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Research Article

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Phytochemical Screening & Antimicrobial Activity of Ethanolic & Aqueous Stembark Extracts of *Boswellia Dalzielli* (Hutch).

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Abstract: Aqueous and ethanolic extracts of the stem bark of *Boswellia dalzielli* (Hutch) were qualitatively screened for phytochemicals and then investigated for antimicrobial activity using agar diffusion method with *Escherichia coli* ,*Staphylococcus aureus, Klebsiella pneumoniae* ,*Streptococcus pneumoniae* ,and *Proteus* species as test organisms. Phytochemical components such as Flavonoids, terpenoids, alkaloids, tannins, quinones and cardiac glycosides were detected. The extracts at various concentrations indicated antimicrobial activity against test organisms, with ethanolic extract showing more activity than the aqueous extract. Both aqueous and ethanolic stem bark extracts of *Boswellia dalzielli* were found to exhibit broad spectrum antimicrobial activity against both Gram-positive and Gram-negative bacteria. The inhibitory effect of the extracts on the test organisms may be attributed to the much available phytochemical components detected in the stem bark.This plant may be a very good source of antimicrobials for commercial purposes.

Key words: Aqueous and ethanolic extracts, phytochemicals, *Boswellia dalzielli*, antimicrobial activity, agar diffusion, test organisms, broad spectrum activity.

INTRODUCTION:

Antimicrobials are substances that either kill microorganisms or prevent their growth[1]. Almost 5000 years before Louis Pasteur (1870) clearly enunciated the germ theory of diseases, plant drugs were prescribed by Shen Nung Tsao (the great herbalist) [2]. In traditional medicine plants are administered as entire plants, leaves, roots, stem bark, seed, juice, flowers and may be taken in form of an infusion or decoction [3]. Plants generally produce many secondary metabolites which constitute an important source of microbicides, pesticides and many pharmaceutical drugs [4]. A great number of Nigerian higher plants are traditionally noted for their medicinal and pesticidal properties [5] but regrettably only a few have been studied for their active constituents.

Boswellia dalzielli (Hutch) belongs to the family Burseraceae.Burseraceae is a small tropical and subtropical family composed of trees and shrubs, most of which yield a resinous aromatic gum from the cut bark. In Nigerian species, the leaves are alternate most of them being once-pinnate with more or less opposite leaflets and an odd terminal one[6].This plant is reported to be used by traditional herbalists in Yola and most parts of north eastern Nigeria to treat various infections [7]. Therefore, in a continued effort to investigate Nigerian higher plants for their medicinal properties, this

study is set to phytochemically screen and investigate the antimicrobial activities of stem bark of *Boswellia dalzielli* (Hutch).

MATERIALS AND METHODS:

Collection of plant material: The stembark of *Boswellia dalzielli* was collected fresh from the Bagale hills, Adamawa State, Nigeria. The sample was cleaned to remove dirt, sun-dried for two days and finally ground to powder using mortar and pestle.

Preparation of the extracts: Aqueous extracts were prepared by soaking 5g,10g and 10g of the powdered plant material in 10ml, 30ml, and 40ml of sterile distilled water to obtain concentrations of 1/2, 1/3, and 1/4 w/v respectively. These were left to stand for 24 hours and then filtered using Whatman No.1 filter paper.The ethanolic extract was prepared by soaking 5g of the powdered sample in 70, 50, and 30 percent of ethanol respectively and allowed to stay for 24 hours. Potato Dextrose Agar (PDA) was prepared according to the method described by Christensen [8].

Test organisms: The test organisms used in this study include *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae* and *Proteus* species. The test organisms were obtained from the Microbiology Laboratory of Pathology Department of the Federal Medical Centre, Yola Adamawa State, Nigeria.

Analyses: Phytochemical screening of stem bark extract of *Boswellia dalzielli* was done according to the methods described by Wall *et al*., [9] and Trease and Evans [10]. Agar diffusion method described by Edward [11] was used to test for antimicrobial activity of the plant extract using paper discs. The plates were observed and the diameters of zone of inhibition of the growth of the microorganisms were recorded.

RESULTS AND DISCUSSION:

Table 1 shows the phytochemicals components detected when the stem bark extracts were qualitatively screened for phytochemicals. Aqueous and ethanolic extracts of the stem bark of *Boswellia dalzielli* showed antimicrobial activity against the test organisms.The test organisms showed different levels of sensitivity (response) to the extracts as shown in **tables 2 and 3.**

The phytochemicals detected in both extracts include flavonoids, terpenoids, alkaloids, tannins, saponins, quinones, and cardiac glycosides.Quinones were however not detected in aqueous extract.

From the various results obtained, it was observed that stem bark extract of *Boswellia dalzielli* have some antimicrobial effect on the test organisms. The extent or levels of the response (sensitivity) of the test organisms varies. *Klebsiella pneumoniae* and *Streptococcus pneumoniae* were more susceptible to the extracts than the other test organisms, while *Proteus species* was less sensitive than the rest. This observation has to some extent agreed with what was reported by Stewart *et al.*, [12] that *Proteus species* exhibited some sort of resistance to common antimicrobial substances.

It was observed that sensitivity decreases with decrease in concentration. This may be due to the fact that the inhibitory effect of a test substance on a particular organism (i.e. the response of the organism on exposure) is proportional to the concentration of the test substance in the medium. This,

therefore, means that the activity of the extract depends on the concentration of the bioactive substance contained in the extract that reaches the organism [13]. From the results, it was observed that the ethanolic extract showed more inhibitory effect on the test organisms than the aqueous extract. This could be due to the fact that the bioactive ingredient in the plant could be more soluble in ethanol than in water. This corresponds to the findings by Gunners *et al.*, [14] who reported that extracts from one plant species using different solvents may show different antimicrobial activities against the same species of microorganisms.

CONCLUSION:

It could therefore be concluded that the stem bark extract of *Boswellia dalzielli* was found to contain some bioactive principles to which these test organisms are sensitive. This study suggests therefore, that the stem bark of *Boswellia dalzielli* has a broad spectrum antimicrobial activity since it is able to inhibit the growth of both Gram-positive and Gram-negative bacteria. This study further suggests that the stem bark of *Boswellia dalzielli* could be a good source of antimicrobial agents which could be developed further into a strong antibiotic for commercial purposes.

Table 1: Phytochemical components of the stem bark extracts of *Boswellia dalzielli*

Phytochemical components	Ethanolic extract	Aqueous extract
Flavonoids	+	+
Terpenoids	+	+
Alkaloids	+	+
Tannins	+	+
Saponins	+	+
Quinones	+	_
Cardiac glycosides	+	+

+ = Presence of phytochemical component; - = Absence of phytochemical component

Table 2: The effect of aqueous stem bark extract of *Boswellia dalzielli* on the test organisms

Test organism	Zone of inhibition in mm per concentration		
	1/2w/v	1/3 w/v	1/4w/v
Escherichia coli	2.8	2.3	1.2
Klebsiella pneumoniae	3.0	2.6	1.4
Proteus species	2.0	1.4	0.8
Staphylococcus aureus	2.4	1.6	0.9
Streptococcus pneumoniae	3.5	2.2	1.5

Table 3: The effect of ethanolic stem bark extract of *Boswellia dalzielli* on the test Organisms

Test organism	Zone of inhibition in mm per concentration		
	70 %	50 %	30 %
Escherichia coli	3.2	2.9	2.8
Klebsiella pneumoniae	3.8	3.5	2.9
Proteus species	2.2	2.1	1.8
Staphylococcus aureus	2.8	2.5	2.3
Streptococcus pneumoniae	3.9	2.8	2.1

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