging dietary phytochemicals are found in fruits, vegetables, legumes, whole grains, nuts, seeds, fungi, herbs and spices [3]. Broccoli, cabbage, carrots, onions, garlic, whole wheat bread, tomatoes, grapes, cherries, strawberries, raspberries, beans, legumes, and soy foods are common sources [11]. Phytochemicals accumulate in different parts of the plants, such as in the roots, stems, leaves, flowers, fruits or seeds. Many phytochemicals, particularly the pigment molecules, are often concentrated in the outer layers of the various plant tissues. Levels vary from plant to plant depending upon the variety, processing, cooking and growing conditions [12]. Phytochemical constituents of some plant leaves have been reported [13-17].

Dicliptera verticillata (Forssk). is a perennial herb, occurring in the Sahel part of the region from Mauritania to Niger and Northern Nigeria, and distributed throughout tropical Africa, India, Burma and endemic to Christmas Island, Australia, Trinidad and Tobago and Thailand. The plant is also found in Southern Africa, Zambia, Senegal and Sudan and also Lake Chad [18]. It is used as a traditional medicine for the treatment of malaria and diarrhoea in Burkina Faso. In India, the leaves are used in preparation of various soups [19]. It is also used as flavouring and spicing [20].

Ethanol and aqueous extract of this plant is sometimes drunk among the Ibibio people of Southern Nigeria for the treatment of malaria.

Hence this work aims at investigating the phytochemical composition of the ethanol and aqueous extracts of this plant in order to ascertain its safety for human consumption.

2. MATERIALS AND METHODS

2.1 Samples Collection and Treatment

The sample *Dicliptera verticillata* was collected in Uyo, Akwa Ibom State, Nigeria. It was identified by a taxonomist Dr. Mrs. Bassey of the Botany Department, University of Uyo. The leaves were plucked from the stem and washed and cut into sizeable length with a knife and air dried for three days. The dried leaves were ground into powder using mortar and pestle in the laboratory. It was then stored in a dry airtight containers for subsequent analysis.

2.2 Extraction Method

The ground leaves were extracted using cold extraction method, where water and ethanol were used separately as the extracting solvents. Three hundred gram (300 g) of each sample was soaked separately with 500 ml of water and ethanol and kept for 48 hour with sequential stirring. The sample was filtered and the filtrate was concentrated using rotary evaporator. The yield of 48.6 g and 29.2 g were obtained for ethanol and aqueous extracts respectively.

2.3 Phytochemical Analysis

Phytochemical analysis was carried out separately on the ethanol and aqueous extracts of *D. verticillata*. The standard methods of Association of Official Analytical Chemistry [21]) and Trease, and Evans [22]) were used to analyse the bioactive components in the plant extract. The phytochemical tests carried out in this work were for detection of alkaloids, saponins, glycosides, tannins, steroid, terpenes, flavonoids and, deoxy-sugar, phlobatannins and anthraquinones.

3. RESULTS AND DISCUSSION

The results of phytochemical composition of the ethanol and aqueous extracts of *D. verticillata* are presented in Tables 1 and 2 respectively.

Table 1. Phytochemical constituents of ethanol extract of *Dicliptera verticillata*

Test	Observation	Inference	Intensity
Saponins			
(i) Frothing test	Stable foam formed	Saponin present	++
(ii) Fehling solution test	Pink precipitate observed	Saponin present	+++
(iii) Fehling test +Na ₂ CO ₃ test	Brownish precipitate observed		
Alkaloid			
Drangendoff's test	Red precipitate formed	Alkaloid present	+++
Hagger's test	A white precipitate observed	Alkaloid present	++
Flavonoids			
Magnesium metal test	No Effervescence occurs No formation of an orange, red or crimson colour	Flavonoids absent	-
Cardiac Glycoside			
Salkowski test	No reddish brown at the interface rather greenish colour was observed	Cardiac glycoside absent	-
Phlobatannins			
Formaldehyde, HCl test	A bulky precipitate formed	Phlobatannins present	+++
Antraquinones			
	No pink , red or violet colouration in the ammoniacal phase	Antraquinones absent	-
Terpenes and Steriods			
(i) Acetic anhydride test	Bluish green interface observed	Terpenes absent Steriods present	- ++
Deoxy-Sugar			
(i) Glacial acetic acid test	Violet ring observed at the interface	Deoxy-sugar present	+

Table 2. Phytochemical constituent of aqueous extract of *Dicliptera verticillata*

Test	Observation	Inference	Intensity
Saponins			
(i) Frothing test	No stable form formed	Saponin absent	-
(ii) Fehling solution test	Pink precipitate observed	Saponin present	+
(iii) Fehling test +Na ₂ CO ₃ test	Brownish precipitate observed	Saponin present	+
Alkaloid			
Drangendoff's test	Red precipitate formed	Alkaloid present	+++
Hagger's test	A white precipitate observed	Alkaloid present	++
Flavonoids			
Magnesium metal test	No effervescence occurs No formation of an orange, red or crimson colour	Flavonoids absent	-
Cardiac glycoside			
Salkowski test	A reddish brown at the interface rather greenish colour was observed	Cardiac glycoside present	++
Phlobatannins			
(i)Formaldehyde, HCl test	A bulky precipitate formed	Phlobatannins present	+++
Antraquinones			
	No pink, red or violet colouration at the ammoniacal phase	Antraquinones absent	-
Terpenes and steriods			
(i) Acetic anhydride test	pink colour observed at the interface	Terpenes present Steriods absent	++ -
Deoxy-sugar			
(i) Glacial acetic acid test	Violet ring observed at the interface	Deoxy-sugar present	+

The results revealed the presence of some classes of secondary metabolites such as alkaloids, saponins, phlobatannins, and deoxy-sugar, in both ethanol and aqueous extracts. Steroids were absent in aqueous extract but present in the ethanol extract while terpenes and cardiac glycoside were absent in the ethanol extract but present in aqueous extract. Anthroquinones and flavonoids were absent in both extracts. The medicinal properties of these components have been reported by Mamta et al. [23]. For example, alkaloids have many pharmacological activities including antihypertensive effects (many indole alkaloids), antimalarial activity (quinine), and anticancer actions (dimeric indoles, vincristine, vinblastine) [24]. Some alkaloids have stimulant property as caffeine and nicotine, morphine is used as an analgesic [25]. The extracts of *Dicliptera verticillata* gives high intensity of alkaloid, therefore consumption of this plant extracts can help to treat any of these sicknesses depending on the type of alkaloid present.

4. CONCLUSION

Phytochemical analyses of the ethanol and aqueous extracts of *Dicliptera verticillata* have shown the presence of pharmacologically active substances such as alkaloids saponins, phlobatannins, and deoxy-sugar, in both extracts. These active properties can be exploited and used as drug base in pharmaceutical industries. Since both extracts contained high intensity of alkaloids, hence the extract can serve as a source of anti malarial drugs as postulated by traditional medicine dealers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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