



## ANTIMICROBIAL ACTIVITY OF METHANOLIC EXTRACT OF MANGROVE BARK

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### ABSTRACT

Antimicrobial effect of the extract of three Indian mangrove plants of *Avicennia officinalis* (stem) Fam. Avicennaceae, *Rhizophora mucronata*, pior (root and stem) Fam. Rhizophoraceae and *Sonneratia alba* J Smith (stem) Fam. Sonneratiaceae bark were investigated. The crude extracts from dried barks of mangroves were extracted in methanol and obtained extracts were evaporated to concentrate. The extract obtained was evaluated for antimicrobial activity against bacteria by using agar well diffusion method and the zone of inhibition in diameters was measured. The standard extracts at the concentration of 50µg/ml exhibited antibacterial activity against test microorganism. The root of *R. mucronata* and stem extract of *R. mucronata*, *S. alba* and *A. officinalis* exhibits highest antimicrobial activity showing zone of inhibition in the range 21-39mm against all tested bacteria.

**KEYWORDS:** Antibacterial activity, *Avicennia sp*, Mangrove, MIC, *Rhizophora sp*, *Sonneratia sp*.



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## INTRODUCTION

From an ancient time, the use of available medicinal plants in a locality will continue to control of diseases as a treatment play significant roles in medical health care implementation. The use of commercially available antibiotics has revolutionized the treatment of microbial infection. Unfortunately, their indiscriminate use has resulted in multiple drug resistances towards many antibiotics<sup>1</sup> and there is an urgent need to search for antimicrobial agents from natural sources<sup>2</sup>. In the developing countries intractable problems of antimicrobial resistance has led to the resurgence of interest in herbal products as sources of the noble compound to suppress or possibly eradicate the ever increasing problems of emergence of newer diseases though to be brought under control<sup>3</sup>. Approximately 62 – 80% of the world's population still relies on traditional medicines for the treatment of common illness<sup>4</sup>. Presently, synthetic drugs are not only expensive and inadequate for the treatment of new diseases but also often are with adulterations and side effects<sup>5</sup>. He further observed that the plant as a whole a safety and efficiency much superior to that of its isolated and pure active components. Therefore, it is the need of time to search for plants having antibacterial potential. To avoid hazardous effects of synthetic chemicals an attempts have been made to evaluate antibacterial property of Mangrove bark of medicinal value. The plants used in the present study are species of *Avicennia officinalis* (L.), *Sonneratia alba* (Smith) , and *Rhizophora mucronata* (Pior) extracts against four pathogenic bacteria, of *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *proteus vulgaris*, and *Salmonella typhae*.

## MATERIALS AND METHODS

The bark samples of mangrove species *Avicennia officinalis* (L.), *Sonneratia alba* (Smith) , and *Rhizophora mucronata* (Pior) were collected from estuaries of Sindhudurga and Ratnagiri Districts during the month of

December, 2011. The materials were initially air dried under shade, then in oven and powdered. Twenty gram of dried bark powder was extracted with 200 ml methanol in Soxhlet extractor and preserved at 5°C in air tight bottles. The extracts were analyzed for the presence of phenols, tannins, flavonoids and sugars following the methods of Trease and Evans<sup>6</sup>, Brindha *et al.*<sup>7</sup> and Lala<sup>8</sup>. The cultures of bacteria were obtained from the Department of Microbiology, Shivaji University, Kolhapur; Antibacterial activity of methanol extracts was determined by cup plate diffusion method<sup>9</sup>. Wells (8mm) were made using sterile cork borer and inoculums containing one loop full of bacteria were spread on solid plates. Each well was filled with 100µl, 200µl and 300µl of extract, as well as with methanol used as negative control and Chloramphenicol (Pfizer Company, India) and Streptomycin (Nicholas Parimal India limited Jogeshwari, Mumbai.) as positive control, at recommended doses (50ug/ml), were also tested for antimicrobial activity for comparison. The plates were incubated for 24 hours at 37°C and zone of inhibition around wells were measured in mm. for each treatment three replicates were maintained. The data were statistically analyzed by applying Duncan's Multiple Range (DMR) Test to compare different treatments with one another<sup>10</sup>. The individual treatments were also compared by applying t-test. The statistical analysis of the data was carried out by "Analysis of Variance" method<sup>11</sup>.

## RESULTS AND DISCUSSIONS

Significant antibacterial activity of methanol extract at 300µl was observed against all pathogens (Table, 1). Among the pathogenic bacteria *Speudomonas aeruginosa* was highly susceptible to the methanol bark extract of *Rhizophora mucronata* proproot bark showing 36.66 mm. zone of inhibition *Pseudomonas fluorescens* and *Proteus vulgaris* shows maximum zone of inhibition 28.33 mm and 40.33 mm *Rhizophora mucronata* proproot bark and

*Sonneratia alba* stem bark extract respectively. *Salmonella typhi* was equally susceptible to *Rhizophora mucronata* stem bark extract recording the 21.66 mm zone of inhibition as compared to with standard antibiotics. Methanolic extract of mangrove barks contained moderate proportion of alkaloids, steroids, terpenoids, caumarins and xantho-proteins (Table, 2). Okeke *et al.*<sup>12</sup> and Ebi and Ofoefule<sup>13</sup> proved that some of the chemical compounds like alkaloids, steroids, terpenoids and xantho-proteins have antimicrobial activity. Same reports are given by another workers also Thomson<sup>14</sup>, Weimann and Heinrich<sup>15</sup>, Atindehou

*et al.*<sup>16</sup> and Edeoga *et al.*<sup>17</sup> Further, Tona *et al.*<sup>18</sup>, proved that the plants are important source having potentially useful structures for the development of new chemotherapeutic agents. The first step towards this goal is the *in vitro* antibacterial activity assay. The results of present investigation also indicate that the antibacterial activity vary with the species of the plants and type of plant material. It is thus concluded that the potential mangrove bioactive compounds from bark might could be used for the development of new antibiotics against various bacterial diseases.

**Table 1**  
**Effect of mangrove bark extracts on growth of pathogenic bacteria**

Extract	Zone of Inhibition (Diameter in mm)			
	<i>Pseudomonas aurginosa</i>	<i>Pseudomonas fluroscence</i>	<i>Proteus vulgaris</i>	<i>Salmonella typhi</i>
<i>A. officinalis</i> (stem)	16.33 ± 0.57** xx	13.00 ± 1.00 xx	30.00 ± 4.35** xx	21.33 ± 0.57** xx
<i>R. mucronata</i> (root)	20.66 ± 0.57** xx	28.66 ± 0.57** xx	18.66 ± 0.57 xx	18.66 ± 0.57 xx
<i>R. mucronata</i> (stem)	36.66 ± 0.57** xx	24.66 ± 0.57** xx	39.33 ± 1.15** xx	21.66 ± 0.57** xx
<i>S. alba</i> (stem)	34.66 ± 0.70** xx	17.66 ± 0.57** xx	40.33 ± 0.57** xx	18.33 ± 0.57** xx
Strptomycin +ve control	10.66 ± 0.07	0.00 ± 0.00	0.00 ± 0.00	11.33 ± 0.57
Chloramphenicol +ve control	13.66 ± 0.57	12.66 ± 0.57	18.33 ± 0.57	15.33 ± 0.57
Methanol control	-ve 0	0	0	0

Data given are mean of three replicates with Standard Error (SE) ±  
\* show significant difference from control at 5% level; \*\* at 5 and 1% level of significance for Chloramphenicol.  
x show significant difference from control at 5% level xx at 5 and 1% level of significance for Streptomycin

**Table 2**  
**Phytochemicals Content of Mangrove Barks.**

Phytochemicals	Present / Absent
Alkaloids	++
Caumarins	+++
Steroids	++
Terpenoids	++
Xantho-protein	+++

+- Low concentration ++ - Modrate concentration  
+++ - Higher concentration  
-- Absent.

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