



Some Preliminary Phytochemical Screening and Assessment of Four Solvents Extracts of Button Weed (*Borreria verticillata*)

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ABSTRACT: *Borreria verticillata* is a woody perennial shrub with false-button weedy herb belonging to the family (Rubiaceae), used for treating/curing various forms of diseases across the world since ancient times. Qualitative phytochemical screening of *Borreria verticillata* pulverized whole plant was carried out using four different solvent extracts (N-hexane, chloroform, ethyl-acetate and methanol). The phytochemicals screened contained alkaloids, triterpenes, flavonoids, glycosides, tannins, saponins, anthraquinones and steroids. The extracts were then screened for the presence of some phytochemicals such as alkaloids, anthraquinones, saponins, steroids, terpenes, flavonoids, tannins and glycosides. All the extracts contained alkaloids, triterpenes and glycosides present but flavonoids, saponins and tannins only present in ethyl acetate and methanol while anthraquinones and steroids were totally absent from the extracts. Of all the extracts Ethyl acetate extracts had the most influential effects on pathogenic organisms such as *Culex quinquefasciatus*, *Staphylococcus aureus*, *Escherichia coli* and *Candida albican*

DOI: <https://dx.doi.org/10.4314/jasem.v24i12.12>

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Dates: Received: 17 October 2020; Revised: 30 November 2020; Accepted: 19 December 2020

Keywords: phytochemicals, solvent extracts, pulverized, pathogens, ancient times

Borreria verticillata is a woody shrub, belonging to the Rubiaceae family. It is common in humid environments and is known for its antileprotic, antiparalytic, diuretic and antibilharzia properties (Dlova and Ollengo, 2018). Also an infusion of the leaves is used to treat various skin diseases (Dlovo and Ollengo, 2018). The flowers are usually bisexual with terminal inflorescence globose shape, 1-1.5 cm in diameter, usually with two leafy bracts about 1cm long and reflexed beneath. The calyx is andante to the ovary with epigynous, more or less tubular corolla. The lobes (4-12) are contorted; stamens are epipetalous and alternate with corolla tubes. The anthers are mostly separate and two celled. The ovary is inferior with two or more cells, an axile and apical or basal placenta. The style is slender. The fruit is a dehiscent drupe containing seeds with ruminant endosperm. The embryo is either straight or curve (Dlovo and Ollengo, 2018). The roots have been used by Senegalese traditional medical practitioners as an antileprotic, antiparalytic, diuretic and antibilharzia, an abortive and are also used in veterinary medicine (Dlovo and Ollengo, 2018). In Nigeria the root is used to treat various skin diseases. The leaves and inflorescence of *Borreria verticillata* are also used in Senegal

(internally or externally) for treatment of leprosy. An infusion of the leaves is also used in treating various skin diseases in Nigeria and some parts of eastern Africa (Sofowora, 1993). In Senegal, the plant is used as a fumigant from horses suffering from “Mal ala tate” (Dlovo and Ollengo, 2018). The roots contain 0.1 per cent of the alkaloid emetine, but no cephaeline. However, more recent reports showed that there is no emetine in *Borreria verticillata* from Senegal or South America (Dlovo and Ollengo, 2018). A study of the Senegalese specimen showed that the roots contain two new indole-alkaloids, which represent almost 88% of the total alkaloid fraction; such as borrerine and its apparent dimer borreverine (C₁₂H₄₀N₄). The structure of these alkaloids have been determined (Dlovo and Ollengo, 2018). No base was found in the roots but the tops contain a good quality of total alkaloids. Two new alkaloids, dehydroborreapine and borrecoxine were isolated from a related species, *Borreria capitata* (Dlovo and Ollengo, 2018).

Been an essential oil extracted from leaves and other part of plants has been shown to inhibit *Escherichia coli* and *Staphylococcus aureus* (Burkill 2000); It is used in the form of enema for infantile hyperpernia

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and treatment of leprosy, furuncles, ulcers, gonorrhoeal sores, biharzia and paralysis. *Borreria verticillata* is a forage plant, but not highly favoured by livestock. The plant contains indole alkaloids of which borrevine and borreverine are the major compounds (Burkill 2000). African species were found to contain 0.2 percent alkaloids (Burkill, 2000). At least, parts of the alkaloids are beta-carbolines and may be poisonous if present in a higher concentration (Animal Science at Cornell University, 2002).

In modern medicine, highly marketed drugs such as artemisinin, quinine, and emetine are the best examples of pharmaceuticals derived from medicinal plants (Hidayathula *et al.* 2011). Most of the drugs used in modern practice are very expensive for people living in developing countries, which gives a valuable tool for researchers to search for cheaper antibacterial substances from natural sources. Plants are the best natural sources for new safe, environment friendly and renewable drugs. Given the lack of scientific explanations for the therapeutic uses of medicinal plants by primitive peoples, a careful and well conducted investigation should explore plants as medicinal tools (Perumal and Ignacimuthu, 2000).

This study examines the Preliminary qualitative phytochemical assessment of the four solvent extracts *Borreria verticillata* using the soxhlet extraction method, which revealed the presence of alkaloids, Flavonoids, Cardiac glycosides, Tannins, Saponins and triterpenes in some of the solvent extracts.

MATERIALS AND METHODS

Borreria Verticillata (whole plant) were collected from its natural habitat of kundu village, Giwa Local Government Area (11° 07' 14.77" N 7° 24' 20.34" E), Nigeria. The plant was then taken to the Herbarium unit, Department of Botany, Faculty of Life Sciences, Ahmadu Bello University Zaria, for proper identification, authenticated and assigned voucher number of 670. The plant material was spread out to dry on wooden tables at room temperature in the laboratory, until it became brittle. It was then pulverized, using a mortar and pestle and stored in labeled polythene bags, until ready for use.

Solvent Extraction of Pulverized Plant Materials: The pulverized plant material was initially subjected to the soxhlet extraction method with methanol, ethyl-acetate-hexane and chloroform respectively, starting with N-hexane, chloroform, ethyl-acetate and methanol in that order of increasing polarity, of the solvents. The condensed extracts were screened for phytochemicals (Kokates, 1988; Anonymous, 2008). Rotary evaporator was used to remove excess solvents

from the extracts until solidification. Solidified extracts were stored in labelled vials at room temperature until ready for qualitative phytochemical screening.

The various solvent extracts were subjected to preliminary phytochemical screening according to the procedures and methods described by Harborne (1973); Trease and Evans (2002).

Test for Alkaloids: (a) Mayer's test: To a portion of the extract, a few drops of Mayer's reagent was added. A creamy white precipitate indicated the presence of alkaloids (Trease and Evans, 2002).

(b) *Dragendoff's Test:* To a portion of the extract, a few drops of Dragendoff reagent was added. A reddish brown precipitate indicated the presence of alkaloids (Trease and Evans, 2002).

Test for Flavonoids: Sodium hydroxide Test: A few drops of 10% sodium hydroxide were added to a portion of the extract. A yellow coloration indicated the presence of flavonoids (Trease and Evans, 2002).

Test for Saponins: Frothing Test: About 10ml of distilled was added to a portion of the extract and was shaken vigorously for 30 seconds. A honeycomb froth that persisted for 10-15 minutes indicated the presence of saponins (Trease and Evans, 2002).

Test for Unsaturated Steroid and Triterpenes: Liebermann-Buccard Test: To a portion of the extract, equal volume of acetic acid anhydride was added and mixed gently. 1ml of concentrated sulphuric acid was added down the side of the test tube to form a layer. Colour changes were observed immediately and over a period of one hour.

A blue to blue-green in the upper layer and reddish, pink or purple colour indicated the presence of triterpene (Trease and Evans, 2002).

Test for Tannins: Ferric chloride Test: To a portion of the extract, 3-5 drops of ferric chloride solution was added. A blue or brownish precipitate indicated the presence of hydrolysable tannins (Trease and Evans, 2002).

Test for Anthraquinone family of quinine: Bontrager's Test: To a portion of the extract in a dry test tube, 5ml of chloroform was added and shaken for at least for 5 minutes. This was filtered and the filtrate shaken with equal volume of 10% ammonia solution, there was no color change observed which indicated the absence of anthraquinone (Trease and Evans, 2002).

Test for Cardiac glycosides: Keller-kiliani Test: A portion of the extract was dissolved in 1ml of glacial acetic acid containing traces of ferric chloride solution. This was then transferred into a dry test tube and 1ml of concentrated sulphuric acid was added down the side of the test tube to form a lower layer at the bottom. A purple-brown ring was observed at the interphase, which indicated the presence of desoxy sugars and a pale green color in the upper acetic layer which indicated the presence of cardiac glycosides (Trease and Evans, 2002).

RESULTS AND DISCUSSION

The table below shows the presence of phytochemicals in the four solvent extracts of *Borreria verticillata*. In all the 18 Classes of phytochemicals; phytochemicals were detected in only four solvent extracts of *Borreria verticillata*. Alkaloids were detected in the four solvent extracts of *Striga asiatica*. While anthraquinone was not detected in the four solvent extracts. Alkaloids, Cardiac glycosides and Triterpenes were all detected in all four solvent extracts of *Striga asiatica*. Steroids was not detected in the four solvent extracts of *Striga asiatica*. Tannins, Flavonoids and Saponins were only detected in the Ethyl-acetate and Methanol Solvent Extract of *Striga asiatica*.

Borreria verticillata is rich in alkaloids, flavonoids, tannins, steroids, triterpenes, saponins and cardiac glycosides. Anthraquinone and steroids were absent in all the solvent extracts of *Borreria verticillata*. The presence of these classes of phytochemicals could have overt larvicidal efficacies against *Culex quinquefasciatus*. Plants have been known to serve as huge storage of compounds this agrees with the opinion of Ushie *et al.* (2013), that the most important bioactive constituents of *Borreria verticillata* are alkaloids, tannins, flavonoids and phenolic compounds. The presence of alkaloids in all the four solvent extracts of *Borreria verticillata* in this study agrees with the findings of Sofowora (1993) who isolated two alkaloids, dehydroborrecapine and borrecoxine from the related species of *Borreria capitata*. Furthermore, the findings of Karou *et al.* (2011) stated the universal occurrence of alkaloids in plants belonging to the Rubiaceae family; although Leal and Elisabetsky (1996) demonstrated the absence of alkaloids in *Psychotria carthagenesis*. Compounds such as flavonoids, alkaloids, tannins and saponins in plants are known to be responsible for the insecticidal effects and toxicity to other animals (Gutierrez *et al.*, 2014).

Table 1: Qualitative phytochemical constituents of the four solvent extracts of *Borreria verticillata*

Plant species	Extracts type	Phytochemicals							
		Alkaloids	Anthraquinones	Cardiac glycosides	Flavonoids	Saponins	Steroids	Tannins	Triterpenes
<i>Borreria verticillata</i>	N-hexane	+	-	+	-	-	-	-	+
	Chloroform	+	-	+	-	-	-	-	+
	Ethyl acetate	+	-	+	+	+	-	+	+
	Methanol	+	-	+	+	+	-	+	+

Key: + = present, - = absent

Conclusions: Phytochemicals extracted using hexane, chloroform, ethyl acetate and methanol in order of polarity showed the presence of terpenes, alkaloids and cardiac glycosides in all the extracts; flavonoids, saponins and tannins were present in all the extracts except in hexane and chloroform extracts while anthraquinones and steroids were not detected. Ethyl acetate extract exhibited very significant antibacterial activity against *Salmonella typhi*, *Staphylococcus aureus*, *E. coli* and antifungal activity against *Candida albican* with a zone of inhibition of 20-25mm.

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