



STUDIES ON ANTIBACTERIAL PROPERTY OF EUCALYPTUS - THE AROMATIC PLANT

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ABSTRACT

Eucalyptus is a plant that is used in traditional medicine for the treatment as antimicrobial drugs. To calculate the potential of the plant, the antimicrobial activities of extracts of the leaves were evaluated against some common bacteria. The dried powdered leaves were extracted using aqueous and organic solvents (methanol, acetone and water). The antimicrobial activity of the concentrated extracts was evaluated by determination of the diameter of zone of inhibition against both gram negative and gram positive bacteria and fungi using the paper disc diffusion method. The least activity was shown by aqueous extract against *E. coli* (6.5 mm) and *Bacillus subtilis* (10 mm) while the maximum was recognized by the alcoholic extract, with a recorded zone diameter for *E. coli* (14 mm) and *Bacillus subtilis* (17 mm). Phytochemical screening of the plant exposed the presence of tannins, saponins and cardiac glycosides. The results of this analysis support the traditional use of *Eucalyptus* leaves as an antibacterial agent.

Keywords: Antimicrobial, Eucalyptus, Disc Diffusion Method, Traditional Medicine, Zone of Inhibition.

INTRODUCTION

In the recent years, research on medicinal plants has attracted a lot of attentions globally. Plants have been used for the healing of diseases for entire world before the initiation of recent clinical drugs and are acknowledged to contain substances that can be used for therapeutic purposes or as precursors for the synthesis of useful drugs¹. Over 50% of these novel drugs are derivative of natural products and these natural products play a crucial task in drug development in the pharmaceutical industry². World Health Organization (WHO) noted that majority of the world's population depends on traditional medicine for primary healthcare. Medicinal and aromatic plants are widely used as medicine and constitute a major source of natural organic compounds. In contemporary years, there has been a dramatic enhance in the number of cases of bacterial illness³. Thus, there is considerable relevance to stop this upward trend and reduce the incidence of bacterial infection. Due to negative effect of synthetic drugs, attention is shifting towards alternatives that as natural products such as plant extracts. Many microbes have begun to develop resistance to the most widely used chemicals, so there is a need to develop new antibacterial agent with improved performance and less potential environmental impact. It is well established that plant extracts have antimicrobial properties against bacteria⁴⁻⁶. Antimicrobial substances originated from plant have been widely studied to utilize as an agrochemical with favorably activity against some microbes or as lead molecules for the synthesis of new chemical⁷⁻¹¹. Since the ancient times aromatic plants had been used for their preservative and medicinal properties. The pharmaceutical properties of aromatic plants are partially recognized to essential compounds, oils. Down the ages essential oils and other extracts of plants have evoked interest as sources of natural products. They have been

screened for their potential uses as alternative remedies for the treatment of many infectious diseases¹².

Eucalyptus species belong to the order myrtales and mytaceae. It is aromatic trees imaginative to subtropical regions of the world. It contains about 600 species and shrubs¹³ with consequence of well-covered and refers to its flowers that, in bud, are covered with a cup- like membrane. As it is a fast-growing tree, and is a suitable feature for paper manufacture, there has been extensive overseas forest plantation of eucalyptus trees. Leaves are a byproduct of tree cutting, and its excess use for biomass resources is considered to be an important research subject. In supplement, the trees have been known to fabricate several natural substances having antagonistic activities against several microorganisms¹⁴⁻¹⁶. The exploration of certain plants for their antimicrobial activity is therefore of supreme importance. This work is meant to investigating the antimicrobial activity of *Eucalyptus* against Gram-positive and Gram-negative bacteria thus to establish it as a potential antimicrobial agent.

MATERIALS AND METHODS

Plant material

Eucalyptus leaves were collected from the Department of Applied Sciences & Humanities, Jamia Millia Islamia.

Test organisms

The strains of *E. coli*, and *Bacillus subtilis* for antibacterial test were used. These strains were obtained from Department of Biosciences, Jamia Millia Islamia.

Preparation of plant extracts

The *Eucalyptus* leaves were collected and washed in distilled water and air-dried, and then cut into small pieces. The pieces of the leaves were air-dried for 48



hours and the dried leaves were ground using a grinder into a fine powder.

Extractions

50 grams of the plant material was soaked in 200 ml of solvents (aqueous, methanol, acetone) and left for 24 hrs. The fraction was separated using sterile muslin cloth and filter through sterile Whatman filter paper (no. 2). The crude extracts after filtration stored in a refrigerator at 4°C¹⁷. All the extracts were then concentrated with a rotary vacuum evaporator at 40°C.

Phytochemical screening of crude extracts

The phytochemical screening of eucalyptus leaf extracts were screened using the confirmatory test¹⁸. The components analyzed for are saponins, tannins, steroids, flavonoids and cardiac glycosides.

Disc diffusion method

Antibacterial activity of leaf extracts were tested using disc diffusion method¹⁹. The 6-mm diameter disc impregnated with extract and placed on the inoculated agar plates. The inocula of the test organisms were prepared by transferring a loopful of culture into 15 mL of sterile Nutrient Broth (NB Hi media) and incubated at 37°C for overnight. After the inocula dried, the extract impregnated discs were placed on the agar gently pressed down to ensure contact. The inoculated plates were incubated in an upright position at 37°C overnight. The results were expressed as the diameter of inhibition zone around the paper disk (6 mm).

RESULTS AND DISCUSSION

Phytochemical screening of the extracts (Table 1) confirmed the presence of tannins, saponins and cardiac glycosides while anthraquinones and alkaloids were absent. Extracts were found to have antimicrobial activity against *E.coli* and *Bacillus subtilis*. (Table 2) All extracts showed varying degrees of inhibition on the tested Gram-positive and Gram-negative bacteria (Figure 1). The methanol extracts showed greater activity against *E.coli* and *Bacillus subtilis*.

Table 1: Phytochemical analysis extracts (methanol, acetone, water) of *Eucalyptus*.

Phytochemical components	<i>Eucalyptus</i>
Alkaloids	-
Tannins	+
Saponins	+
Anthraquinones	-
Cardiac Glycosides	+
Steroids	+

Note: + = Present - = Absent

Table 2: Antimicrobial activity of extracts of *Eucalyptus*.

Bacteria	Flower extract/mean length of inhibition zones (mm)±S.D		
	Acetone	Methanol	Water
<i>Bacillus subtilis</i>	12	17	10
<i>Escherichia coli</i>	10	14	6.5

Zone values are means ±S.D paper disc for each replication

Used disc was sterile paper disc (mm diameter)

+: Represent an inhibitory effect

-: Represent no inhibitory effect

The antibacterial activity of the leaf extracts of *Eucalyptus* can be recognized due to the phytochemical compounds it contains. Babayi *et al*⁴ reported the presence of saponins, cardiac glycosides, tannins, volatile oils, phenols and balsam (gum) in the plant. Volatile oils and presence of different compounds are responsible to inhibit a wide range of organisms²⁰. The antimicrobial activity of the extracts due to the presence of tannins. The action of tannins is based on their capability of binding proteins thereby inhibiting cell protein synthesis²¹. There was no major variation in the antimicrobial activity of the extracts on Gram-negative and Gram positive bacteria despite the differences in their cell wall components²². Sherry *et al*²³ reported that the applications of eucalyptus clear methicillin resistant microorganisms infections. The methanol extract of *Eucalyptus* has been found to be effective against *E.coli* and *Bacillus subtilis*²⁴.

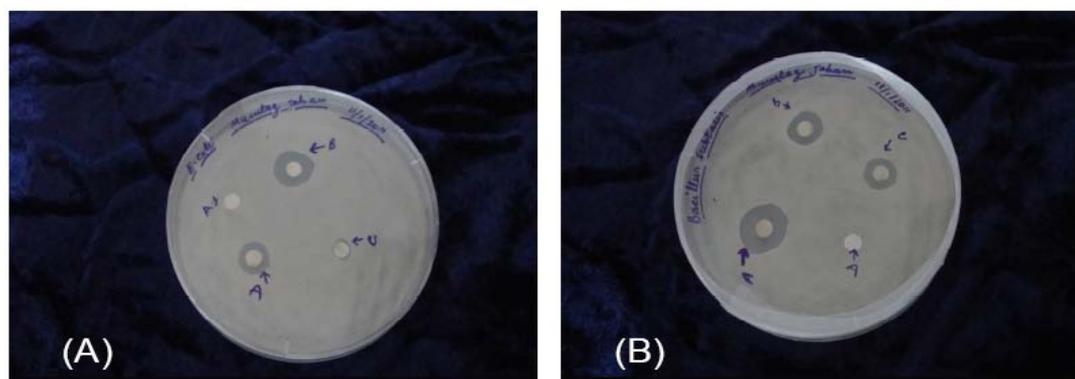


Figure 1: Antibacterial activity of the leaf extracts of *Eucalyptus* against (A) *E.coli*, (B) *Bacillus subtilis*.

CONCLUSION

The outcome of this work has shown that the leaf extracts of *Eucalyptus* have great potential as antimicrobial agents in the treatment of infectious organisms. In future this investigation can be beneficial for human by developing new pharmaceuticals.

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