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Comprehensive Review of Phyto Constituents and Antimicrobial Activity of Jasminum Sambac Ait.

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ABSTRACT:

A traditional medicinal herb, *Jasminum sambac* is used to cure a number of illnesses, including cancer, diarrhea, fever, dermatitis, conjunctivitis, and stomach aches. The current study sought to identify the phytochemicals, assess the antioxidant activity, and ascertain the antibacterial properties of *Jasmine sambac's* aqueous leaf extract. The existence of bioactive substances such flavonoids, phenolics, and steroids, which support its medicinal efficacy, is confirmed by the phytochemical study. The plant's essential oil and methanol extract exhibit antibacterial action in vitro, especially against bacterial pathogens, making it a viable natural substitute for antibiotics in the fight against antibiotic resistance. The six bacteria Staphylococcus aureus, Staphylococcus epidermidis, Basillus subtilis, Basillus cereus, Escherichia coli, and Shigella species were all effectively inhibited by the ethanolic extract. Recent pharmacological studies along with the jasmine plant's long-standing traditional use highlight the plant's significance as a medicinal plant with potential for use in healthcare and pharmaceutical development in the future, even though further scientific validation is required.

Keywords: *Jasminum sambac*, Anti-microbial activity, Jasminum plant.

Introduction:

The family Oleaceae includes the genus *Jasminum*, which has more than 200 species of flowering climbing shrubs and vines that can reach heights of two to three meters worldwide. Of the 252 medications on the WHO essential medicine list, 11% are solely derived from plants. The tropical and subtropical nations are home to the genus *Jasminum*. Numerous species can be found in the Mediterranean, India, and Eurasia regions. It may be grown in a wide variety of soil types and conditions. It usually favors a mid-tropical climate for thriving growth and blooming. Their flowers and essential oils are the reason they are grown commercially. These species' plants are trees, vines, and shrubs or bushes. While many jasmine plants many have noticeable features white, yellow, or pink blossoms with a pleasant perfume. Cancer is frequently treated with jasmine tea. Its oil is especially good for relaxing and calming, and its leaf extract helps prevent breast cancer. As a field crop, jasmine plants are highly valuable to the floral, landscaping, pharmaceutical, and medical industries. *Jasminum grandiflorum, Jasminum sambac, Jasminum flexile, Jasminum pubescens,* and *Jasminum angustifolium* are among the species used traditionally for their antimicrobial, antiulcerative, antidepressant, anti-inflammatory, anti-cancer, flavoring, and fragrance properties, as well as for the treatment of breast cancer, diarrhea, fever, dermatitis, conjunctivitis, and abdominal pain.

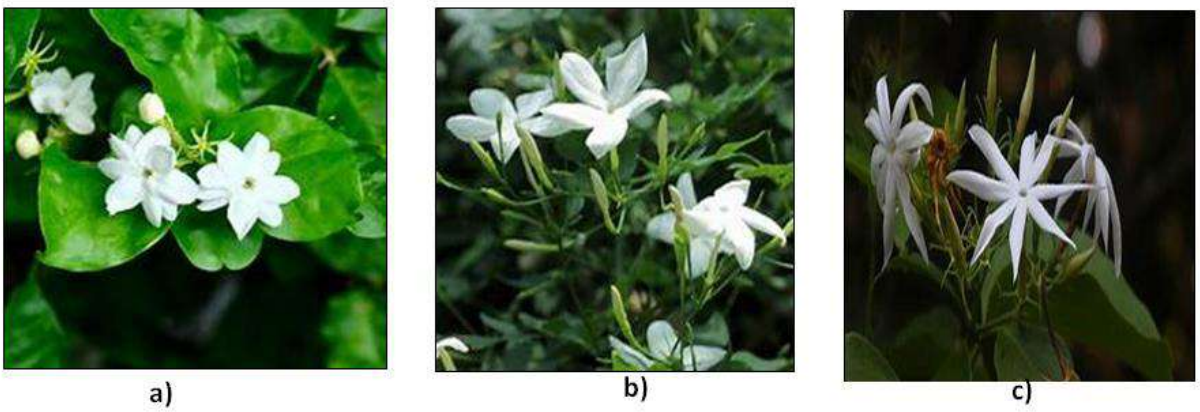

Figure 1: *Jasminum species a) Jasminum sambac b) Jasminum grandiflorum c) Jasminum malabaricum*[(1)]

Jasminum sambac:

Jasminum sambac is well-known in many nations and goes by several names. For example, in the Philippines, it is referred to as Sampaguit and is also the national flower. It is referred to as Arabian jasmine, or Gunda mallige, in India. Thailand, the Philippines, and India are commercial growers of this plant. The Arabian jasmine is an evergreen shrub that is most likely indigenous to India or Southeast Asia. It grows as a twining shrubby vine on a support. It develops as a spreading shrub when left unsupported. It can grow to a height of one to three meters and is an evergreen broadleaf vine or shrub. The leaves are oval, dark green, and have opposing or three whorls in their phyllotaxy. These blooms are open at night and have a powerful scent.

This plant's traditional uses include aphrodisiac, antidepressant, analgesic, sedative, anti-inflammatory, antiseptic, and expectorant. The roots help heal wounds and snake bites. The leaves and blossoms have antipyretic and decongestant qualities. Its blooms, roots, and leaves are used to treat a variety of ailments, including dermatitis, conjunctivitis, diarrhea, and abdominal pain. Its leaves are also used to treat fever, diarrhea, and pain. Anesthesia is another use for it.

Despite the fact that the entire plant is used and recommended in traditional medicine, there are only two documented pharmacological investigations of *Jasminum sambac*. The essential oil was shown to have antimicrobial properties, and the flower demonstrated effectiveness in suppressing puerperal lactation. Traditional healers may utilize *Jasminum sambac* to treat a variety of infectious disorders because of its essential oil and methanol extract's in vitro antibacterial and antioxidant properties[(2)]. Identification of phytochemicals, assessment of antioxidant activity, and determination of the antimicrobial properties of an aqueous leaf extract of the *Jasminum sambac* species were the goals of the current investigation.

Phytochemical studies:

Numerous phytoconstituents, including proteins, carbohydrates, phenolic compounds, flavonoids, and steroids, are present in jasmine sambac. Despite being one of the priciest oils, jasmine essential oil is a fantastic investment due to its intensity and amazing scent power. Although jasmine oil has well over 100 ingredients, the primary chemical components include cis-jasmone, benzyl acetate, linalool, benzyl alcohol, indole, and benzylbenzoate.

Phytochemicals	**Test**	**Observation**	***Jasminum sambac***	
			Root	**Leaves**
Alkaloids	Mayers test	Turbidity	_	+
Tannin/ Phenolics	Lead test	Yellow/greenprecipitate	_	+
Saponin	Foam test	Presence of emulsion	_	+
Protein	Biuret test	Purple	_	+
Flavonoids	Ferric chloride test	White precipitate	_	+
Steroid	Chloroform test	Red colour	+	+
Carbohydrates	Molisch’s test Benedict’s test	Red colour	_	+
Phytosterols	Salkowski test	Reddish brown	_	_
Glycosides	Ferric chloride test	Brown ring	_	+

Table 1: Phytochemical analysis of aqueous extract of *Jasminum sambac*.

Role of Jasminum Plants in Combating Resistance:

Antibiotic resistance has grown to be a major public health issue in the twenty-first century. Through a variety of unidentified and uncharacterized processes, bacterial and fungal strains are continuously evolving novel methods to adapt and resist the fatal or biostatic effects of antibiotics. Poor surveillance, insufficient laboratory resources, and decades of antibiotic usage and abuse are major contributors to resistance. The jasmine plant is essential in combating antibiotic resistance.

For example: Resistance in Fungi: Since fungal infections are frequently associated with increased mortality, they appear to pose a serious concern. Fungi pose a serious hazard because of the growing signs of fungal infections, such as Aspergillus fumigatus. The four main categories of antifungal medications that are now on the market are azoles, polyenes, echinocandins, and alkyl amines. Drug target overexpression or modification, drug transporter up-regulation, or cellular alterations that reduce drug toxicity or enable tolerance to drug-induced stress are some of the ways that azole resistance can arise. The resistance mechanism of Candida albicans includes overexpression of Cdr1, Cdr2 (Candida albicans multidrug resistant protein), and Mdr1 (multidrug resistant protein 1), as well as mutations in lanosterol 14-αdemethylase (ERG11), transcription factors UPC2, TAC1 (transcriptional activator of CDR genes), and MRR1 (transcription factor); and loss of heterozygosity, and MRR1 (transcription factor); heterozygosity loss; and overexpression of Cdr1, Cdr2 (Candida albicans multidrug resistant protein), and Mdr1 (multidrug resistant protein 1). A number of stress-response

pathway mediators (Hsp90 (Heat shock protein-90), Sgt1, calcineurin, KDACs (lysine deacetylases), PKC (protein kinase C) can also contribute to resistance. On the other hand, Aspergillus fumigatus resistance is related to mutation at Gly54 (position) in the cyp51A gene, while over expression of cyp51A is due to TR/L98H mutations. Additionally, there is over expression of ATP Binding Cassette (ABC) transporter gene (AtrF), Mdr3, and Mdr4[3].

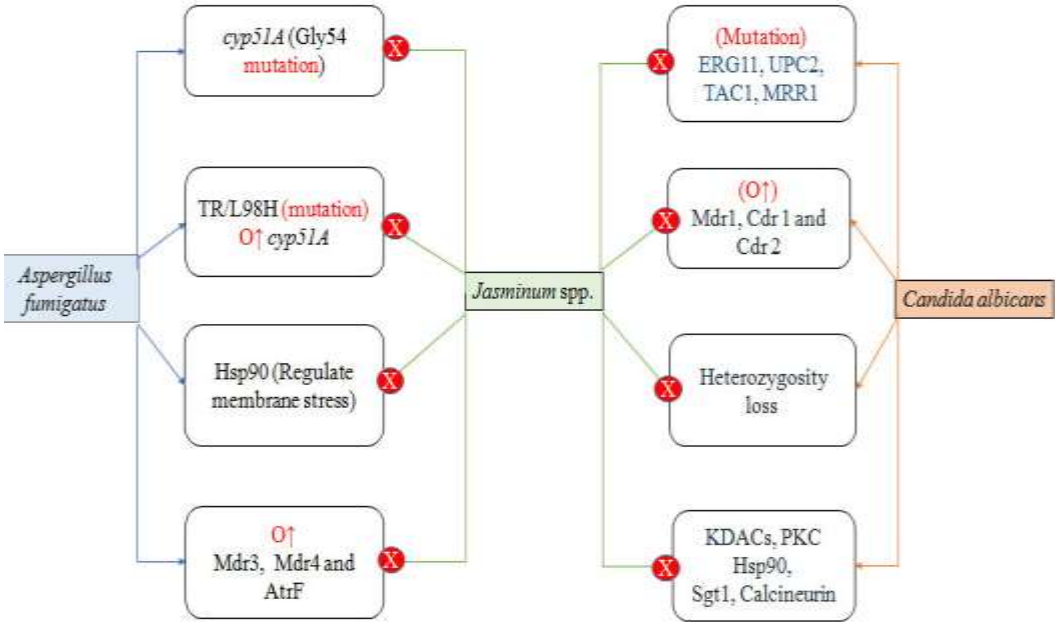

Figure 2: Markers of antifungal resistance in Aspergillus fumigatus and Candida albicans and protective role of Jasminum plants against the same. Over expression (O↑); Lanosterol 14-α demethylase (ERG11); Transcription factor (UPC2, MRR1),

Antimicrobial Activity of *Jasminum Sambac:*

Minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC), and minimum fungicidal concentration (MFC) are used to compare antibiotics to medications and assess the potential of an ethanolic extract from the medicinal plant *Jasminum sambac* (flower) on common microorganism strains.

Tested microorganisms	EJF	Ampicillin	**Zone of Inhibition (mm)** Amikacin	Chlotrimazole	DMSO
Staphylococcus aureus	7.33± 0.58	46.00±1.01	11.33±0.59	20.67±0.59	NA
Staphylococcus epidermidis	8.67± 0.58	26.67±0.58	15.00±0.00	24.67±0.58	NA
Micrococcus luteus	NA	45.33±0.58	14.00±0.00	33.00±0.00	NA
Bacillus subtilis	7.33± 0.58	16.33±0.58	14.33±0.58	22.67±0.58	NA
Basillus cereus	7.00± 0.00	18.33±0.58	15.00±0.00	22.00±0.00	NA
Escherichia coli	7.00± 0.00	23.67±0.58	15.00±0.00	NA	NA
Enterobacter aerogenes	NA	10.67±0.58	10.00±0.00	NA	NA
Salmonella typhi	NA	34.67±0.58	10.00±1.00	NA	NA
Salmonella typhimurium	NA	30.67±0.58	15.33±1.15	NA	NA
Shigella sp.	7.67± 0.58	29.67±0.58	16.00±1.00	NA	NA
Candida albicans	NA	NA	NA	32.00±1.00	NA
Saccharomyces cerevisiae	9.67± 0.58	NA	NA	34.67±1.15	NA

Table 2: Zone of inhibition of ethanolic extract, negative and positive controls

Sample / Tested microorganisms	**MIC and MBC/ MFC**									
	EJF		**Ampicillin**		**Amikacin**		**Clotrimazole**		**DMSO**	
	MIC	**BC**	**MIC**	**MBC**	**MIC**	**MBC**	**MIC**	**MBC**	**MIC**	**MBC**
Staphylococcus aureus	250	>4000	0.039	1.25	2.5	10	2.5	>20	NA	NA
Staphylococcus epidermidis	250	>4000	0.156	1.25	0.625	2.5	1.25	20	NA	NA
Bacillus subtilis	1000	000	>20	>20	1.25	2.5	2.5	10	NA	NA
Basillus cereus	1000	2000	20	20	5	5	2.5	20	NA	NA
Escherichia coli	1000	>4000	20	2.5	5	2.5	20	NA	NA	NA
Shigella sp.	500	4000	20	1.25		5	NA	NA	NA	NA

NA = no activity, EJF = Ethanolic extract of *Jasminum sambac* flower

Table 3: MIC and MBC or MFC of ethanolic extract, negative and positive controls

The six bacteria Staphylococcus aureus, Staphylococcus epidermidis, Bacillus subtilis, Basillus cereus, Escherichia coli, and Shigella species were effectively inhibited by the ethanolic extract from *Jasminum sambac* flower, but Micrococcus luteus, Enterobacter aerogenes, Salmonella typhi, and Salmonella typhimurium were not inhibited [(4)].

Conclusion:

Because of its extensive range, rich phytochemical composition, and variety of therapeutic applications, the genus *Jasminum* and *Jasminum sambac* in particular has enormous medical, cultural, and commercial significance. While recent research offers mounting proof of its pharmacological potential, traditional uses emphasize its antibacterial, anti-inflammatory, antioxidant, and anticancer properties. The existence of bioactive substances such flavonoids, phenolics, and steroids, which support its medicinal efficacy, is confirmed by the phytochemical study. Crucially, *Jasminum sambac* exhibits encouraging antibacterial activity, especially against bacterial infections, making it a viable natural substitute in the fight against the worldwide problem of antibiotic resistance. The significance of *Jasminum sambac* as a significant medicinal plant with future potential in healthcare and pharmaceutical research is highlighted by its long-standing traditional use in conjunction with current pharmacological findings, even though further scientific validation is required.

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