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Metabolomic Profiling And In-Vitro Antipsoriatic Potential Of Jasminum Auriculatum Extracts

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ABSTRACT

Objective: To scientifically validate the antipsoriatic activity of chloroform and methanolic extracts derived from *Jasminum auriculatum* (whole plant), traditionally used in Ayurveda and ethnomedicine for treating skin ailments.

Methods: Chloroform and methanolic extracts of *Jasminum auriculatum* were prepared and subjected to metabolomic profiling and phytochemical characterization using LC-MS. Preliminary phytochemical screening was also conducted. The *in-vitro* antipsoriatic activity was evaluated using the HaCaT human keratinocyte cell line via the MTT assay. Additionally, lipoxygenase and nitric oxide (NO) inhibition assays were performed to assess anti-inflammatory potential.

Results: LC-MS and phytochemical screening revealed the presence of phenolic compounds, flavonoids, sterols, and essential fatty acids. Both extracts exhibited concentration-dependent inhibition of HaCaT cell proliferation, with IC_{50} values of 88.02 µg/ml (chloroform extract) and 32.46 µg/ml (methanolic extract). The extracts also demonstrated notable lipoxygenase and NO inhibitory activity. Among the two, the chloroform extract showed superior antipsoriatic effects in the HaCaT cell line study.

Conclusion: *Jasminum auriculatum* extracts, especially the chloroform extract, contain potent bioactive compounds with significant antipsoriatic activity. These findings scientifically support the traditional use of the plant in managing psoriasis and highlight its potential in developing effective phytotherapeutic treatments.

Keywords: *Antipsoriatic, HaCaT, Jasminum auriculatum, In-vitro cell lines, Metabolic profiling, IC_{50}*

1. INTRODUCTION

Psoriasis is an autoimmune skin disease characterised by inflammation, proliferation, and T-cell activation. It is identified by sharply defined patches of hard, silvery scales that are peach-pink or dull-red in colour and that specifically abrasion the skin. In addition, it results in abnormal keratinization, dilated microvessels, hyperkeratosis, epidermal proliferation, and infiltration of inflammatory cells. Psoriasis is a common risk factor for a number of illnesses, including type 2 diabetes, dyslipidemia, and heart disease. Among the problems that are commonly encountered include depression, arthritic pain, and insomnia [1]. Psoriasis can affect any body part, although their effects are usually seen on head, back, and upper extremities, especially the knees and elbows. Although it can manifest at any age, psoriasis usually first manifests in individuals between the ages of 15 and 22. Psoriasis seems to peak again between the ages of 60 and 69. Women are somewhat more likely than men to get psoriasis at a younger age, and the onset date of psoriasis is also greatly influenced by family history. The sickness may last for a few weeks or it may last for the remainder of one's life with relapses and remissions occurring on alternate times. Psoriasis patients exhibit a significant surge in the inflammatory cytokines TNF, IL-6, and IL-7. Psoriasis which is a persistent, systemic chronic inflammatory condition is the linked to metabolic syndrome. Moreover, those with metabolic syndrome possess cytokines that may contribute to psoriasis development, such as TNF, IL-1, IL-4, IL-6, IL-8, and IL-12 [2]. In addition to chronic inflammation, psoriasis can be brought on by a variety of causes such as heredity, stress, alcohol intake, environmental conditions, and poor diet. Psoriasis development is influenced by both genetics and environment. Patients with psoriasis have a greater prevalence of metabolic syndrome than without the condition. There are other subtypes that exist in between the two main categories of pustular and non-pustular psoriasis. Psoriasis vulgaris is the kind of plaque

psoriasis most commonly seen. One of the most common symptoms associated with plaque psoriasis is erythrodermic psoriasis, accounting for 75% of cases. Plaque psoriasis is generally associated with three types: erythrodermic psoriasis, which covers 75% of the body surface; psoriasis groove; and eruptive psoriasis, which usually affects children and young adults. Psoriasis is associated with flexible areas of the skin. Inverse psoriasis is linked to flexural regions of the skin [3]. Conventional topical therapy is the first line of treatment and involves the use of corticosteroids, vitamin D, and its analogues. Vitamin A was used as a control for measuring psoriasis. Many Vitamin A compounds influence the rate of proliferation and the growth of epithelia. Psoriasis is an autoimmune illness that is controlled by variations in keratin [4]. Psoriasis is widespread around the world and affects people of all ages in certain regions, according to a global epidemiology research. The prevalence of psoriasis in children is 0% in Taiwan, In France, 5.20% are adults, in Germany it is 0.71%, and in Italy, it is 2.1%. Despite being less frequent than in western countries, psoriasis is nevertheless reported in a small number of instances in India. A variety of other illnesses, such as a heart attack, diabetes, arthritis, etc., can exacerbate psoriasis, which is a serious condition in and of itself. Health-wise, it's detrimental. According to *Ram S* (*2013*) [5], the National Health Services increasingly prioritize patient education and empowerment in order to mitigate the adverse consequences of their sickness. The World Health Assembly, in its 67th session, approved a resolution about psoriasis on May 24, 2014. To battle psoriasis, all member states committed to reducing the number of people affected by the condition by making the appropriate steps. Because of inadequate care, erroneous or delayed diagnoses, and problems with access to care, the members were aware of the psoriasis patients across the world. To raise awareness of the impact of psoriasis on public health, the persistence petitioned the World Health Organisation to plan a global report on the disease and to take part in psoriasis awareness campaigns. Promoting the wellbeing and social inclusion of psoriasis sufferers is the aim of policymakers' endeavours. According to *Michaelek et al. (2017*) [6], in order for psoriasis therapy to be a model for other chronic skin illnesses, health services research needs to improve the efficacy and calibre of care. Various trigger events have been identified that lead to the onset of the disease or the recurrence of chronic diseases. One of the most important steps in managing psoriasis is to identify triggers and minimise them. Psoriasis growth has been connected to obesity or weight increase, according to several studies conducted in various countries. Apart from environmental and stress factors pasoriasis can also occur to tobacco smoke. Certain diseases, such throat infections caused by streptococci, can also cause psoriasis. People with periodontitis are more likely to get psoriasis. The main initiating cause for psoriasis in adults and children is stress [7].

*Jasminum auriculatum*Vahl. is a species of jasmine genus belonging to the Oleaceae family. The plant is commonly found in India, Nepal, Sri Lanka, Bhutan and Andaman Islands. The plant is well known plant commonly called as ‘Juhi’. Ethnobotanical data shows that the plant can be utilized in burning sensation, ulcers, stomatopathy, hyperdesia cardiopathy, starngury, and dermatopathy. The current study focuses on both pharmacognostical and pharmacological evaluation.

2. MATERIALS AND METHODS

Chemicals

All reagents and chemicals were of analytical grade and purchased from Merck (Mumbai, India), Sigma-Aldrich (New Delhi, India). The sterile water was Double-distilled for complete experimentation.

Collection, Authentication and Extracts Preparation of Plant material

The whole plant of *Jasminum auriculatum* Vahl. was collected from the medicinal plant garden of Sri Venkateswara University, Tirupati (Andhra Pradesh) in January 2022. The samples were authenticated by Dr. K. Madhava Cheety (Rtd.), Plant Taxonomist (IAAT: 337), Assistant Professor, Department of Botany, Venkateswara University, Tirupati-517502, Andhra Pradesh, India under voucher specimen no. 0557. For future reference, the plant specimen was retained in the Geeta Institute of Pharmacy, Geeta University, Panipat, Haryana. The whole plant was air and shade-dried followed by drying at 30^{o}C-35^{o}C in an oven for 8 hours. Pulverisation of plant material was done to convert it into coarse crude powder and kept in an airtight container at room temperature till further studies. The extract was prepared by maceration using chloroform and methanol as solvent [8]. The extracts was evaporated on water bath at atmospheric pressure till semisolid consistency and kept separately in airtight containers at room temperature.

Pharmacognostical Analysis

Preliminary phytochemical Analysis

Primary phytochemical analysis of the extract was performed using simple analytical tests [9].

TLC Analysis

TLC analysis was done using solvent as the mobile phase toluene: ethyl acetate in 7:3 v/v ratio was found best for separation of the required components in the Jasminum extracts for the study. Analysis of the spots were done under UV light (254 nm and 366 nm) or by exposure to day light or by spraying with Anisaldehyde sulphuric acid and heating at 105^{o}C for 10 minutes [10,11].

LC-MS Analysis

LC-MS analysis was carried out in SAIF lab (Sophisticated Analytical Instrumentation Facility) of Punjab University, Chandigarh. The instrument used for LC/MS analysis of samples was Waters, SYNAPT-XS HDMS. The liquid chromatographic system was UPLC Acquity H class series with separation done on a Waters, Acquity BEH-C18 (2.1 × 100 mm, 1.7 µm) column. The Hybrid quadruple and TOF analysers were used in positive mode [12]. All secondary metabolites present in the extracts were identified solely on the basis of LC retention time and high resolution mass spectra. Ionic estimations were made according to their standard MS m/z value obtained from the Mass Bank of Europe, the National Library of Medicine and literature reviews [13].

HPLC analysis

HPLC (Waters, Alliance e2695), of 100 µL injector (Alliance), reciprocating pump (Waters), 4 degassers (lines in-line) and a PDA detector (2998) with the Empower2 software interface of Waters Corporation was utilized for chromatographic analysis. Separation was done using reverse-phase chromatographic method having C_{18} column (4.6 mm × 250 mm, 5 µm) and isocratic elution of acetonitrile-water 45:55 (v/v) using 2.0 mL/min flow rate. The analysis was performed at a wavelength of 242 nm, and 20 µLt of injection volume was used [10].

HPTLC analysis

The Test samples were prepared in HPLC grade Acetonitrile and filtered with 0.45 µM membrane filter. Precoated TLC plates having Silica gel 60 F_{254} with 0.2 µM layers (Merck Millipore, Germany) were used. The semi-automatic sample applicator of Linomat V (CAMAG, Switzerland) was used to apply sample volume of 10.0 µL on 6.0 mm wide band length. The mobile phase used for separation is Chloroform: methanol in the ratio of 90:10% v/v. Presaturated (approx. 20 minutes) glass chamber (20 × 10cm twin-trough) was used and the plate was kept in it till it reach 80 mm. The plate was then removed from the chamber, air-dried and scanned at 254 nm, and 366 nm using D2, and Hg detector, respectively. For analysis, TLC scanner III (CAMAG, Switzerland) with a slit dimension of 4.0x0.30 mm, and scanning speed of 10 mm/s was used. The plate was immersed in 0.05% methanolic DPPH reagent for derivatization for 10 sec and then covered with aluminium foil further it was kept in dark for 15 min. Images were taken in white light with photo documentation chamber of CAMAG, TLC Visualizer [14].

***In-vitro* Antipsoriatic Activity**

Cell Culture and Preparation of test materials for bioassay

For the experiment, cells were seeded at a density of 10,000 cells/well in 96-well plates and incubated for 24 hours in DMEM medium, which was enriched with 10% FBS and 1% antibiotic solution, at 37°C in an atmosphere containing 5% CO_2 [15]. Chloroform and methanolic extracts of *Jasminum auriculatum* were dissolved in DMSO/ethanol/acetone, then concentrated using a filter with 0.2 µm porosity. Concentrations from 1 to 1000 µg/ml were prepared for various cultures, ensuring the final solvent concentration was below 1% (v/v) in all wells; at this concentration, no toxic effects on cell growth or replication were observed [16].

Cytotoxicity on HaCaT cell line (MTT Assay)

For cytotoxicity assessment using the MTT assay in the HaCaT cell line, MTT is commonly employed for cell viability measurement [17], correlating with the production of red formazan by cell mitochondria [16]. Cells were treated with concentrations ranging from 1 to 1000 µg/ml of the extracts (prepared in varying concentrations) for 24 hours. Subsequently, an MTT solution (250 µg/ml final concentration) was added to the cultures and incubated for 2 hours. At the conclusion of the experiment, the formazan product was solubilized, the supernatant discarded, and the solubilized formazan read at 540 nm and 660 nm using an Elisa plate reader (iMark, Biorad, USA) to determine the formazan concentration.

Evaluation of the effect on NO production

For the assessment of NO production impact, cultured cells were treated at varying concentration of the samples and incubated for 24 hours. The cultured supernatant was collected after 24 hours and used for the analysis using Griess Assay [18]. In brief, 50 µl of culture supernatant was mixed with an equal volume of Griess reagent, and the color was allowed to develop for 15 minutes. The plates were then read at 540/660 nm in an ELISA plate reader (iMark, Bio-Rad, USA) [19]. Results were expressed as % inhibition as compare to control [20].

Evaluation of effect on lipid peroxidation

Cells were treated at varying concentration for 24 hours and lysate were prepared in PBS (50,000-80,000 cells lysate in 200 µl). Furthermore, 50 µl of Cell Lysate was combined with 250 µl TCA (8% w/v) and thoroughly mixed. Both the extracts were centrifuged at 2500 rpm for 5 minutes for removing protein precipitate after that supernatant was used for further analysis. 100 µl of supernatant was mixed with 0.9 ml of TBA reagent, and the solution was heated for 15 minutes in boiling water bath. The absorbance of the blank, containing all reagents except the extract, was measured at 532 nm. The amount of malondialdehyde was calculated using extinction coefficient of 1.56×10^5 $M^{-1}cm^{-1}$ [21,22].

Malondialdehyde concentration (M) = (Absorbance $_{532\ nm}$ / 1.56×10^5) × dilution factor

Statistical analysis

Data are expressed as mean ± SEM. Statistical analysis of group differences was performed using Student's t-test. Values of $p \leq 0.05$ were considered statistically significant.

3. RESULTS AND DISCUSSION

Psoriasis is a skin disorder thought to be due to epidermal keratinocyte but it is found to be due to immune-mediation [23]. Both cellular and genetic factors are involved in the causation of diseased condition that's why targeted approach to treat symptoms and immune mediated response is generally followed in the treatment [24]. A lot of work has already been done to find the safer and effective way of natural treatment in treating this chronic disorder [25]. The emphasis of the current research article is to find the Antipsoriatic activity of extracts obtained from *J. auriculatum* using HaCaT cell lines and phytochemical profiling.

Percentage yield of extracts

The Percentage yield of extracts obtained from whole plant of *J. auriculatum* Vahl. are found to be 2.6 and 13.67 % for chloroform and methanolic extract respectively. The results are shown in **Table 1**.

Table 1. Percentage yield of extracts.

S. No.	Solvent Used	*J. auriculatum*
1.	Chloroform	2.60
2.	Methanol	13.67

Preliminary phytochemical screening

Preliminary phytochemical screening provides information about the presence of various phytoconstituents like alkaloids, carbohydrate, saponins, cardiac glycosides, coumarins glycosides, flavonoids, tannins, and amino acids in methanolic extract whereas steroids and triterpenoids in chloroform (CE) and methanolic (ME) extracts of J. auriculatum Vahl. The result of Preliminary phytochemical screening of whole plant extract of J. auriculatum Vahl. are shown in **Table 2**.

Table 2. Preliminary phytochemical screening.

S. No.	Phytoconstituents	*J. auriculatum*	
		C. E	M. E
1.	Alkaloids	-	+
2.	Carbohydrate	-	++
3.	Anthraquinone glycoside	-	-
4.	Saponin glycoside	-	+++
5.	Steroids & Triterpenoids Glycoside	+	+
6.	Cardiac glycoside	-	+++
7.	Coumarin glycoside	-	++
8.	Cyanophoric glycoside	-	-
9.	Flavonoid glycoside	-	+++
10.	Tannin & Phenolic compound	-	++
11.	Proteins & Amino acid	-	++

Note: (-): not detectable. (+): low quantities. (++): average quantities. (+++): high quantities; based upon the intensity of color developed

Phytochemical profiling

LC-MS Analysis

LC-MS analysis of chloroform methanolic extracts showed the presence of 21 phytoconstituents (as shown in **Table 3**) while methanolic extracts contains 61 phytoconstituents (as shown in **Table 4**). Out of all 14 constituents (as shown in **Table 5**) are common in both the extracts. The constituents are of flavonoids and essential fatty acid category that plays a vital role in the treatment of psoriasis by reducing orthokeratosis, dryness and itching. Preliminary phyto-chemical screening and LC-MS data reveals the presence of phenolic compounds, flavonoids, sterols and essential fatty acids. The extract was found to be rich in constituents who are already found to possess anti-psoriatic activity. **Figure 1** depicted HPTLC profile of *J. auriculatum* extracts and **Figure 2** depicts HPLC chromatogram of extracts of *J. auriculatum*.

Table 3. TLC profiling.

Plant	Extracts	No. of spots	Rf values
J. auriculatum	Chloroform	2	0.11, 0.51
	Methanolic	8	0.11, 0.20, 0.47, 0.60, 0.66, 0.72, 0.77, 0.97

Table 4. LC-MS (Chloroform Extract).

S.No.	Compound (m/z)	Compound ID	Formula	Description	m/z
1	12.18_303.0522	CSID24785350	$C_{15}H_{14}O_9$-2	4-{4-[(*E*)-2-Carboxylatovinyl]-2,6-dimethoxyphenoxy}-3-hydroxy-4-oxobutanoate (Quercetin dihydrate)	303.0522
2	12.77_163.0396	CSID10254753	$C_9H_6O_3$	IN00458	163.0396
3	12.77_163.0396	CSID10289	$C_9H_{10}O_5$	Syringic acid	163.0396
4	12.77_163.0396	CSID12693	$C_9H_{10}O_5$	Ethyl gallate	163.0396
5	12.77_163.0396	CSID134374	$C_9H_{10}O_5$	Danshensu	163.0396
6	12.77_163.0396	CSID13479	$C_9H_6O_3$	2-Hydroxychromone	163.0396
7	12.77_163.0396	CSID4444774	$C_9H_6O_3$	Umbelliferone	163.0396
8	12.77_163.0396	CSID67282	$C_9H_{10}O_5$	5-Hydroxyveratric acid	163.0396
9	13.92_177.0557	CSID141152	$C_{10}H_{12}O_5$	Vanillactic acid	177.0557
10	13.92_177.0557	CSID35015213	$C_{10}H_{12}O_5$	3-(3,4-Dihydroxyphenyl)-2-methoxypropanoic acid	177.0557
11	13.92_177.0557	CSID35015214	$C_{10}H_{12}O_5$	2-Hydroxy-3-(3-hydroxy-4-methoxyphenyl)propanoic acid	177.0557
12	13.92_177.0557	CSID8760010	$C_{10}H_{12}O_5$	Methyl 3-(3,4-dihydroxyphenyl)-2-hydroxypropanoate	177.0557
13	16.09_121.0287	CSID10710392	$C_7H_8O_4$-2	2-Isopropylmaleate	121.0287
14	16.09_149.0250	CSID24784824	$C_8H_8O_5$-2	2-Hydroxy-3-(2-methylenecyclopropyl)succinate	149.025
15	16.09_149.0250	CSID24785202	$C_8H_8O_5$-2	2-Hydroxy-2-(2-methylenecyclopropyl)succinate	149.025

16	16.95_194.0853	CSID64808706	$C_7H_{15}NO_3S$	N-Hydroxy-6-(methylsulfanyl)-*L*-norleucine	194.0853
17	17.79_194.0845	CSID64808706	$C_7H_{15}NO_3S$	N-Hydroxy-6-(methylsulfanyl)-*L*-norleucine	194.0845
18	22.29_119.0856	CSID28029	$C_9H_{14}O_2$	2,2,6-Trimethyl-1,4-cyclohexanedione	119.0856
19	22.29_119.0856	CSID80489	$C_9H_{14}O_2$	4-Hydroxy-2,6,6-trimethyl-2-cyclohexen-1-one	119.0856
20	22.29_437.1971	CSID21864842	$C_{25}H_{21}N_3O_2$	oxidized Renilla luciferin	437.1971
21	26.60_301.1445	CSID30790778	$C_{18}H_{20}O_4$	4-[(2*R*,3*S*,4*R*,5*R*)-5-(4-Hydroxyphenyl)-3,4-dimethyltetrahydro-2-furanyl]-1,2-benzenediol	301.1445

Table 5. LC-MS (Methanolic Extract).

S. No.	Compound (m/z)	Compound ID	Formula	Description	m/z
1	12.15_303.0519	CSID24785350	$C_{15}H_{14}O_9$-2	4-{4-[(*E*)-2-Carboxylatovinyl]-2,6-dimethoxyphenoxy}-3-hydroxy-4-oxobutanoate	303.052
2	12.77_163.0394	CSID10254753	$C_9H_6O_3$	IN00458	163.039
3	12.77_163.0394	CSID10289	$C_9H_{10}O_5$	Syringic acid	163.039
4	12.77_163.0394	CSID12693	$C_9H_{10}O_5$	Ethyl gallate	163.039
5	12.77_163.0394	CSID134374	$C_9H_{10}O_5$	Danshensu	163.039
6	12.77_163.0394	CSID13479	$C_9H_6O_3$	2-Hydroxychromone	163.039
7	12.77_163.0394	CSID4444774	$C_9H_6O_3$	Umbelliferone	163.039
8	12.77_163.0394	CSID67282	$C_9H_{10}O_5$	5-Hydroxyveratric acid	163.039
9	13.92_177.0555	CSID10295	$C_{10}H_8O_3$	Herniarin	177.056
10	13.92_177.0555	CSID141152	$C_{10}H_{12}O_5$	vanillactic acid	177.056
11	13.92_177.0555	CSID35015213	$C_{10}H_{12}O_5$	3-(3,4-Dihydroxyphenyl)-2-methoxypropanoic acid	177.056
12	13.92_177.0555	CSID35015214	$C_{10}H_{12}O_5$	2-Hydroxy-3-(3-hydroxy-4-methoxyphenyl)propanoic acid	177.056
13	13.92_177.0555	CSID4444190	$C_{10}H_8O_3$	Hymecromone	177.056
14	13.92_177.0555	CSID8760010	$C_{10}H_{12}O_5$	Methyl 3-(3,4-dihydroxyphenyl)-2-hydroxypropanoate	177.056
15	16.12_149.0235	CSID18679	$C_8H_8O_5$	3-O-methylgallic acid	149.023
16	16.12_149.0235	CSID24784824	$C_8H_8O_5$-2	2-Hydroxy-3-(2-methylenecyclopropyl)succinate	149.023
17	16.12_149.0235	CSID24785202	$C_8H_8O_5$-2	2-Hydroxy-2-(2-methylenecyclopropyl)succinate	149.023

18	16.12_149.0235	CSID70398	$C_8H_8O_5$	4-O-Methylgallic acid	149.023
19	16.12_149.0235	CSID81407866	$C_8H_8O_5$	2-(2-Methylenecyclopropyl)-3-oxosuccinic acid	149.023
20	16.12_573.1583	CSID58829962	$C_{28}H_{32}O_{15}$	5,7-Dihydroxy-2-(4-methoxyphenyl)-4-oxo-4*H*-chromen-3-yl 6-*O*-(6-deoxy-alpha-*L*-mannopyranosyl)-beta-*D*-glucopyranoside	573.158
21	19.31_318.3014	CSID108921	$C_{18}H_{39}NO_3$	Phytosphingosine	318.301
22	27.41_228.2331	CSID7901	$C_{12}H_{26}O$	Dodecan-1-ol	228.233
23	30.94_135.1177	CSID24785381	$C_{10}H_{18}O_2$	(2*Z*,6*E*)-2,6-Dimethyl-2,6-octadiene-1,8-diol	135.118
24	30.94_135.1177	CSID4515751	$C_{10}H_{18}O_2$	8-hydroxygeraniol	135.118
25	30.94_135.1177	CSID478433	$C_{10}H_{18}O_2$	8-Methyl-6-nonenoic acid	135.118
26	30.94_135.1177	CSID58829897	$C_{10}H_{18}O_2$	(1*R*,6*S*)-1,3,3-Trimethyl-2-oxabicyclo[2.2.2]octan-6-ol (Citronellic Acid)	135.118

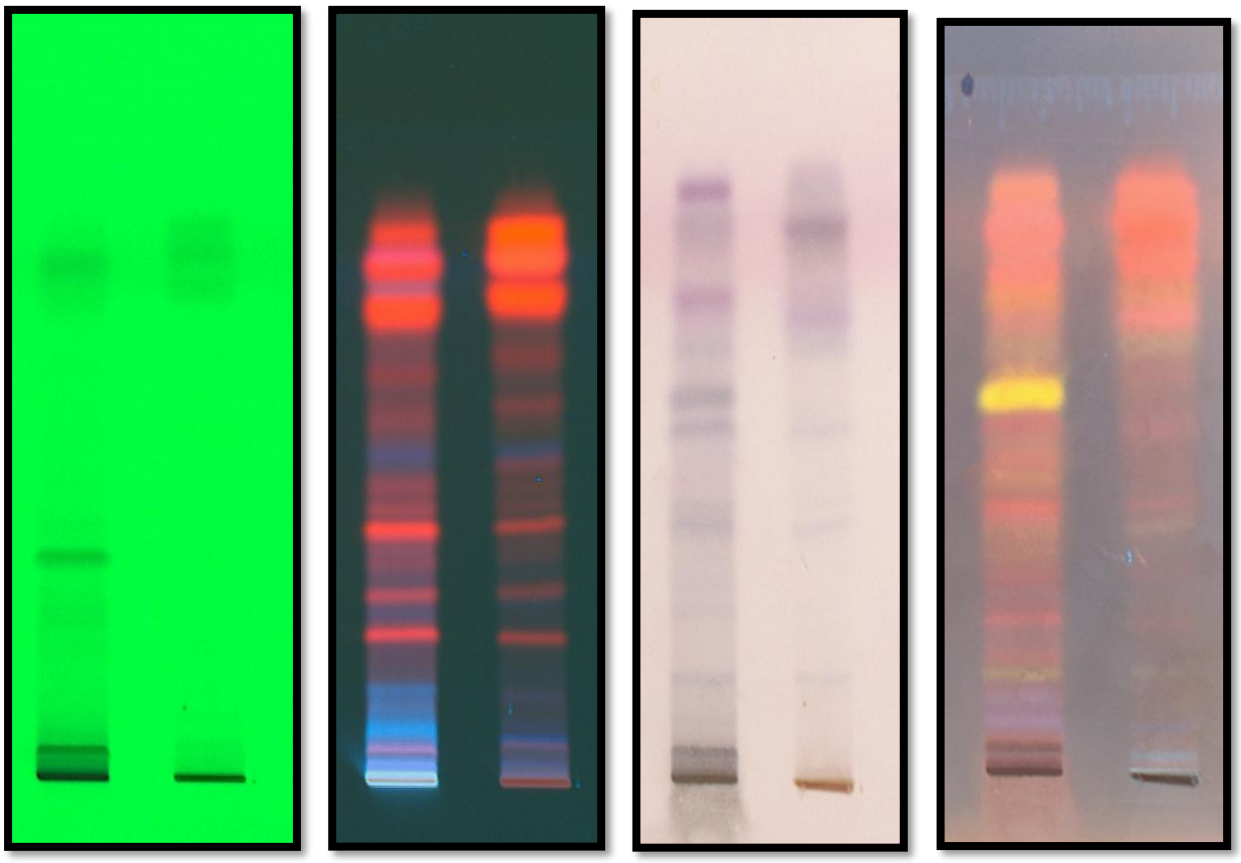


Figure 1. (A) HPTLC profile of *J. auriculatum* extracts at 254 nm; (B) HPTLC profile of *J. auriculatum* extracts at 366 nm; (C) HPTLC profile of *J. auriculatum* extracts after derivatization in visible light; and (D) HPTLC profile of *J. auriculatum* extracts after derivatization at 366 nm.

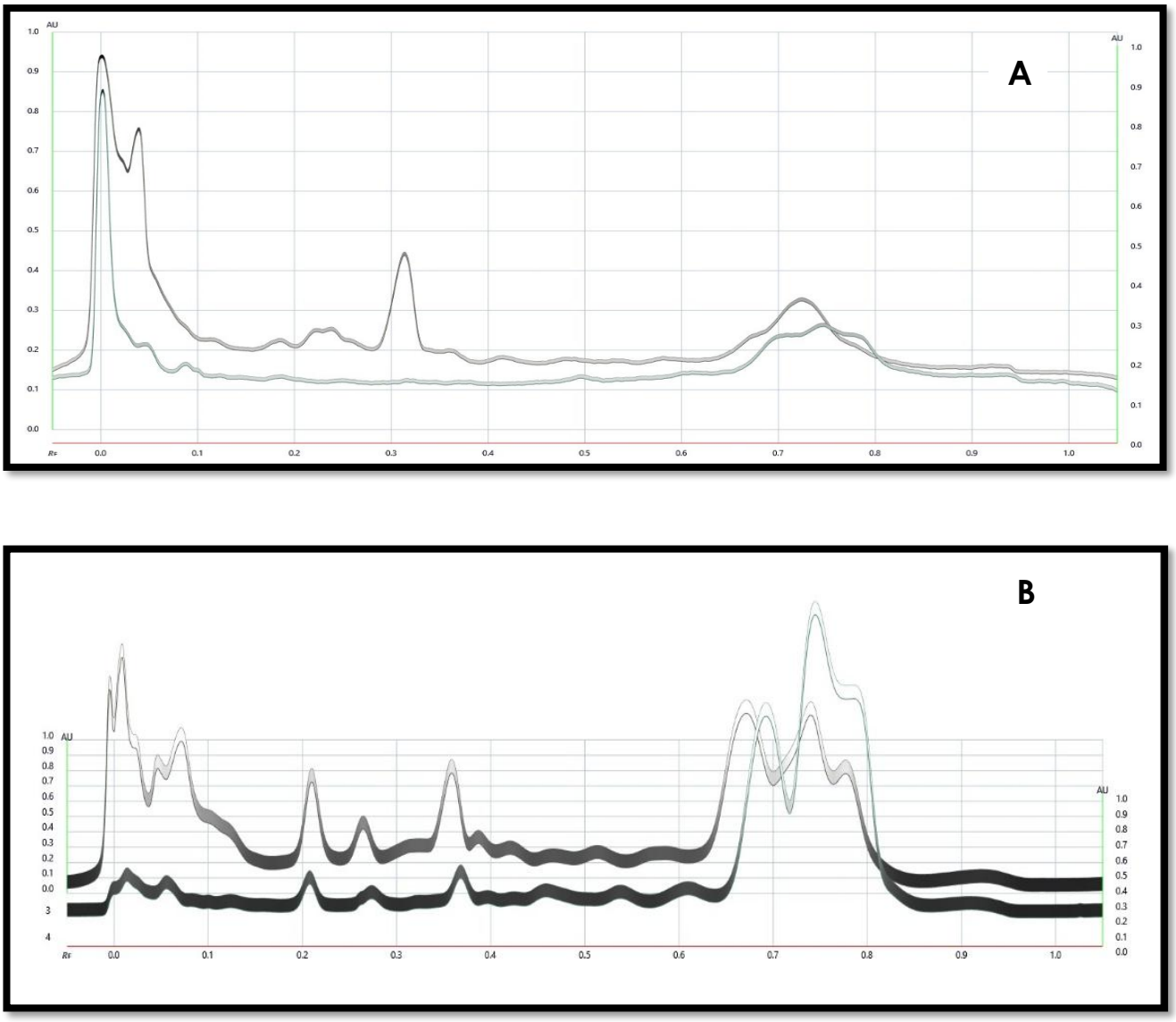


Figure 2. HPLC chromatogram of extracts of *J. auriculatum* (A) at 254 nm (B) at 366 nm.

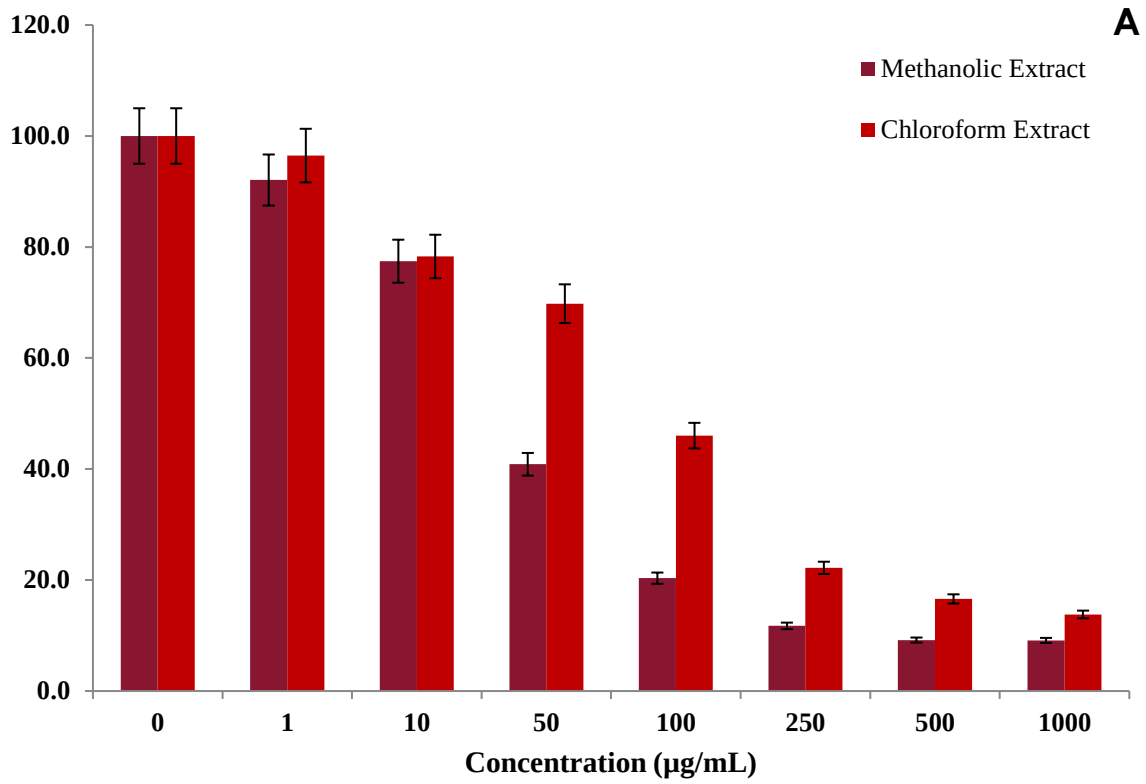
***In-vitro* Antipsoriatic activity**

HaCaT cell lines are spontaneous immortal human keratinocyte cells which is best cellular method for modulation study of keratinocyte. Psoriasis in indicated by hyperproliferation and HaCaT cell lines is for antiproliferative effects for over 48 hours. The result showed the potential activity of extracts in dose dependent manner. The results are shown in **Table 6** as Mean±S.D. of 3 subsequent experiments. The chloroform and methanolic extract inhibited the proliferation of HaCaT cells in concentration dependent manner and reduced cell number with IC_{50} Value of 88.02 µg/ml and 32.46 µg/ml, respectively (**Figure 3**).

Table 6. LC-MS (Common Constituents).

S. No.	Description
1	4-{4-[(*E*)-2-Carboxylatovinyl]-2,6-dimethoxyphenoxy}-3-hydroxy-4-oxobutanoate
2	IN00458
3	Syringic acid

4	Ethyl gallate
5	Danshensu
6	2-Hydroxychromone
7	Umbelliferone
8	5-Hydroxyveratric acid
9	Vanillactic acid
10	3-(3,4-Dihydroxyphenyl)-2-methoxypropanoic acid
11	2-Hydroxy-3-(3-hydroxy-4-methoxyphenyl)propanoic acid
12	Methyl 3-(3,4-dihydroxyphenyl)-2-hydroxypropanoate
13	2-Hydroxy-3-(2-methylenecyclopropyl)succinate
14	2-Hydroxy-2-(2-methylenecyclopropyl)succinate



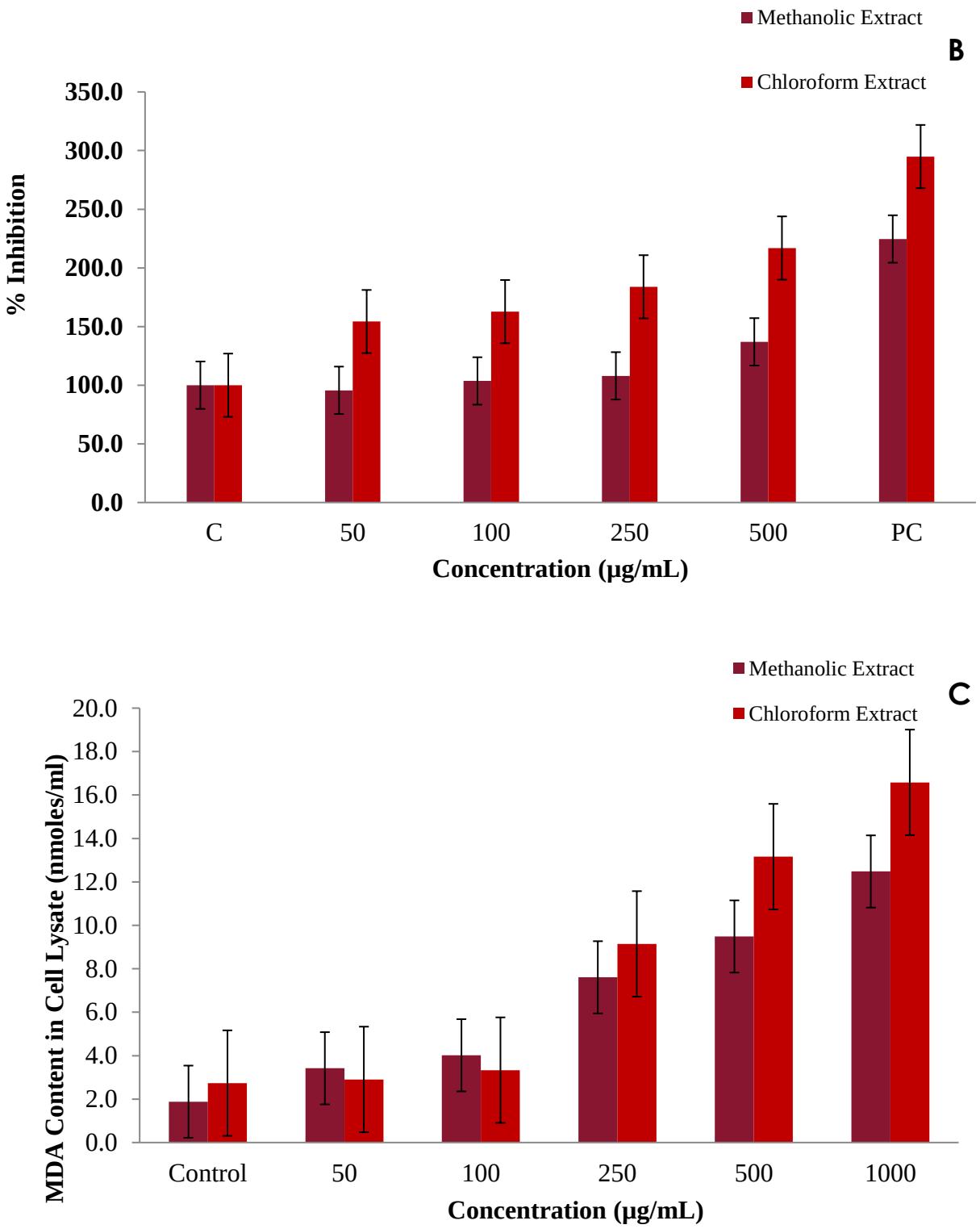


Figure 3. Antipsoriatic activity (A) Extract Concentration, (B) % Inhibition, (C) MDA Content in Cell Lysate.

The antipsoriatic activity of chloroform and methanolic extract of *J. auriculatum* was confirmed by cell viability in HaCaT cell lines using MTT assay. The principle of this method is dependent on the ability of metabolically active cells to change 3-(4,5-dimethythiazol-2-yl)-2,5-diphenyl tetrazolium bromide to formazan by an enzyme called mitochondrial succinate dehydrogenase. The MTT which is yellow in colour is converted to an insoluble dark purple coloured product; hence numbers of viable cells are determined by the color intensity. **Table 7** and **Table 8** depict the MTT activities of extract.

Table 7. Concentration activity study of extracts in MTT assay.

Sample Conc.	Methanolic Extract	Chloroform Extract
0	100.0	100.0
1	92.1	96.5
10	77.4	78.3
50	40.9	69.8
100	20.3	46.0
250	11.7	22.2
500	9.2	16.6
1000	9.1	13.8

Table 8. IC_{50} Value using MTT assay.

Extract	IC_{50} value (µg/mL)
Methanolic Extract S1	32.46
Chloroform Extract S2	88.02

Free radicals are the major indicators affecting the keratinocyte proliferation of psoriasis. NO; *i.e.* Nitric oxide is an intracellular free radical found helpful in auto immunity and inflammation. The level of NO is increased in various diseased conditions such as psoriasis. The result of this study reveals the impact of increased NO inhibition in skin keratinocytes using griess reagent by colorimetric analysis. Result as indicated in **Table 9**, revealed the inhibition of NO radical is in directly correlation with the concentration of extract.

Table 9. RNI effect of Extract.

Sample Conc.	Methanolic Extract	Chloroform Extract
C	100.0	100.0
50	95.7	154.2
100	103.6	162.7
250	108.0	183.9
500	137.0	216.9
PC	224.6	294.9

Lipoxygenase (LOXs) is an enzyme involved in arachidonic pathway and catalyses the oxidized products which formed in psoriasis development. Thereby inhibition of increased Lipoxygenase helps in lowering down the severity of psoriasis. Both the extracts are shown to reduce lipid peroxidation by lowering the increased level of lipoxygenase enzyme (**Table 10**).

Table 10. Lipid peroxidation.

Sample Concentration	Methanolic Extract	Chloroform Extract
Control	1.9	2.7
50	3.4	2.9
100	4.0	3.3
250	7.6	9.1

500	9.5	13.2
1000	12.5	16.6

It was observed that both the extract significant results as an antipsoriatic agent but the chloroform have the better activity in treatment of psoriasis indications. The finding also suggested the presence of phytoconstituents which have been proved to be good in treatment of psoriasis. Scientific studies showed that Quercetin has been reportedly proved as Antipsoriatic agent. It lower down the level of TNF-α, IL-6 and IL-17 levels, increases metabolic activities like GSH, CAT, and SOD. It has also shown to decrease the MDA (malonedialdehyde) level deposition in IMQ induced psoriasis in mice.

The plant was also found to have phytoconstituents that are predominantly considered to be responsible in the ailment of psoriasis. That's why it may be suggested that due to presence of polyphenolic compounds, flavonoids, sterols and fatty acids extracts of *Jasminum auriculatum*may have Antipsoriatic activity

Phenolics and Polyphenolic compounds exhibit anti-inflammatory activity and generally inhibit expression of genes and activity of skin enzymes activity like collagenas, hyaluronidases, matrix metalloproteinases, serine proteases and elastases. Flavanoids possess antinflammatory, antioxidant and free radical scavenging activity. Flavonoids inhibit arachidonic acid pathway by oxidation of membranal lipids. They usually form chelated with inactivate 5-lipoxygenase and cyclooxygenase that converts arachidionic acid to prostaglandins and leukotrienes that causes inflammation.

ROS and NOS are associated with psoriasis; hence redox imbalance and increased NOS levels are the main cause of oxidative stress in psoriasis. Flavanoids due to their antioxidant activity shows promising result in decreasing oxidative stress in psoriasis, mainly on skin.

Flavanoids directly or indirectly balances the action and production of inflammatory mediators thereby balancing the levels of inflammatory cytokines and mediators such as TNF-α, NF-κB, IL-1β, IL-17, Il-6, IL-22, IL-23, PGE_2, and COX enzymes. Various other factors like SOD, CAT and GSH levels are also balanced by flavanoids that changes the orthokeratosis occurred in damaged skin due to psoriasis.

The present study provides compelling evidence for the antipsoriatic potential of *Jasminum auriculatum* extracts, supported by their rich phytochemical composition and demonstrated bioactivity in *in-vitro* models. The metabolomic profiling and phytochemical characterization of the chloroform and methanolic extracts revealed the presence of phenolic compounds, flavonoids, sterols, and essential fatty acids, which are well-documented for their anti-inflammatory, antioxidant, and immunomodulatory properties. These findings align with recent studies on medicinal plants, which emphasize the role of polyphenols and flavonoids in managing psoriasis through their ability to modulate keratinocyte proliferation and inflammation [26].

The inhibition of HaCaT cell proliferation by both extracts, with IC_{50} values of 88.02 µg/ml (chloroform extract) and 32.46 µg/ml (methanolic extract), highlights their potential to target keratinocyte hyperproliferation, a key feature of psoriasis. The superior activity of the methanolic extract may be attributed to its higher solubility of polar compounds, such as phenolic acids and flavonoids, which have been shown to exert antiproliferative effects in psoriatic models [27]. Similar findings were reported in a recent study on *Curcuma longa* extracts, where methanolic extracts demonstrated significant inhibition of HaCaT cell proliferation due to their high curcuminoid content [28].

The lipoxygenase and NO inhibitory activities of the extracts further support their anti-inflammatory potential. Lipoxygenase enzymes play a critical role in the biosynthesis of leukotrienes, which are potent mediators of inflammation in psoriatic lesions. The inhibition of lipoxygenase by *Jasminum auriculatum* extracts suggests their ability to disrupt the inflammatory cascade associated with psoriasis. This is consistent with recent findings on *Azadirachta indica* extracts, which showed significant lipoxygenase inhibition and reduced psoriatic inflammation *in-vitro* [29]. Similarly, the reduction in NO production indicates the potential of these extracts to mitigate oxidative stress, a key contributor to psoriasis pathogenesis. Recent studies on *Ocimum sanctum* have also highlighted the role of NO inhibition in alleviating psoriatic symptoms [30].

The presence of essential fatty acids in the extracts is particularly noteworthy, as these compounds are known to restore the skin barrier function and reduce inflammation in psoriatic patients. This aligns with the findings of a 2023 study on *Pongamia pinnata*, where essential fatty acids were shown to improve skin hydration and reduce scaling in psoriatic lesions [31]. The synergistic action of these phytoconstituents likely contributes to the overall antipsoriatic activity of *Jasminum auriculatum* extracts, supporting the growing interest in multi-target therapies for psoriasis [32].

While the chloroform extract showed better antipsoriatic activity in the *in-vitro* cell line study, the methanolic extract demonstrated a lower IC_{50} value, suggesting that the choice of solvent significantly influences the extraction efficiency and bioactivity of the phytoconstituents. This observation is consistent with a recent study on *Moringa oleifera*, where solvent polarity was found to impact the yield and pharmacological activity of bioactive compounds [33].

The results of this study are further supported by existing literature on the therapeutic potential of *Jasminum* species. For instance, *Jasminum sambac* has been reported to possess anti-inflammatory and antioxidant properties, while *Jasminum*

grandiflorum has shown wound-healing and antimicrobial activities [34]. However, this study is among the first to specifically investigate the antipsoriatic potential of *Jasminum auriculatum*, providing a scientific basis for its traditional use in skin disorders.

Despite the promising results, certain limitations should be acknowledged. The study was conducted *in-vitro*, and further validation in *in-vivo* models and clinical trials is necessary to confirm the efficacy and safety of *Jasminum auriculatum* extracts for psoriasis treatment. Additionally, the specific bioactive compounds responsible for the observed effects need to be isolated and characterized to elucidate their mechanisms of action. Recent advances in metabolomics and bioassay-guided fractionation could facilitate this process, as demonstrated in studies on *Withania somnifera* and *Bacopa monnieri* [35,36].

In conclusion, this study demonstrates that *Jasminum auriculatum* extracts possess significant antipsoriatic potential, mediated by their ability to inhibit keratinocyte proliferation, reduce inflammation, and modulate oxidative stress. The findings underscore the importance of integrating traditional knowledge with modern scientific approaches to develop novel, plant-based therapies for psoriasis. Future research should focus on isolating bioactive compounds, evaluating their mechanisms of action, and conducting preclinical and clinical studies to translate these findings into effective therapeutic interventions.

4. CONCLUSION

The present study provides a comprehensive evaluation of the metabolomic profile and *in-vitro* antipsoriatic potential of chloroform and methanolic extracts derived from the whole plant of *Jasminum auriculatum*. Phytochemical characterization and LC-MS analysis revealed the presence of bioactive compounds such as phenolic compounds, flavonoids, sterols, and essential fatty acids, which are known to contribute to antipsoriatic activity. Both extracts demonstrated significant inhibition of HaCaT cell proliferation in a concentration-dependent manner, with the methanolic extract showing a lower IC_{50} value (32.46 µg/ml) compared to the chloroform extract (88.02 µg/ml). Additionally, the extracts exhibited notable lipoxygenase and NO inhibitory activities, further supporting their anti-inflammatory and antipsoriatic potential. Although both extracts displayed promising results, the chloroform extract emerged as more effective in the *in-vitro* cell line studies, suggesting its superior antipsoriatic efficacy. These findings align with the traditional use of *Jasminum* species in Ayurveda and traditional medicine for treating skin disorders and provide scientific validation for their therapeutic potential. The presence of phytoconstituents with proven antipsoriatic activity underscores the potential of *Jasminum auriculatum* as a natural source for developing novel psoriasis therapies. Future studies should focus on isolating and characterizing the specific bioactive compounds responsible for these effects and evaluating their efficacy in *in-vivo* models and clinical trials. This research highlights the importance of integrating traditional knowledge with modern scientific approaches to uncover the therapeutic potential of medicinal plants like *Jasminum auriculatum*.

5. CONFLICT OF INTEREST

The authors report that there is no conflict of interest.

6. FUNDING

Nil

7. AUTHOR CONTRIBUTION

SIMRAN ANEJA: Literature Review, Laboratory Research; NEERUPMA DHIMAN: Conceptualization, Mentoring, Analysis, Reviewing, Editing, Supervision; ARUN MITTAL: Investigation, Visualization, Data Curation, Resources; BHUPESH SHARMA: Language improvement, Methodology

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