

Phytochemical Investigation and Pharmacological Studies on The Stem of *Jasminum Grandiflorum*

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ABSTRACT

Jasminum grandiflorum (Spanish jasmine) has been widely used in traditional medicine for its therapeutic potential. This study investigates its phytochemical composition, antifungal, and antipyretic properties to validate its medicinal significance. Chromatographic analysis (TLC and HPLC) identified key bioactive compounds such as alkaloids, flavonoids, glycosides, phenolic acids, terpenoids, and saponins. The agar well diffusion method revealed strong antifungal activity against *Aspergillus aculeatus* and *Cryptococcus neoformans*, comparable to Amphotericin B. The nitric oxide scavenging assay confirmed its antipyretic properties. These findings support *Jasminum grandiflorum* as a natural source of antifungal and antipyretic agents, with potential applications in herbal medicine and pharmaceutical formulations. The pharmacological studies validates for fever reducing effects and broad spectrum antifungal activity. However, further research is necessary to explore these potential medicinal benefits.

Keywords: *Jasminum grandiflorum*, Antipyretic activity, Antifungal activity

INTRODUCTION

Jasminum grandiflorum (Spanish jasmine or Royal jasmine) is a medicinally significant plant widely used in traditional and Ayurvedic medicine. While its flowers and leaves are well known for their therapeutic benefits, the stem also contains bioactive compounds that contribute to its pharmacological properties, including antipyretic and antifungal activities. The stem of *J. grandiflorum* is believed to possess fever-reducing properties due to the presence of flavonoids, alkaloids, and phenolic compounds. These bioactive molecules help regulate body temperature by inhibiting the release of pyrogens and reducing inflammation. Traditional healers have used extracts from the plant to manage fevers associated with infections and inflammatory conditions. The antifungal potential of *J. grandiflorum* stem is attributed to phytochemicals such as tannins, saponins, and essential oils. These compounds exhibit inhibitory effects against fungal pathogens by

disrupting cell membranes and interfering with fungal growth. The stem extracts have been explored for their ability to combat fungal infections affecting the skin and other body systems. The medicinal significance of *Jasminum grandiflorum* stem highlights its potential as a natural alternative for treating fever and fungal infections. Further scientific research is necessary to validate its efficacy and explore its mechanisms of action.

METHODOLOGY

Physico Chemical Evaluation ^[1-4]

The moisture content, total ash, water soluble ash, acid insoluble ash, alcohol soluble extractive value, water soluble extractive value and loss on drying were determined as part of its physiochemical parameters.

Preliminary phytochemical screening of extract

This is a standard set of qualitative phytochemical tests used to identify the presence of alkaloids, glycosides, flavonoids, and phenolic acids, terpenoids,

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saponins in ethanolic extract of stem of *Jasminum grandiflorum*. These tests on specific chemical reaction that produce characteristic color changes or precipitates, indicating the presence of different classes of bioactive compounds.

TLC or Thin Layer Chromatography-

System Components

TLC system components consist of

1. **TLC plates**, preferably ready-made with a stationary phase: These are stable and chemically inert plates, where a thin layer of stationary phase is applied on its whole surface layer. The stationary phase on the plates is of uniform thickness and is in fine particle size.
2. **TLC chamber**. This is used for the development of the TLC plate.
3. **Mobile phase**. This comprises of a solvent or solvent mixture (Toluene: Ethyl acetate: Formic acid) [5:4:1]
4. **Detecting agent**: Iodine chamber, UV light

7.5 High Performance Liquid Chromatography (HPLC) ^[51]

The HPLC Methods are follows:

Make: Waters HPLC System, Vienna, Austria

Detector: Waters 2545 Quaternary Gradient Module with 2998 Photodiode Array Detector (waters G.M.B.H., Vienna, Austria).

Column: Sunfire (4.58x250mm)C18 column.

Software: The data were collected and processed with the software Empower 2.0.

Sample preparation: 1mg/ml concentration of the compound was taken and dissolved with HPLC-grade methanol. Compounds were then filtered through a syringe filter (PVDF Filter membrane with polypropylene Housing pore size 0.2µm, whatman, GE Healthcare) for HPLC analysis.

Sample volume: 20µl

Mobile phase: Methanol: Water (50:50)

Flow rate: 1ml/min.

• Invitro Antifungal Activity

1. Agar Well Diffusion Method

a. Potato Dextrose Agar Medium

The potato dextrose agar medium was prepared by dissolving 20 gm of potato infusion, 2 gm of dextrose and 1.5 gm of agar in 100ml of distilled water. The dissolved medium was autoclaved at 15 lbs pressure at 121°C for 15 minutes. The autoclaved medium was mixed well and poured onto 100mm petri plates (25-30 ml/plate) while still molten.

PROCEDURE

Petri plates containing 20ml potato dextrose agar medium was seeded with 72 hr 000culture of fungal strain (*Aspergillus aculeatus*, *Cryptococcus neoformans*) with different concentration of sample SJ (500, 250, 100 and 50 µg/ml) was added. The plates were then incubated at 28°C for 72 hours. The anti-fungal activity was assayed by measuring the diameter of the inhibition zone formed around the wells. Amphotericin B was used as a positive control. The values were calculated using Graph Pad Prism 6.0 software (USA).

• Invitro Antipyretic Activity

Nitric Oxide Radical Scavenging Assay ^[7,8]

Procedure

The extracts were prepared from a 50 mg/mL (SJ) crude extract. These were then serially diluted with DMSO to make concentrations from 500–10 µg/mL of the samples. These were stored at 4°C for later use. The 150 µl extract was mixed with an equal volume of freshly prepared Griess reagent (150µl). Control samples without the extracts but with an equal volume of buffer were prepared in a similar manner as was done for the test samples. After 30 minutes of incubation period, 100 µL of the reaction mixture was transferred to a 96-well plate. The absorbance was measured at 540 nm using a UV-Vis microplate reader (Molecular Devices, GA, USA).

Formula

Nitric Oxide Scavenge (%) = $\frac{A_{\text{control}} - A_{\text{test}}}{A_{\text{control}}} \times 100$

A control - Absorbance of control

A Test - Absorbance of test sample

RESULTS AND DISCUSSION

Physico-Chemical Evaluation

Physicochemical parameters are mainly used in judging the purity and quality of the powdered drug. The ash values of a drug gave an idea of the earthy matter or the inorganic composition and other impurities present along with the drug. The extractive values are primarily useful for the determination of exhausted or adulterated drug. The Physico-chemical standards of stem of *Jasminum grandiflorum* are listed below.

**Data showing the Physico-chemical standards of
*Jasminum grandiflorum***

S.NO	Physico-chemical standards	Values in % (w/w)
1.	Ash value	
	Total ash	10.89
	Water soluble ash	2.92
	Acid insoluble ash	1.29
2.	Extractive value	
	Alcohol soluble extractive value	11.57
	Water soluble extractive value	12.14
3.	Loss on drying	4.25

Extraction

Percentage Yield of Total Extract

**Percentage yield, colour and consistency of
ethanolic extract of *Jasminum grandiflorum***

Extract/Fraction	Percentage yield(%w/w)	Colour	Consistency
Ethanolic extract	14.3	Dark green	Semisolid

**Preliminary Phytochemical Screening of Ethanolic
Extract**

S.NO	Chemical test	Test performed	Result
1.	Alkaloids	+Mayers reagent	+
		+Dragendroffs reagent	+
		+Wagner's test	+
2.	Glycosides	+Borntragers reagent	+
		+Keller-killiani	+
3.	Flavonoids	+Alkaline reagent	+
		+Lead acetate solution	+
4.	Phenolic acids	+Ferric chloride solution	+
		+Potassium hydroxide solution	+
5.	Terpenoids	+Salkowski reagent	+
		+Liebermann-Burchard reagent	+
6.	Saponins	Sample shaken with water	+
		+Hemolysis test	+

+ Present

-Absent

Thin layer chromatography (TLC)

Chromatographic Evaluation

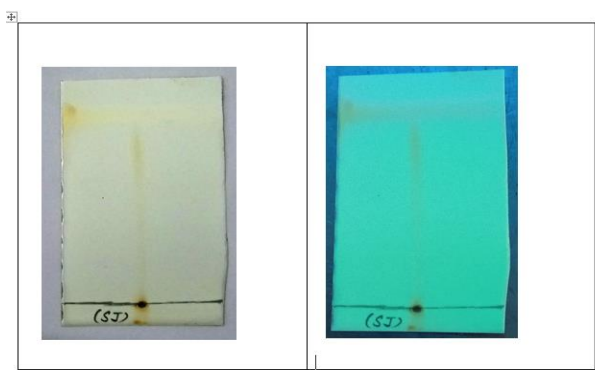


Figure 10.1: Thin Layer Chromatography

Thin layer chromatography

Thin layer chromatography		
S. No	Name of test samples	Rf values
1.	SJ	0.8

High performance liquid chromatography (HPLC)

Reported by User: System

Project Name: Thava

SAMPLE INFORMATION			
Sample Name:	SJ	Acquired By:	System
Sample Type:	Unknown	Date Acquired:	30/12/2024 8:23:46 PM IST
Vial:	1	Acq. Method Set:	joe
Injection #:	4	Date Processed:	30/12/2024 8:50:48 PM IST
Injection Volume:	20.00 ul	Processing Method	SJ
Run Time:	30.0 Minutes	Channel Name:	220.0nm
Sample Set Name		Proc. Chnl. Descr.:	PDA 220.0 nm

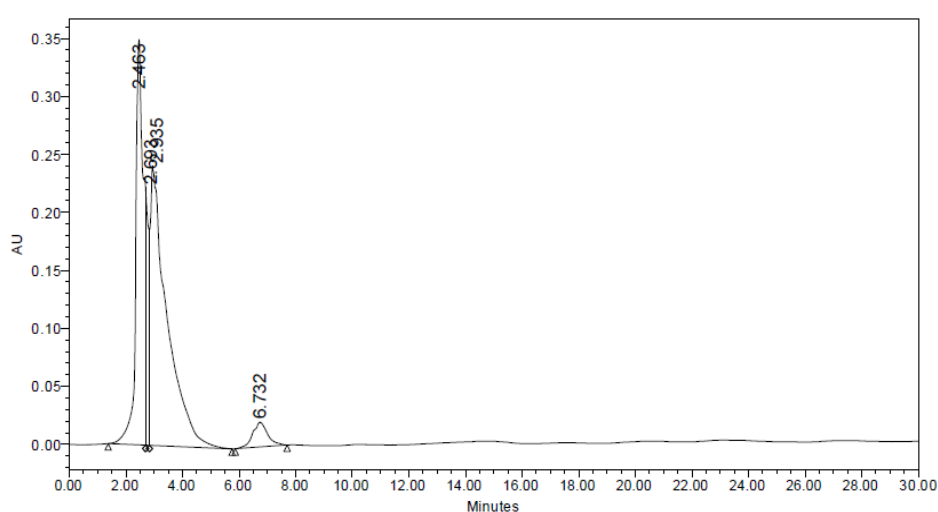


Figure 10.2: High Performance Liquid Chromatography

Table 10.4: Data showing the RT values of *Jasminum grandiflorum* stem extract

	RT	Area	% Area	Height
1	2.463	6532489	34.60	349449
2	2.693	1641311	8.69	222059
3	2.935	9926101	52.58	240953
4	6.732	779488	4.13	21329

Antifungal Activity

Agar well diffusion method

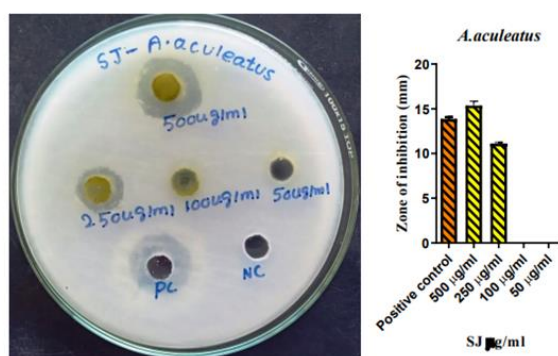


Fig:10.3 Effect of sample SJ against *A. aculeatus*

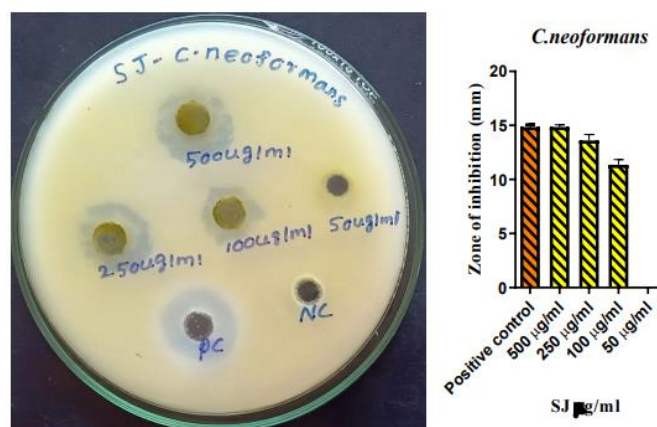


Fig:10.4 Effect of sample SJ against C.neofomans.

Table:10.5 Means of zone of inhibition obtained by sample SJ against A.aculeatus,C.neofomans

S.N O	Name of the test organism	Name of the test sample	Zone of inhibition (mm)				
			SD ± Mean				
			500 µg/ml	250 µg/ml	100 µg/ml	50 µg/ml	PC
1.	<i>A.aculeatus</i>	SJ	15.35±0.49	11.1±0.14	0	0	13.85±0.21
2.	<i>C.neofomans</i>	SJ	14.85±0.21	13.6±0.56	11.35±0.49	0	14.85±0.21

SD – Standard Deviation, *Significance - $p < 0.05$ **ANTIPYRETIC ACTIVITY****A. OD Value at 540 nm**

sample: Nitric Oxide Radical Scavenging Assay

Table10.6: Control Mean ODvalue

S. No	Tested sample (µg/ml)	OD Value at 540 nm (in triplicates)		
1.	Control	0.900	0.986	0.981
2.	500 µg/ml	0.342	0.352	0.355
3.	250 µg/ml	0.361	0.362	0.364
4.	100 µg/ml	0.365	0.387	0.390
5.	50 µg/ml	0.410	0.415	0.417
6.	10 µg/ml	0.434	0.515	0.545

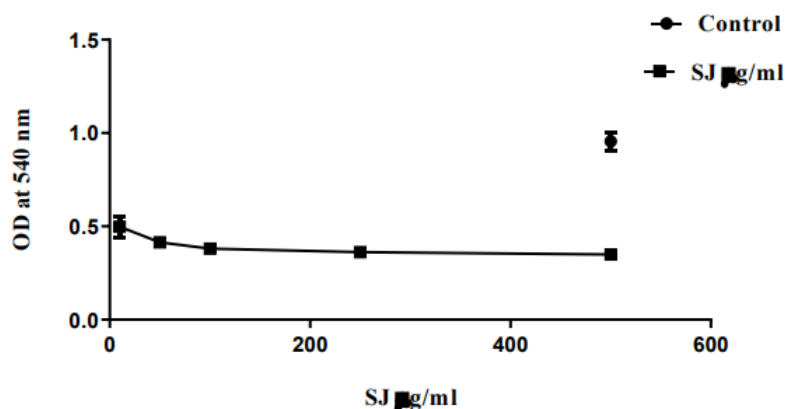


Figure 10.5: OD Value at 540nm

Table 10.7: Percentage of inhibition

S. No	Tested sample concentration ($\mu\text{g/ml}$)	Percentage of inhibition (in triplicates)			Mean value (%)
1.	Control	100	100	100	100
2.	500 $\mu\text{g/ml}$	62	64.3002	63.8124	63.3709
3.	250 $\mu\text{g/ml}$	59.8889	63.286	62.895	62.0233
4.	100 $\mu\text{g/ml}$	59.4444	60.7505	60.2446	60.1465
5.	50 $\mu\text{g/ml}$	54.4444	57.9108	57.4924	56.6158
6.	10 $\mu\text{g/ml}$	51.7778	47.7688	44.4444	47.997

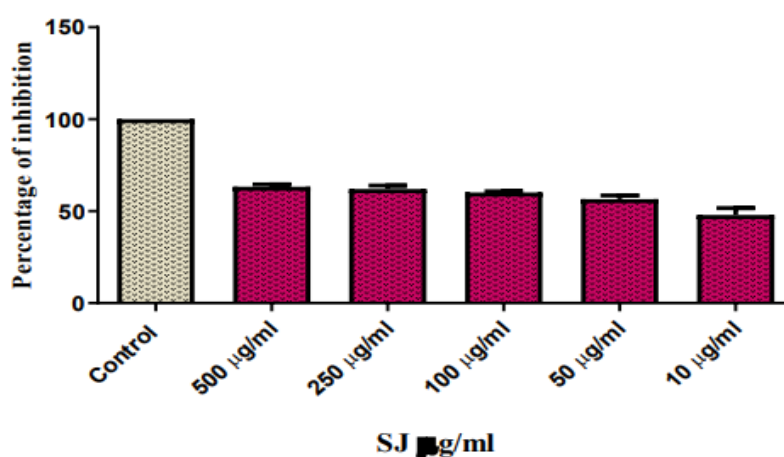
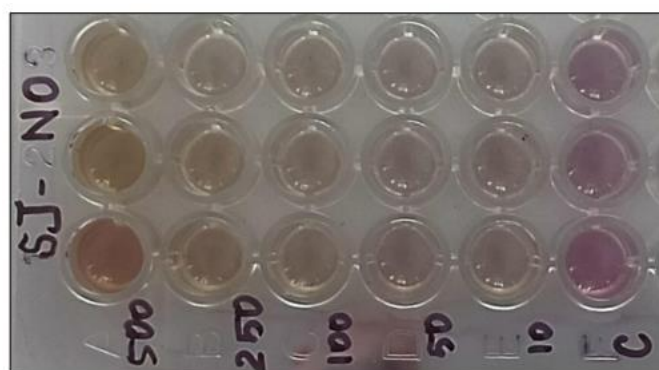


Figure 10.6: Percentage of inhibition

Table 10.8: C. IC50 Value of tested sample:46.16µg/

log(inhibitor) vs. normalized response -- Variable slope	Ambiguous	
Best-fit values		
LogIC50		1.664
HillSlope		-1.870
IC50		46.16
Std. Error		
LogIC50		0.08161
HillSlope		0.6552
95% CI (asymptotic)		
LogIC50		1.488 to 1.841
HillSlope		-3.285 to -0.4545
IC50		30.76 to 69.28
Goodness of Fit		
Degrees of Freedom		13
R squared		0.8483
Sum of Squares		3409
Sy.x		16.19
Number of points		
# of X values		15
# Y values analysed		15

**SJ sample****Figure 10.7: IC50 Value of tested sample:46.16µg/ml****DISCUSSION:**

The physico-chemical parameters of *Jasminum grandiflorum* shall aid to identify it from different species. The pharmacognostical profile of the plant will assist in the standardization in terms of quality, purity and sample identification. The physico-chemical parameter is within the limits specified by the Indian pharmacopoeia standards. Preliminary phytochemical analysis of the ethanolic of *Jasminum grandiflorum* extracts was done for the detection of different plant constituents. These extracts revealed the presence of medicinally important phytoconstituents like alkaloids, glycoside, carbohydrate, flavonoids, phenolic acids, terpenoids and saponins. More phytoconstituents were present in

the ethanolic extract and thereby, the ethanolic extract had been selected for further studies. The R_f value of 0.8 in Thin Layer Chromatography indicates that the compound travelled 80% of the total distance moved by the solvent. This suggests the compound has relatively low polarity, as it interacts less with the stationary phase and more with the mobile phase, resulting in higher mobility. The peak at RT 2.935 has the highest area (9,926,101) and % area (52.58%), suggesting it is the most abundant component in the sample. Peaks at RT 2.693 and 6.732 represent minor components with lower % areas (8.69% and 4.13%, respectively). For *A. aculeatus*, the maximum zone of inhibition was observed at 500 µg/ml (15.35 ± 0.49 mm), while no inhibition was recorded at 100 µg/ml

or lower concentrations. Similarly, for *C. neoformans*, the zone of inhibition was highest at 500 µg/ml (14.85 ± 0.21 mm), with inhibition diminishing at lower concentrations and being absent at 50 µg/ml and below. The positive control consistently exhibited inhibitory effects, with zones of inhibition for *A. aculeatus* (13.85 ± 0.21 mm) and *C. neoformans* (14.85 ± 0.21 mm) comparable to those of the highest SJ concentration (500 µg/ml). The result indicates that as the concentration of ethanolic extract increased, the percentage of inhibition also increased, demonstrating its potential as an antipyretic agent. The percentage inhibition of highest concentration of ethanolic extract stem on the *Jasminum grandiflorum* (500µg/ml) was found to be 63.37%. It showed that ethanolic extract of stem *Jasminum grandiflorum* has antipyretic activity.

CONCLUSION

The stem extracts of *Jasminum grandiflorum* have been found to contain various phyto constituents, including alkaloids, flavonoids, tannins, and phenolic compounds. These secondary metabolites are known for their significant medicinal properties including antifungal and antipyretic activities. The pharmacological studies validate for fever reducing effects and broad spectrum antifungal activity. However, further research is necessary to explore these potential medicinal benefits.

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