

**ANTIMICROBIAL STUDIES OF SOME SELECTED MEDICINAL PLANTS**

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**ABSTRACT**

The antimicrobial activity of the methanolic extracts from the roots of *Raphanus sativus*, fruits of *Hibiscus esculentus*, *Citrus maxima* and *Capsicum annum*, leaves of *Psidium guajava* and *Syzygium cumini* was studied using disc diffusion method against various Gram-positive and Gram-negative bacteria at 1000 µg/disc concentration. Significant antimicrobial activity in the extract of leaves of *Psidium guajava* and *Syzygium cumini* was observed.

**Keywords:** Antimicrobial activity, *Psidium guajava*, *Syzygium cumini*, disc diffusion method.

**INTRODUCTION**

The significance of medicinal plants for prevention, treatment and cure of diseases is long recognized. History reveals that plants have been a valuable source of natural products for maintaining human health from ancient time. Most of the people now prefer natural therapies to overcome severe side effects of some of the present day medication.<sup>[1]</sup> According to World Health Organization, medicinal plants are the best source to obtain a variety of drugs.<sup>[2]</sup> Since antiquity, man has used plants to treat common infectious diseases and some of these traditional medicines are still included as a part of the habitual treatment for various maladies.

The continuous increase in antibacterial resistant strains is becoming a serious concern to public health therefore the search of new, potent, cost effective and natural source based antimicrobial agents is of great demand. The current work was designed to investigate the antibacterial activity of various plants of Pakistani origin which are commonly used in eastern medicine and are not well explored. In the present study, six medicinally significant plants (Table-1) were screened to establish their antibacterial activity against twelve Gram-positive and eighteen Gram-negative bacteria using disc diffusion method.

## MATERIALS AND METHODS

**Plant Materials:** The fresh roots of *Raphanus sativus* (RS), fruits of *Hibiscus esculentus* (HE), *Citrus maxima* (CM) and *Capsicum annuum* (CA), leaves of *Psidium guajava* (PG) and *Syzygium cumini* (SC) were purchased from the local market and identified by an expert.

**Extraction:** The selected plant materials were separately cut into small pieces and repeatedly extracted with methanol (5 times) at room temperature. The extracts were concentrated in rotary evaporator under reduced pressure to obtain residues marked as RS, HE, CM, CA, PG and SC.

**Determination of Antibacterial Activity:** The disc diffusion method<sup>[3]</sup> was used to determine the antibacterial activity. 100 mg/ml of each extract in DMSO were prepared and marked as stock solution. Sterile filter discs containing 10 µl of stock solution were used for screening. The Iso sensitest agar (Oxoid) plates were seeded with 24 hours old culture (containing approximately 1-2 x 10<sup>8</sup> CFU/ml) grown in Mueller Hinton broth (Oxoid). The prepared discs were placed on to the agar surfaces at different positions and plates were incubated at 37 °C for 24 hours. Results were recorded by measuring the zone of inhibitions in mm. DMSO was used as negative control.

## RESULTS AND DISCUSSION

In the preset studies methanolic extracts of leaves of *Psidium guajava* and *Syzygium cumini* and fruits of *Hibiscus esculentus*, *Citrus maxima* and *Capsicum annuum* and roots of *Raphanus sativus* were tested against twelve Gram-positive and eighteen Gram-negative bacteria at 1000 µg/disc concentrations using disc diffusion method.

It is revealed that *Psidium guajava* extract showed strong activity against ten Gram-positive and eleven Gram-negative bacteria and *Syzygium cumini* exhibited significant activity against six Gram-positive and ten Gram-negative bacteria. However extracts of roots of *Raphanus sativus* and fruits of *Hibiscus esculentus*, *Citrus maxima*, and *Capsicum annuum* were inactive against the bacteria tested (Table-1). It is reported that most of the antimicrobial medicinal plants are more effective against Gram-positive than Gram-negative bacteria.<sup>[4,5]</sup> However, our current findings showed a remarkable activity of PG and EJ methanolic leaves extracts against both the Gram-positive and Gram-negative bacteria. The antimicrobial activity of *S. cumini* leaves methanolic extract may be due to flavonoids, tannins and other phenolic constituents. *S. cumini* is known to be very rich in gallic and ellagic acid polyphenol derivatives.<sup>[6,7]</sup> Also flavonol glycosides kaempferol, myricetin and other polyphenols were isolated from *S. cumini* leaves.<sup>[8,9]</sup> It was reported that PG also contains flavonoids, tannins and other polyphenols.<sup>[10]</sup> The results obtained in this study suggest a potential application of *S. cumini* and *P. guajava* leaves for treatment of skin wound, typhoid fever, inflammations, and urinary diseases. Further investigations should be conducted in order to explore their applications.

## CONCLUSION

It can be interpreted that the antibacterial activity against microorganisms is due to the polyphenolic compounds present in PG and SC. Present findings support the applicability of these two plants in traditional systems for their claimed uses such as fever, inflammations, urinary and skin diseases.

**Table 1.** Traditional medicinal plants selected for antibacterial study.

S.No.	Botanical Name	Common Name	Family	Medicinal use / activity	Part used
1	<i>Raphanus sativus</i>	Radish (Mooli)	Brassicaceae	Anti-cancer, anti-microbial activity, diuretic activity, stimulate appetite <sup>11,12</sup>  Hepatoprotective, laxative, stimulate and digestion <sup>13</sup>  Asthma, expectorant, anti-spasmodic, astringent, digestive <sup>14</sup>	Roots  Leaves, seeds roots  Roots
2	<i>Hibiscus esculentus</i>	Lady finger (Bhindi)	Malvaceae	Constipation, leucorrhea, spermatorrhea, diarrhea, diabetes, jaundice, dysentery, gastric ulcer <sup>15</sup>  Antioxidant <sup>16</sup>	Fresh Tender Pods, Mucilage  Mucilage
3	<i>Citrus maxima</i>	Grape fruit (Chakotra)	Rutaceae	Appetizer, antitoxic, cardiac stimulant, stomach tonic <sup>17</sup>  Antioxidant, convulsive cough, hemorrhagic diseases <sup>18,19</sup>	Pulp  Fruit
4	<i>Capsicum annuum</i>	Red pepper (Surkh mirch)	Solanaceae	Anti-oxidant, anti-bacterial activity, rheumatoid arthritis, headache <sup>20, 21</sup>	Fruit
5	<i>Syzygium cumini</i>	Jambolan (Jamun)	Myrtaceae	Astringent, carminative, cytotoxic, diuretic antioxidant <sup>22, 23</sup>  Anti-inflammatory <sup>24</sup>	Fruit  Leaves
6	<i>Psidium guajava</i>	Guava (Amrood)	Myrtaceae	Anti-inflammatory, antiseptic, dysentery, stomachache, constipation, antibiotic <sup>10, 25, 26</sup>	Leaves, fruit, bark,

**Table 2.** *In vitro* antibacterial activity of methanolic extracts (zone of inhibition in millimeter).

Bacteria Tested	RS	HE	CM	CA	SC	PG	DMSO	*Streptomycin
<b>Gram Positive</b>								
<i>Bacillus anthracis</i>	0	0	0	0	10	16	0	0
<i>Bacillus pumilus</i>	0	0	0	0	11	20	0	0
<i>Bacillus subtilis</i>	0	0	0	0	0	12	0	18
<i>Corynebacterium diphtheriae</i>	0	0	0	0	13	17	0	18
<i>Corynebacterium hoffmanii</i>	0	0	0	0	15	16	0	22
<i>Corynebacterium xerosis</i>	0	0	0	0	15	16	0	22
<i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	25
<i>Staphylococcus citreus</i>	0	0	0	0	14	15	0	0
<i>Staphylococcus epidermidis</i>	0	0	0	0	0	15	0	18
<i>Staphylococcus faecalis</i>	0	0	0	0	0	0	0	0
<i>Staphylococcus lactis</i>	0	0	0	0	0	16	0	0
<i>Streptococcus pyogenes</i>	0	0	0	0	0	20	0	0
<b>Gram Negative</b>								
<i>Branhamella catarrhalis</i>	0	0	0	0	11	11	0	0
<i>Enterobacter aerogenes</i>	0	0	0	0	0	14	0	22
<i>Escherichia coli</i>	0	0	0	0	0	0	0	10
<i>Klebsiella ozaenae</i>	0	0	0	0	0	15	0	0
<i>Klebsiella pneumoniae</i>	0	0	0	0	14	11	0	18
<i>Proteus vulgaris</i>	0	0	0	0	15	0	0	0
<i>Pseudomonas aeruginosa</i>	0	0	0	0	0	0	0	10
<i>Pseudomonas fluorescens</i>	0	0	0	0	0	10	0	0
<i>Salmonella schottmuelleri</i>	0	0	0	0	11	14	0	0
<i>Salmonella typhi</i>	0	0	0	0	15	12	0	15
<i>Salmonella typhimurium</i>	0	0	0	0	11	0	0	0
<i>Salmonella paratyphi A</i>	0	0	0	0	10	12	0	NT
<i>Serratia marcescens</i>	0	0	0	0	0	14	0	0
<i>Shigella boydii</i>	0	0	0	0	15	0	0	NT
<i>Shigella dysenteriae</i>	0	0	0	0	11	0	0	10
<i>Shigella flexneri</i>	0	0	0	0	0	14	0	0
<i>Shigella sonnei</i>	0	0	0	0	14	12	0	0
<i>Vibrio cholerae</i>	0	0	0	0	0	0	0	0

1000 µg/disc; \*12.5 µg/disc; NT: not tested

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