

# Evaluation of Phytochemicals Found in the Leaves of *Jasminum sambac* L. for Antimicrobial Activity

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## ABSTRACT

*Jasminum sambac* Linn. (Family—Oleaceae) was tested for antibacterial activity against three important pathogenic bacteria, i.e., *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Powdered leaf material was extracted with different solvents from non-polar to polar viz., n-hexane, chloroform, ethyl acetate, methanol, and water using Soxhlet apparatus. All the solvent extracts were evaporated to dryness using a hot dry air oven. The dry residue was dissolved in respective mother solvents (1:10 w/v) and tested for the presence or absence of various phytochemicals. An antimicrobial test was also followed to check the antimicrobial activity. Among five solvents tested, methanol, n-hexane, and ethyl acetate extracts showed significant antibacterial activity and chloroform extract showed less activity when compared with control (respective mother solvent). Water extract did not show any activity against all three microorganisms.

**Keywords:** Antimicrobial activity, *Jasminum sambac*, Phytochemicals.

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## INTRODUCTION

Aromatic plants had been used for their preservative and medicinal properties since ancient times, and to create aroma and flavor in the food. The pharmaceutical properties of aromatic plants are partially characterized by essential oils.<sup>1</sup>

Medicinal plants are served as a rich repository source in nature for thousands of years and an infinite number of English medicines have been extracted from natural sources which is, plant origin.<sup>2</sup> Various medicinal properties have been found in natural herbs. All medicinal plants contain the important source of pharmaceuticals and healthcare products.<sup>3</sup> The plants being used for medicinal purpose is as older as of the history of mankind. The medicinal plants are used by a human being in the industrialized societies has been discovered to the extraction and several plant-related drugs have been traced in which some are traditionally used as folk medicine.<sup>4</sup>

Approximately 80% of the world population is still depending on traditional medicines. Extraction and characterization of many active phytoconstituents from this green world have given the way to generate some new high activity profile drugs with high potential.<sup>5</sup> There are so many available pieces of evidence that show that India is quite dependent on the traditional medicine system.<sup>6</sup> It is also believed that the individual plant extract is having a less impact when it is compared to the crude extract of the plant. The crude extract is the combination of all secondary metabolites which are actively showing their presence in terms of their activity.<sup>7</sup> Many reports suggest that green medicines are easily available, having fewer side effects, and safe to use so the need of discovering such kinds of herbal medicines become a necessity of society. It has also been reported that nowadays; there are so many pharmaceutical industries that are showing their interest in green medicines.<sup>8</sup> The antimicrobial potential of different medicinal plants is being extensively studied all over the world<sup>9-12</sup> but only a few studies have been carried out systematically. However, in the absence of any scientific proof

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of their effectiveness, the validity of these remedies remains questionable and their use locally restricted. Phytochemical and pharmacological investigations of several plants have already led to the isolation of some of the natural antimicrobials.<sup>13</sup>

The plant which was chosen for the study is *Jasminum sambac*, which is commonly known as Mogra, which is an important flowering plant. This plant is related to the Oleaceae family which contains many other important medicinal as well as aromatic plants. The traditional use of this plant suggests analgesic, antidepressant, anti-inflammatory, antiseptic, aphrodisiac, sedative, expectorant, and tonic (uterine) effects. The essential oil of *J. sambac* is used as a fragrance for skincare products. Jasmine oil absolutely reduces skin inflammation, tones the skin, and lifts your mood.

In the present study, qualitative phytochemical analysis of phytochemicals and their antimicrobial activity were carried out on the leaf of *J. sambac* against some selected bacterial strains to search for beneficial uses of this plant.<sup>14</sup>

## MATERIALS AND METHODS

### Collection and Identification of Plant Material

Fresh plant material was collected from the Jaipur region. The plant material was identified by the Curator (Herbarium, Dept. of Botany), University of Rajasthan, Jaipur, Rajasthan, India. The voucher specimen was also deposited in our university for further study. Fresh plant materials were properly washed in tap water, air-dried, and then homogenized the plant part into a fine powder and stored in airtight bottles.

### Plant Extraction Process

The plant extract was prepared with the help of the Soxhlet extraction unit in various solvents. The 100 g powdered form of leaves were treated with 2,000 mL of solvents i.e., 1:20, ranging from non-polar to polar viz. n-hexane, chloroform, ethyl acetate, methanol, and water by Soxhlet extraction for a relevant period of time at different temperature. In Soxhlet apparatus, a continuous hot percolation process is followed in which crude plant extract was obtained. The mother solvent was removed by evaporating it in the oven and resulting semisolid, mass was dried at room temperature to yield a gummy residue.

### Preliminary Qualitative Phytochemical Screening

The crude plant extract of the n-hexane, chloroform, ethyl acetate, methanol, and water of *J. sambac* leaves was dissolved in 1:10 mL of its own mother solvents to obtain a stock solution. The extracts thus obtained were subjected to preliminary qualitative phytochemical screening with the method of Harborne<sup>10</sup> and Evans.<sup>12</sup>

n-Hexane, chloroform, ethyl acetate, methanol, and water extracts of the leaves of *J. sambac* showed the presence and the absence of alkaloids, glycosides, flavonoids, saponins, phytosteroids, tannins and phenolic compounds, phytosteroid, and fixed oils and fats. The result obtained in the present investigation is given in Table 1.

### Test Microorganisms

The ATCC bacterial strains used for the investigation were obtained from Microbiology Department, Mahatma Gandhi Medical College, Jaipur, Rajasthan, India, i.e., the gram-positive *Staphylococcus aureus* and the gram-negative *Escherichia coli* and *Pseudomonas aeruginosa*.

### Preparation of Bacterial Inoculum

Bacterial cultures were routinely maintained on nutrient agar slants at 4°C. For the experiment purpose, bacterial inoculums were

prepared by taking a loopful of isolated colonies was inoculated into 4 mL of peptone water, incubated at 37°C for 4 hours. This actively growing bacterial suspension was then adjusted with peptone water to obtain turbidity visually comparable to that of 0.5 McFarland standard<sup>8</sup> prepared by mixing 0.5 mL of 1.75% (w/v) barium chloride dihydrate (BaCl<sub>2</sub> · 2H<sub>2</sub>O) with 99.5 mL of 1% (v/v) sulphuric acid (H<sub>2</sub>SO<sub>4</sub>).

### Antimicrobial Assay

#### Disk Diffusion Method

Disk diffusion assay was done by the Kirby–Bauer method.<sup>9</sup> Mueller–Hinton agar (MHA) media was used for antimicrobial activity which is obtained from Himedia (Mumbai). The MHA plates were prepared by pouring 15 mL of molten media into sterile Petri plates. The plates were allowed to solidify for 5 minutes and inoculum suspension was swabbed uniformly and allowed to dry for 5 minutes. Disks were prepared by Whatman filter paper no. 1 with 4 mm of diameter and sterile them in a hot dry air oven for 1 hour at 160°C. The disks were placed on the surface of the medium and 10 µL plant extract was loaded on sterile individual disks. The extract was allowed to diffuse for 5 minutes and the plates were kept for incubation at 37°C for 24 hours and respective mother solvent was used as control. At the end of incubation, a zone of inhibition formed around the disk was measured with a transparent ruler in millimeters. All the experiments were performed in three replicates. The result obtained in the present investigation is given in Table 2.

## RESULTS

In the present study, the results of the various phytochemical tests revealed that alkaloids, saponins, flavonoids, and glycosides were present in all plant extracts, i.e., n-hexane, chloroform, ethyl acetate, methanol, and water. Phytosteroids were present in water and ethyl acetate plant extracts but absent in n-hexane, chloroform, and methanol. In the same way, tannins and phenolic compounds are only present in water extract while absent in all remaining plant extracts. Fixed oils and fats were absent in all plant extracts.

For gram-positive and gram-negative ATCC reference cultures, some plant extracts were showed tremendous antimicrobial activity and some showed no activities. The water plant extract did not show any activity against tested pathogens. Methanol, n-hexane, and chloroform plant extract showed activity against reference cultures (Table 2) but ethyl acetate showed very good activity against *P. aeruginosa*. The n-hexane plant extract also showed good activity against *E. coli* and *S. aureus*.

**Table 1:** Qualitative phytochemical analysis of various extracts of *Jasminum sambac* (leaf extract)

	<i>n</i> -Hexane extract	Chloroform extract	Ethyl acetate extract	Methanol extract	Water extract
<i>Phytoconstituents</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>L</i>
Glycosides	+	+	+	+	+
Alkaloids	+	+	+	+	+
Phytosteroids	–	–	+	–	–
Flavonoids	+	+	+	+	+
Saponins	+	+	+	+	+
Tannins and phenolic compound	–	–	–	–	+
Fixed oils and fats	–	–	–	–	–

(+) = indicates presence, (–) = indicates absence

**Table 2:** Antibacterial activity of different solvent extracts of *Jasminum sambac* (leaf extract) ATCC bacterial strains (zone of inhibition measured in mm)

S. no.	Solvent	Sample no.	Bacterial strains zone of inhibition (mm)		
			<i>Staphylococcus aureus</i> ATCC	<i>Escherichia coli</i> ATCC	<i>Pseudomonas aeruginosa</i> ATCC
1	n-Hexane	J.S.L.-17	10, 10, 9	10, 9, 9	9, 9, 8
2	Chloroform	J.S.L.-14	6, 7, 7	9, 8, 10	6, 6, 7
3	Ethyl acetate	J.S.L.-8	13, 12, 12	13, 14, 13	16, 17, 17
4	Methanol	J.S.L.-5	11, 10, 10	8, 9, 10	8, 8, 8
5	Water	J.S.L.-11	–	–	–

## DISCUSSION

The antibacterial substances are present in the higher plants is well established.<sup>14</sup> Medicinal plant products still remain the source of inspiration for novel drug compounds in orthodox medicine today and have made a significant contribution to human health. It is also well known that the plant kingdom offers a better opportunity of providing useful medicinal compounds for the treatment of some diseases as phytomedicine.<sup>15</sup> Plants have some chemical compounds that are show resistance against the number of microorganisms that cause disease. By the use of these chemicals, many diseases can cure without any side effects, unlike the modern drugs that cause many side effects that why people are inclining toward green medicines which are safer and cheaper. Bacterial infections can be treated with antibiotics. Thus, there has been a continuing need for new and more biologically active antibiotics through plant origin.<sup>16</sup> According to World Health Report on infectious diseases 2000, the emerging issue for WHO for the next millennium is to overcome antibiotic resistance. Hence, in the last few decades, plants are more potentially investigated as a major source of human disease management<sup>17-20</sup> and not many results are available on the exploitation of plant resources for the management of plant diseases.<sup>21-27</sup> So, it was observed that the biologically active phytochemicals were present in all solvent extracts viz., n-hexane, chloroform, ethyl acetate, and methanol except water extract of the leaves of *J. sambac*. The medicinal properties and the microbial activity of *J. sambac* extracts may be due to the presence of the above-mentioned phytochemicals. Further studies are in progress in our laboratory to isolate the active components.

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