

Phytochemical and Antimicrobial Screening of the Stem-Bark Extracts of *Vitex doniana*

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Abstract: This research work on the phytochemicals and antimicrobial activities of the stem-bark extract of *Vitex doniana* were analyzed to substantiate its use in the ethnomedicinal practises. The stem-bark of the plant was extracted and subjected to phytochemical and antibacterial screening. The phytochemical analysis carried out on the plant stem-bark extract revealed the presence of alkaloids, saponins, tannins, glycosides and flavonoids. The sensitivity test carried out on *Staphylococcus aureus*, *Salmonella typhi*, *Pseudomonas aeruginosa* and *Escherichia coli* gave zones of inhibition ranging from 2.38-19.71mm in most of the extracts.

Key words: *Vitex doniana* • Phytochemicals • Antimicrobial activities and Medicinal plants

INTRODUCTION

Plants and other substances of natural origin have been in use throughout the world for human and animal health care [1]. Medicinal plants are plants that have healing properties, used in the production of mainstream pharmaceutical products or used in their natural occurring state without being synthesized [2]. For example, *Aloe-vera* gel can be used for the treatment of sunburn and bruise and/or the use of cascara or senna to relieve constipation [3]. The use of plant in the management and treatment of diseases started with life especially in Africa where large population of people depend on traditional medicine and folkloric use of plant because of their inability to obtain synthetic drugs [4].

The stem-bark of *vitex doniana* or black plum has numerous applications in traditional medicine. The pastes of the pounded bark are applied to wounds and burns. Powdered bark added to water is used to treat colic [5]. The bark is also used against leprosy and liver diseases and to control bleeding after child birth, the blackish extract obtained by boiling leaves, bark, roots and fruits is used as ink and as a dye for cloths [6].

The plant *vitex doniana* is under the family of *verbanacea* and it is locally called Chaste tree in English, Dinya in Hausa, Orinla in Yoruba and Ucheakoro or mbe in Igbo. It is a deciduous tree, usually 4-8m high. It is found in dry, moist and wet lowlands [7]. *V. doniana* is widely spread in tropical West Africa and extending eastward to Uganda, Kenya and Tanzania and is also grown throughout the world as ornamental and as sources of wood and unusual chemical, some of which have medicinal properties [8] and [9]. Nnajifor, (2003) [10] studied the fermentation of *V. doniana* (black plum) juice for the production of wine. While, Agbede and Ibitoye, (2007) [11] studied the sugar content as well as the anti-nutritional factor in its fruit.

Vitex doniana belongs to the family of *Verbenaceae*. It is the most abundant and widespread of the genus occurring in savannah regions. It is a deciduous forest tree of coastal woodland, riverine and lowland forests and deciduous woodland, extending as high as upland grassland [12], [13], [14], [15] and [16].

Experimental Design

Sample Collection and Identification: The stem-bark of *vitex doniana* was collected from UNIZIK Awka, Anambra State Nigeria. The plant was identified by Mr. Iloh E. O.

Methods: The bark of the plant was cleaned with distilled water, shade-dried at room temperature and pulverized using Kenwood electric blender. The plant was analysed for phytochemical constituents and other fractions using standard methods.

Sample Preparation and Extraction: The sample was washed and allowed to dry under room temperature to avoid varying chemical changes under high temperature for about 8 days, after drying, the dry-bark extracts were ground into fine powder with the help of a blender. The ground extract was divided into five parts which was later on extracted with cold water, hot water, ethanol, acetone and methanol.

RESULTS AND DISCUSSION

Phytochemicals are chemical compounds that are found naturally in plants. They are responsible for the medicinal and organoleptic properties of the plants [15,16]. Some phytochemicals are responsible for the colouration of the plants and hence determines the medicinal applications of the plant. Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties [15,16].

Alkaloids have a wide range of pharmacological activities including antimalarial, anticancer, antibacterial and antihyperglycemic activities. Saponins have anti-tumor effect, flavonoids have antioxidant and steroids have anti-inflammatory properties.

Tables 1: Results of yield for crude extract

Extraction Solvent	Yield (mg)	Yield (%)
Methanol	7.31	14.62
Ethanol	6.54	13.08
Acetone	7.96	15.92
Hot water	6.06	12.12
Cold water	6.74	13.48

Table 2: Result of phytochemical screening of the stem-bark of *Vitex doniana*

Test	Methanol	Ethanol	Acetone	Hot water	Cold water
Alkaloids	+++	++	+++	++	+
Glycosides	++	+++	+++	+	-
Tannins	++	+	+	+++	+
Saponins	-	++	+	+++	-
Flavonoid	+	+	-	++	+
Carbohydrate	++	++	++	+++	++
Protein	+	+	+	++	+

Key: (-) = not present

(+) = Present in small quantity

(++) = Moderately present

(+++)= Present in large amount

Table 3: Zone of inhibition of micro-organism by stem-bark extract in (mm)

Extract of	Solvent	<i>E-coli</i>	<i>S.aureus</i>	<i>P. Aeruginose</i>	<i>B.subtilis</i>	<i>S.typhi</i>
	Methanol	14.62	10.35	-	3.62	10.51
	Ethanol	13.84	9.94	-	2.38	12.09
	Acetone	17.31	10.62	-	3.90	19.71
	Hot water	9.48	5.17	-	-	14.71
	Cold water	5.11	3.63	-	-	5.12

Table 4: Minimum inhibitory concentration (MIC) of stem and bark extract on test organisms (mg/ml)

Solvent	<i>E-coli</i>	<i>S. aureus</i>	<i>B. subtilis</i>	<i>S.typhi</i>
Methanol	6.20	12.53	99.89	3.14
Ethanol	6.24	50.01	99.97	6.25
Acetone	0.78	12.52	12.52	1.56
Hot water	5.03	100.08	-	1.56
Cold water	100.05	200.01	-	49.98

Table 5: Minimum Bacteria concentration of stem and bark extract (MBC) (mg/ml)

Solvent	<i>E-coli</i>	<i>S. aureus</i>	<i>B. subtilis</i>	<i>S. typhi</i>
Methanol	50.03	100.05	800.50	12.55
Ethanol	100.50	100.60	1600.80	51.00
Acetone	3.130	100.50	400.50	6.30
Hot water	401.00	1600.10	-	25.08
Cold water	400.50	1700.00	-	790.00

The results of phytochemical analysis revealed the presence of alkaloids, flavonoids, saponins, tannins, proteins, carbohydrates and glycosides which are the active components of the plant responsible for the medicinal values of the plant. The extracts exerted antibacterial activity against bacterial like *E-coli*, *S. aureus*, *B. subtilis* and *S. typhi*. Each of the extracts used showed a large zone of inhibition against the organisms used confirming the use of the stem-bark in the treatment of diseases like diarrhoea and dysentery.

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