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ANTIMICROBIAL AND ANTIOXIDANT ACTIVITY OF ETHANOLIC LEAF EXTRACT DERIVED FROM *voacanga africana*

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ABSTRACT

The antimicrobial activity of the ethanolic leaf extract of *Voacanga africana was evaluated using* standard methods. The phytochemical profile and antioxidant activity were also assessed using routine procedures. Dried and pulverized leaves of *V. africana* were extracted with ethanol.The result of the phytochemical screening revealed the presence of some bioactive compounds; tannins, flavonoids, phenols anthraquinones, saponins, phlobatanins, cardiac glycosides and terpenoids. The crude leaf extracts exhibited antimicrobial activity at concentrations of 250mg/ml-500mg/ml with a growth inhibitory zone of 1-6 mm for *Klebsiella* sp, 3-11mm for *Staphylococcus* sp, 9-13mm for *Escherichia coli* and 11-14mm for *Pseudomonas* sp. For the fungal isolates, the extract elicited a zone of inhibition of 6-11mm for *Penicillium* sp, 11-20 for *Aspergillus* sp. and 6-10 for *Fusarium* sp. The ethanolic leaf extract of *Voacanga africana* showed significant antioxidant activity using the DPPH test. These findings suggested that the ethanolic leaf extract of *V. africana* has potent antimicrobial and antioxidant activity.

KEY WORDS: antimicrobial, antioxidant activity, ethanolic leaf extract, phytochemical

INTRODUCTION

Finding healing powers in plants has been an ancient idea. Across the world, people have long applied poultices and imbibed infusions of hundreds, if not thousands, of indigenous plants (Cowan, 1999). However, since the discovery of antibiotics in the 20th century, the use of plant derivatives as antimicrobials has been virtually nonexistent. It has been reported that on average, two or three antibiotics derived from microorganisms are launched each year (Lampinen, 2005). Generally, antimicrobials are substances of natural, semi synthetic or synthetic origin that kills or inhibits the growth of microorganisms but causes little or no damage to the host (Khamaneh, 2016). After a downturn in that pace in recent decades, the pace is again quickening as scientists realize that the effective life span of any antibiotic is limited, leading to investigation and study of other sources of anti-infectives, especially of plant extracts (Talib, 2011).

The use of plant extracts, as well as other alternative forms of medical treatments, is enjoying great popularity in the late 1990s (Cowan, 1999). Some of the phytochemicals which include; alkaloid, flavonoids, glycosides, phenols, phlobatanins, saponins, tannins had been found in crude extracts of some plant species, called medicinal plants (Okwu, 2001; Ano and Ubochi, 2007). Among these plants is a tropical shrub called *Voacanga Africana* which belongs to the family of Apocynaceae. It is an abundant, deciduous, mesophytic, sapwoody, perennial, aborescent shrub of the primary and secondary rain forest, within the tropical rain forest especially in Nigeria and the Guinea savannah wood belt.

The mature *V. africana* is known to grow up to a height of about 6m, not more than 10m, with low widely spreading crown, distributed mainly in West Africa from Senegal to the Sudan and South Angola (Iwu, 1993). It is known locally as

kokiyar in hausa, pete-pete in igbo, Kirongasi in swahili and Ako- Dodo in Yoruba. The leaves are opposite obovate and acuminate, dark green and glossy and usually stalkless. Flowers are white borne in axiliary or terminal loosely branch glabrous inflorescence. Spherical, mottled green fruit occurs mainly in pairs, with seeds wrapped in yellow pulp. The plant is used to treat leprosy, diarrhea, generalized oedema, and convulsion in children and as infant tonic (Iwu 1993).

A decoction of the stem bark and root is used to treat mental disorders and the latex is applied to carious teeth. The decoction of the bark is considered analgesic, and is added to embrocating mixtures used as pastes during fracture repair. Root and bark decoctions are also used to treat cardiac spasms. The fruit decoction is used as a disinfectant and the leaf decoctions to treat asthma in children (Neuwinger, 2000). Seeds of *V. africana* contain medicinally useful phytochemicals, such as alkaloids, anthranoids, anthraquinones, cardiac glycosides, phenols, phlobatanins and tannins. These substances are antimicrobial and could be extracted for bacterial and fungal diseases management, pharmaceutical exploits, research in microbiology, biotechnology and general medicine (Duru and Onyedinike, 2010).

The purpose of this study is to further investigate this plant, with a view to determining the antimicrobial and antioxidant activity of the leaf extracts in *in vitro* Culture.

Table 1:Phytochemical Analysis of Ethanol Leaf Extracts of *Voacanga africana*

Parameters	Remark
Tannins	+
Flavenoids	+
Phenols	+
Anthraquinones	+
Saponins	+
Phlobatannins	+
Cardiac glycosides	+
Terpenoids	+

Key: + = present; - = absent

Microbial susceptibility test

Table 2: The zones of inhibition at 35.5mg/mL-500mg/mL, minimum inhibitory concentration and minimum bactericidal concentrations of bacterial and fungal isolates on ethanolic leaf extracts of *Voacanga africana* at 24hours and 96hours respectively.

Isolates	MIC	MBC	Zone of Inhibition				
			100% 500mg/ml	50% 250mg/ml	25% 125mg/ml	12.5% 75mg/ml	6.25% 35.5mg/ml
Klebsiella sp.	250mg/ml	500mg/ml	6	1	-	-	-
Staphylococcus sp	125mg/ml	500mg/ml	11	6	3	-	-
Escherichiacoli	250mg/ml	500mg/ml	13	9	-	-	-
Pseudomonas sp.	250mh/ml	500mg/ml	14	11	-	-	-
Penicillium sp	250mg/ml	500mg/ml	11	6	-	-	-
Aspergillus sp	250mg/ml	500mg/ml	20	11	-	-	-
Fusarium sp	250mg/ml	500mg/ml	10	6	-	-	-

Table 3: The zone of inhibition of the Bacterial and Fungal isolates on standard antibiotics gentamicin and clotrimazole respectively.

Isolates	Gentamicin	Clotrimazole
Bacteria		
Klebsiella sp.	22	-
Staphylococcus sp	19	-
Escherichiacoli	23	-
Pseudomonas sp.	20	-
Fungi		
Penicillium sp		20
Aspergillus sp		27
Fusarium sp		21

Antioxidant activity

Table 4: The % Inhibition of DPPH against 50mg/ml -250mg/ml concentrations of *ethanolic* leaf extract of *Voacanga africana*

Ethanolic Leaf Extract

	50µg/ml	100µg/ml	150µg/ml	200µg/ml	250µg/ml
SRSA	25.56	39.84	42.85	46.60	48.86
HRSA	40.47	57.55	59.75	64.99	68.13
DPPH	44.51	53.12	56.16	57.84	61.33

Key:
SRSA: Superoxide radical scavenging activity
HRSA: Hydroxyl radical scavenging activity
DPPH: Dipheny-picryl-hydrazyl

DISCUSSION

It was observed that the leaf extracts contained some phytochemicals such as tannins, flavonoids, phenols, anthraquinone, saponins, phlobatanins, cardiac glycosides, and terpenoids. The extracts had antibacterial activity against *Escherichia coli, Pseudomonassp, Klebsiella sp.*and *Staphylococcussp*. It also demonstrated antifungal activity against *Penicillium sp, Aspergillus sp*and *Fusarium sp*as such suggesting that the leaf extracts of *V. africana* has a broad spectrum antimicrobial potency. The antibacterial and the antifungal potency may be due to the presence of the above listed phytochemicals. This result agrees with the report of (Duru and Onyedineke 2010).

The susceptibility test result showed that all the clinical isolates were susceptible to the ethanolic leaf extract of *Voacanga africana*. The susceptibility of the isolates to the leaf extract was less potent when compared with standard antibiotics gentamicin and clotrimazole for the bacterial and fungal isolates respectively agreeing with the report of Duru and Onyedineke (2010). Generally, the reduced efficacy of the extracts,

relative to the standard antibiotics, used in the study may be due to the fact that they are still crude and require further purification (Duru and Onyedineke 2010).

All the selected clinical isolates had a minimum inhibitory concentration of 250mg/ml with the exception of *Staphylococcus* sp which had a minimum inhibitory concentration of 125mg/ml. The minimum bactericidal (MBC) and fungicidal (MFC) concentrations was 500mg/ml for all the bacteria and fungi isolates.

The results of the present study would suggest that the ethanolic extract of the leaves of *Voacangaafricana* has significant antioxidant activity. The DPPH test provides information on the reactivity of test compounds with a stable free radical. Based on its odd electron, 2, 2- diphenyl-picryl-hydrazyl radical (DPPH) gives a strong absorption band at 517nm in visible spectroscopy (deep violet colour). As the electron becomes paired off in the presence of a free radical scavenger, the absorption varnishes, thus the resulting decolorization is stoichiometric with respect to the number of electrons taken up. The scavenging activity of the ethanol leaf extract of *Voacanga africana* may be due to the presence of phytochemical compounds such as flavonoids which are generally known to be good antioxidants according to the report by Olaleye *et al* (2004).

CONCLUSION

Voacanga africana leaves contained potentially medicinally useful phytochemicals such as tannins, flavonoids, phenols, anthraquinone, saponins, phlobatanins, cardiac glycosides, and terpenoids. These anti-nutrients could be extracted because of their antimicrobial and antioxidant activity

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