REVIEW ARTICLE

A Critical Review on Natural Bioactive of *Jasminum* Genus as Potential Therapeutics in Various Disorders

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ABSTRACT

There are many widely used medicinal plants in the Oleaceae family, which also includes the species *Jasminum*. Typical uses for the *Jasminum* species, which include *Jasminum auriculatum vahl, J. humile, J. flexile Vahl, J. grandiflorum L, J. polyanthum, J. officinale, J. multiflorum, J. aungustifolium, J. pubescens, and J. sambac,* include anti-Jasmine oil is commonly used in aromatherapy. The presence of a wide range of bioactive substances in *Jasminum* plants, including fatty acids, glycosides, coumarins, sterols, terpenoids, esters, and phenolics, may be the cause of their therapeutic effects. The combined impact of essential oils is responsible for the aromatherapy's antibacterial, anti-acne, spasmolytic, and other properties. According to phytochemical studies, phenolic compounds are significantly more bioactive than the bulk of terpenoids and other chemicals. The medicinal potentials of phenolic components have been extensively studied, including their anti-inflammatory, antiulcer, antioxidant, lipid peroxidation, ACE inhibitor, vasodilation, antioxidant, and antiaging capabilities, as well as their wound healing and protective characteristics. The medicinal potentials of phenolic chemicals are reviewed in the current research, coupled with *Jasminum*'s phyto screening and ethnobotanical features.

Keywords: *Jasminum* genus, Pharmacological activities, Phytochemical constituents, Traditional uses.

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INTRODUCTION

The family Oleaceae, which also comprises floral climbing shrubs and vines, includes the genus *Jasminum*. Almost 2000 plants and 200 different species of *Jasminum* can be discovered worldwide.[1] The chemical components of plants are classified into several classes in most references, including flavonoids, alkaloids, carbohydrates, tannins, steroids, terpenoids, phenols, proteins, glycosides, and mucilage.[2] Due to their bioactive effects, such as their antidiabetic, cardio-protective, anti-inflammatory, neuroprotective, anticancer, antibacterial, anti-lithiasis, antimicrobial, antioxidant, immunostimulatory, antidiuretic, antifungal, and antiviral properties phenolic compounds play a significant role in human health.[3] One significant traditional flower crop in our nation is jasmine.[4] *Jasminum* plants have been suggested as a treatment for venereal and intestinal worms. Interestingly, practically every portion of the plant is significant in the areas of medicine and pharmaceuticals. While leaves are used to cure breast cancers, flowers are utilized to treat vesicles, ulcers, skin conditions, boils, and eye issues. Several representatives of the *Jasminum* genus have historically been employed as medicines. For instance, *J. officinale* demonstrates a range of medicinal qualities, including sedative, anti-depressant, expectorant, analgesic, diuretic, antibacterial, and depurative. Many tribes utilize it to treat irregular menstruation, cough, pyrexia, gastrointestinal issues, and ocular inflammation. *J. grandiflorum* is also advised against cough, hysteria, uterine conditions, and postpartum issues.[5]

Review Literature of Genus *Jasminum*

Using terms like Oleaceae, *Jasminum*, management, treatment, and pharmacological roles, a large database of several diverse websites was browsed through. This study discusses the botanical description, phytochemistry, various pharmacological roles, and toxicology of genus *Jasminum*. Several articles from several websites, including Google Scholar, Springer, Taylor & Francis, Elsevier, and Bentham, are studied for the literature survey.

Taxonomical/Scientific Classification

Kingdom: Plantae
Subkingdom: Viridiplantae
Division: Magnoliophyta
Super division: Embryophyte
Class: Magnoliopsida

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Subclass: Acari
Order: Lamiales
Family: Oleaceae

The study's objective was to examine the flavonoids, alkaloids, carbohydrates, phenols, tannins, steroids, terpenoids, proteins, glycosides, mucilage's compounds, and pharmacological activity in some *Jasminum species*, including *J. auriculatum vahl, J. humile, J. flexile Vahl, J. grandiflorum L, J. polyanthum, J. officinale, J. multiflorum, J. aungustifolium, J. pubescens, J. sambac*.

Jasminum auriculatum vahl

A species of *Jasminum* that belongs to the Oleaceae family is called *Jasminum auriculatum Vahl*. It can be found all throughout the Andaman Islands, Bhutan, Sri Lanka, India, and Nepal.[6,7] It is widely cultivated in Thailand and India. In India, it is utilized for festivities and ornamental uses. The Latinized version of the Arabic name "Yasemin" for plants with a sweet aroma is *"Jasminum*".[8] It has historically been used to treat conditions such as heart disease, bleeding issues, poisoning, skin issues, stomatitis, gingivitis, eye problems, ear, nose, and throat problems, wound healing, immunopharmacology, *in-vitro* antioxidants, and antibacterial compounds. It belongs to the jasmine genus *auriculatum* Vahl, which has around 200 species. Different plant components, including flowers, stems, leaves, roots, bark, and seeds, have been used for treating a variety of diseases since the dawn of time. It contains a wide range of phytoconstituents, including glycosides, proteins, steroids, terpenoids, flavonoids, phenols, alkaloids, tannins, and carbohydrates.[9] The blooms are aromatic, pleasant, freezing, astringent, cardiotonic, diuretic, and depurative in nature, while the roots are helpful for skin conditions, particularly ringworm. They are helpful for dermatopathy, nephrolithiasis, cardiopathy, ulcers, and stomatopods. Lupeol and jasmine have reportedly been found in the leaves of *J. auriculatum*. *J. auriculatum* flower extracts in both alcohol and water showed diuretic efficacy by raising urine volume and potassium and sodium salt concentrations and antiurolithiatic activity by lowering increased urinary oxalate synthesis.[10] Essential oils from *J. auriculatum* flowers are frequently extracted.[11] *Jasminum* blossoms are also used to make jasmine tea.[12]

Chemical Constituents *J. auriculatum* Vahl

It contains a wide range of phytoconstituents, including glycosides, proteins, steroids, terpenoids, phenols, tannins, flavonoids, alkaloids, and carbohydrates**.** Two triterpenoids (an Isomer and leupeol), D-mannitol, hentriacontane, n-triacontanol, and four fatty acids (stearic, palmitic, oleic, linoleic acids) are all said to be present in *J. auriculatum* (Vahl) leaves.[13] One-hexacosene, 4-methyl-2-propyl 11-pentanol, propyl oleate, 3,5-dimethyl 1-hexene, 3,4-dimethyl 1-hexene, and 1-butoxy made up most of the flower volatile oil concretes. 2,5,5-trimethyl 1-hexene, 17-pentatriacontene, octadecane, and 1,54-dibromo-tetrapentacontane are examples of 2-pen-tene.

Pharmacological Activity

Wound healing activity

The ability of J. *auriculatum* Vahl's leaf extract to cure wounds. Using EW and IW models were used on albino rats to evaluate the wound healing potential. According to higher wound contraction rates (83.660.50% on day 15), shorter epithelialization times (17.831.6 days), stronger skin that can be broken (170.711.52 g), more collagen, and favorable histological changes, topically applying an ointment usually contains S.E.E. from *J. auriculatum* leaf has the most effective wound healing ability in both models under consideration. The ethanolic extract's scavenging of DPPH radicals' activity was discovered to be 33.39 g/mL. Successive ethanolic extract was shown to be the most effective treatment for *Pseudomonas aeruginosa*, with an inhibitory zone measuring 16.65, 0.6 mm and the lowest inhibited concentration of 0.78 mg/mL.[14]

Antilithiatic effect

J. auriculatum Vahl's flowers were investigated for their potential antilithiatic properties. Green pharmacy journal international (IJGP). In the investigation, male albino rats were employed. The effects of orally treated of alcoholic and aqueous extract of *J. auriculatum Vahl.* flower on calcium nephrolithiasis. Ethanol feeding resulted in both hyperuricemia and a rise in renal excretion of calcium and phosphate. By greatly lowering the elevated urine oxalate levels, *J. auriculatum* flower extract showed a regulatory influence in endogenous oxalate production. Aqueous and alcohol extracts were used for both curative and preventive treatment, which considerably reduced the accumulation of stone-forming substances in the renal of calculogenic rats. According to the research*, J. auriculatum* flowers have antiurolithiatic properties.*[15]*

Antidiuretic activity

The antidiuretic properties of *J. auriculatum* Vahl flower extract. The Oleaceae plant *J. auriculatum* Vahl's blossoms are frequently used in the Ayurvedic medical system to cure diuretics. In alcohol and aqueous extracts, the possible diuretic effects of flowers were investigated in albino rats. When compared to the reference drug furosemide (0.1 gm/kg body mass), the results revealed that both extracts substantially increased urine output and potassium & sodium salt levels at 0.25 g/kg body weight.[16]

Antioxidant activity

Evaluates the isolated component from the methanolic steam-treated barks of *J. auriculatum* Vahl that has antioxidant action *in-vitro*. The 2, 2, diphenyl-l-picrylhydrazyl (DPPH) test method was used to decide to isolate the chemical's *in-vivo* antioxidant activity. It depends on using oxidant scavengers to reduce the colorful oxygen radicals DPPH in methanol. Measuring the drop in DPPH absorption at its 517 nm maximum absorbance, which is related to the quantity of an oxidant scavenger added to the reagent solution, is the method. The effective concentration, or EC_{50}, is used to express the

activity. Phenolic components were discovered in the isolated *J. auriculatum* compound according to the results of early phytochemical screening. It has been suggested that phenolic compounds have antioxidant properties.[17]

Anticancer activity

The employment of *J. auriculatum* leaf extract, which serves as a reduction and stabilizing agent, in the biogenic synthesis of gold nanoparticles. Their ability to cut on p-nitrophenol shows that biogenic Au NPs provide a versatile option for heterogeneous catalysis. The pH stability investigation using phosphate buffer solution demonstrated our gold nanoparticles' suitability for biological applications. With an IC_{50} value of 104 ng/mL, the bioactive AuNPs' cytotoxicity assay showed that they had a significant amount of the drug's inhibitory ability on the proliferation of the cancer cell line. The biogenic gold nanoparticles significantly inhibited the human pathogenic bacteria and fungi.[18]

Immunostimulatory activity

Studies on the flavonoids extracted from an aqueous extract of *J. auriculatum* that have immunostimulatory properties. Human whole blood was treated with various concentrations of the plant's aqueous leaves extract (0.0005–0.03 g/mL), and the hemolytic activity of *J. auriculatum* was determined by counting the monocytes, lymphocytes and granulocytes as well as examining the onward size and shape and side disperse (granularity of the cell) using a flow cytometer. According to the results, the aqueous extract of *J. auriculatum* leaves raised the amount both granulocytes and monocytes in human whole blood as evidenced by the retention and decrease in forward and side scatter. At high concentrations, or 30 mg/mL, the aqueous extract exhibited hemolytic effect in comparison to control. The results showed that an individual vaccine antigen was stimulated by an aqueous extract (leaves) of *J. auriculatum*.[19]

Antibacterial activity

In our most recent investigation, we used a stem extract from *J. auriculatum* to demonstrate the antibacterial effect of silver nanoparticles. The shift in hue and the absorption at 355 nm in the UV-visible spectra provided proof that silver nanoparticles had been synthesized. According to the XRD study, the nanoparticles are a highly crystalline fcc shape of metallic silver. According to the SEM image, the stable nanoparticles are spherical and range in size from 10 to 20 nm.Studies on antibacterial activity have shown that silver nanoparticles are more effective against human infections. A study found that the anabolism of silver nanoparticles is a straightforward process with numerous benefits, including compatibility and environmental friendliness for industrial, biomedical, pharmaceutical, and water filtration applications as well as large-scale manufacturing.[20]

Jasminum Grandiflorum Linn

Plants of the Oleaceae family include *J. grandiflorum* Linn., sometimes known as "Spanish jasmine" or "Royal jasmine." Traditionally the blossoms and leaves of this species is used to combat and prevention of breast cancer. Its classical names include Jati, Malti, or Rajput Rika. Carbohydrate, proteins, triterpenoids, fixed fats and oils, gums, and mucin, phytosterols, glycoside, terpenes, resins, and salicylic acid are all present in *J. grandiflorum* Linn. According to reports, the plant has analgesic, antimicrobial, antioxidant, antiulcer, anti-inflammatory, wound healing, cytoprotective, nephrotoxic, and hepatoprotective properties.

Chemical Constituents J. grandiflorum Linn

Numerous studies have been published on the chemical composition of various *J. grandiflorum* components. Jasmin anhydride, demethyl-200-epifraxamoside, and secoiridoid glycosides.[21] The leaves of *J. grandiflorum* were shown to contain is Oleacein, quercitrin, 3,4-dihydroxy benzoic acid, 2-(3,4- dihydroxy phenyl)-ethanol, oleanolic acid, 2-hydroxy-30, 40- dihydroxy acetophenone, and salicylic acid.[22]

Pharmacological Activity

Wound healing

Studies on the effects of *J. grandiflorum* L. extract of leaves on the recovery of cutaneous wounds in rats. A study found that the topical ointment application of methanolic leaves extract of *J. grandiflorum* L. (Oleaceae) shows potent wound healing efficacy in rats. Applying the *Jasminum* ointment topically accelerated the healing of full-thickness excision wounds. Total hydroxyl proline, DNA, and protein content was much greater, resulting in noticeably more collagen formation and tissue growth. When the response was assessed on days 4, 8, and 12 after the formation of the wound, it was concentration- and time-dependent. According to wound contraction, tensile strength, and other histological alterations, the pace of wound healing was quicker. Additionally, in wound tissue with increased GSH concentrations and reduced amounts of lipid peroxidation products, this ointment boosted the action of catalase (CAT) and superoxide dismutase (SOD). Thus, ointment derived from the methanol extracts of *J. grandiflorum* leaf may speed up wound healing by enhancing the antioxidant system of the newly produced healing wound tissue and promoting collagen formation. Up to 30 days later, the pH increased slightly but remained within the normal range for human skin: pH 5–6. During a 12-day monitoring period, neither formulation caused erythema or edema on the skin.[23]

The protease action of flower leaf extract of *J. grandiflorum* L., an herb for healing wounds, is evaluated. The amount of total protein and protease activity were assessed in the floral extracts and various flower parts. The findings of this study aid in determining the degree of protease activity in *J. grandiflorum* floral organs. The fact that stamens outperformed the other floral organs in terms of protease activity may be the reason the floral extract has wound-healing properties. The extraction and purification of proteolytic enzymes from this herb as well as the *in-vitro* and *in-vivo* assessment of the enzyme on wounds, will help us better comprehend the herb's ability to treat wounds.[24]

Evaluations of *J. grandiflorum* Linn's ethanolic extract. flowers' effects on diabetic wistar albino rats' wound healing.

Three groups were treated with *J. grandiflorum* Linn. floral extract for excision wounds: the diabetic control group, the positive control group (which received Glibenclamide), and the treatment group (EW). These techniques were used to heal dead space wounds and incision wounds (IW) (DW). In terms of wound breakage energy, hydroxyproline level, and crystal growth cell density, the treatment group's IWs and DWs considerably improved when compared to the control group. The therapy group also had a significant level of neo-angiogenesis. Comparison to the diabetic normal group, the treated group's wound constriction began earlier (day 14), (day 20). Re-epithelization did not significantly improve in the therapy group. By promoting granulation tissue production and boosting wound contraction, flowers may be beneficial in promoting the healing of diabetic wounds.[25]

Studies of the effects of *J. grandiflorum* leaf oil decoction on albino rat wound healing. In excision wound ($p<0.05$) and burn wound ($p<0.001$) models, test groups demonstrated a substantial decrease in durations of tissue regeneration when compared to the controls and vehicle control groups. In both models, the rate of wound contraction was also noticeably accelerated in the test groups ($p<0.001$). An oil extract of *J. grandiflorum* leaves has demonstrated wound-healing properties in burn and excision wounds.[26]

Analgesic activity

Evaluations of the decoction from the leaf of *J. grandiflorum* Linn. albino mice of either sex (weighing 20–25 gm) and adult wistar albino rats of either sex (weighing between 100–200 gm) were employed. The crude drug was treated orally at 0.1 and 0.2 g/kg bw doses. The maximum activity is produced by aqueous leaf decoction of *J. grandiflorum* leaf at a concentration of 0.2 g/kg, according to both models. The outcome plant leaf ethanolic extract (200 mg/kg) has a similar impact to WEJG. Both extracts' analgesic action is comparable to that of the common drug indomethacin (10 m/kg), and they both provide a significant ($p < 0.05$) analgesic effect. PEEJG, however, had negligible effects at doses of 0.1 g/kg and 0.2 g/kg. *J. grandiflorum* leaves have good peripheral analgesic effect, according to the current study, which aims to determine the plant's precise mechanism of action.[27]

Nephrotoxicity activity

Evaluates the effects of a methanolic decoction of the leaf of *J. grandiflorum* Linn on rat nephrotoxicity brought on by gentamicin. Five animals were employed, and each received a single oral dose of JGLE (2 g/kg, b.w). Food was avoided for an additional three to four hours following the delivery of JGLE. Throughout the first 30 minutes after dosing, once every hour for the first 24 hours, and then every day for the next 14 days, each animal was monitored at least once. Once per day, observations made from the cage included changes to the animal's skin, fur, eyes, mucous membranes (especially the nasal mucous membrane), autonomic (lacrimation, defecation, urinary incontinence, and salivation), central nervous system (tremors and convulsions) changes, and respiratory rate, and circulatory (HR and BP). Mortality was calculated during a 2-week producing. The 14 day treatment of rats with gentamicin, a nephrotoxic drug, had the following effects on animal body weights: 0.1 and 0.2 g/kg/day of oral JGLE. As demonstrated in the daily i.p. gentamicin 40 mg/kg for 14 days caused significant progressive losing weight seen in the toxic control group rats from the 17th to the 14th day. When compared to the hazardous group, virtually little weight loss was seen in the other treatment groups.[28]

Hepatoprotective activity

J. grandiflorum (JG) was tested for hepatoprotective effects in wistar albino rats after isoniazid-induced liver injury (INH). To harm the livers of wistar rats INH (0.054 g/kg, orally, once in a day for 30 days) and JG (0.2 g/kg, oral route, once daily, one-hour beforehand INH (0.054 g/kg, orally, once daily)) were administered. The benchmark was silymarin (0.05 g/kg p. o.) for 30 days. Result JG treatment significantly decreased high alanine transaminase, aspartate transaminase and blood lipid levels after INH administration. It was found that JG-treated animals exhibited less hepatic collagen deposition than untreated mice. JG pretreatment results in significantly decreased LPO levels and enhanced antioxidant activity in rats.[29]

Anti-inflammatory activity

J. grandiflorum was tested for hepatoprotective effects in wistar albino rats after isoniazid (INH)-induced liver injury. To harm the livers of wistar rats, INH (0.054 g/kg, orally, once in a day for one month) and JG (200 mg/kg, oral route, once daily, one-hour beforehand INH (0.054 g/kg, orally, once daily)) were administered. The benchmark was silymarin (0.05 mg/kg p. o.) for one month. Result JG treatment significantly decreased high alanine transaminase, aspartate transaminase and blood lipid levels after INH administration. It was found that JG-treated animals exhibited less hepatic collagen deposition than untreated mice. JG pretreatment results in significantly decreased lipid peroxidation (LPO) levels and enhanced antioxidant activity in rats. The anti-inflammatory properties of carrageenan were also investigated in rats with paw edema caused by the drug. This extract included superoxide and OH radicals and significantly decreased lipid peroxidation brought on by iron. At an 800 g/mL concentration, it dramatically decreased NO emission without altering cell viability, preventing paw edema development in rats. The anti-inflammatory efficacy of JG leaves can be attributed to their high phenol content (2.25 0.105 mg/l of the gallic acid proportionate), reducing power, and oxygen radicals' ability.[30]

Examines the anti-inflammatory effects of the oleaceae plant *J. grandiflorum* L. saubsp. Floribundum in models of arthritis and inflammatory bowel disease. The anti-inflammatory properties of aerial constituents of JTME were investigated using two experimental rat models. JTME treatment resulted in dose-dependent anti-inflammatory efficacy. Prednisolone, 2 mg/kg, was comparable to JTME, 400 mg/kg. It decreased the colonic mucosa's intestinal expression of pro-inflammatory cytokines. As a result, *J. grandiflorum* L. is an important pharmaceutical compound used

to treat chronic inflammatory diseases. We may recommend that additional future studies isolate useful chemicals from the n-butanol portion of the genus *Jasminum* because our *In-vitro* trials demonstrated high anti-inflammatory potential.[31]

Anti-hypertension activity

For *in-vitro* anti-hypertensive efficacy testing, aerial portions of *J. grandiflorum* subsp. floribundum and their corresponding fractions were used. The ACE and renin inhibitory activity samples were also measured using five complimentary tests, including TAC, DPPH, ABTS, FRAP, and iron-reducing power. The n-butanol fraction showed strong ACE and renin inhibition as well as considerable antioxidant activity when compared to lisinopril and aliskiren standard medications.[32]

Antibacterial activity

The extract has demonstrated antibacterial activity against all the tested species at varied concentrations compared to the standard group. In comparison to the reference, methanol, petroleum ether and leaves extract have demonstrated greater effectiveness against all four bacteria. Only *P. aeruginosa* and *Bacillus subtilis* were resistant to chloroform extract. *Escherichia coli* and *P. aeruginosa* were the most resistant to acetone extract. The plant extract has antibacterial activity against the test organism, it has been determined. The inhibition zone varied, indicating the herb's many phytoconstituents' differing levels of effectiveness on the target organism.[33]

Jasminum Multiflorum Linn

Various jasmine, generally known as Indian jasmine, downy jasmine, and winter jasmine, is called *Jasminum multiflorum*. This is a native of Southeast Asia and India and is a lovely floral plant. Ancient people relied on the local flora and animals as a form of traditional medicine to survive. Traditional remedies often comprise of leaves, fruits, flowers, and roots to maintain wellness and treat illnesses like, indolent ulcers, fever, cough, abdominal distention, diarrhea, controlling menstrual flow, clearing renal waste, and inflamed, reducing blood glucose levels and bloodshot eyes.[34] In India, Nepal, Bhutan, Laos, Burma, Thailand, and Vietnam, *J. multiflorum* is a natural plant. In tropical and subtropical areas, it is frequently farmed. Although jasmine blossoms are well-known for their beautiful and very scented flowers, this type has no perfume. According to reports, the plant has antioxidant, anti-anxiety, and altered motor coordination properties.

Chemical Constituents J. Multiflorum Linn

In addition to phenolic compounds and nitrogen-containing compounds, alkaloids, steroids, phlobatannins, minerals, tannins, flavonoids, carbohydrates, and proteins, vitamins, cardiac glycosides, terpenoids, amino acids and saponins are among the secondary metabolites that plants produce in significant amounts.[35]

Pharmacological Activity

Antioxidant activity

The ability of plant extracts to serve as antioxidants has been extensively studied using the DPPH radical scavenging activity. Based on the EC_{50} value, the DPPH ability was calculated and shown. The study's findings indicated that *J. multiflorum* leaf and flower crude extract have inhibitory activity, but that the max. number of inhibition effect was found in the ethanolic leaf extract (141.2 1.24 g/mL) and the least amount in the aqueous leaf extract (524.6 2.35 g/mL), while the maximum concentration of reduction of free radicles was discovered in the ethanolic extract of the floral (252.4 2.41 g/ml).[36]

Anti-anxiety activity

Rat performance in the EPM has long been recognized as reliable for determining which medications have anxiolytic qualities. Rats' natural propensity to explore wide-open places in contrast to their innate fear of heights, is the cause of the anxiety they feel during EPM. Rats with lower anxiety levels would typically spend more time and more visits in the open arms of EPM. In our investigation, we discovered that rats given 200 mg/kg of jasmine exhibited reduced stress levels by entering the arms open more randomly and remaining there for long periods. These results were like those of diazepam at 0.002 g/kg.[37]

Motor coordination alteration

Rat performance on the rotarod treadmill is a widely used responsible technique to evaluate the components of equity and denomination in rat motor activity. We used an accelerating rotarod to investigate potential modifications in motor activity brought on by the decoction. The rats' time spent on the treadmill was not significantly reduced by jasmine at 0.2 g/kgor diazepam at 0.003 g/kg, indicating that neither drug had an impact on the animals' motor function. Jasmine, however, severely decreased motor function at 0.5 g/kg.[37]

Jasminum Officinale Linn

The garden plant frequently referred to as "Jasmine" is *J. officinale Linn*. (Family: Oleaceae), which is widespread in Asia and typically utilized in aromatherapy. *J. officinale* leaf have been referenced in ancient Indian review as possessing antibacterial, allelopathic, antispasmodic, wound-healing, anti-inflammatory, and anti-hepatitis B properties.

Chemical Constituents J. Officinale Linn

Coumarins, anthocyanins, phlobatannins, carbohydrates, flavonoids, steroids, tannins, saponins, terpenoids, alkaloids, glycosides, essential oil and anthraquinones, leucoanthcyanins are among the chemical compounds found in *J. officinale*.[38,39] Salicylic acid, quercetin, oleanolic acid, eugenol, oleacein, P-cresol, 3,4-dihydroxybenzoic acid, isoquercitrin, 4-p-coumaroylquinic acid, vanilin, kaemferol, oleuropein, and oleanolic acid, ursolic acid, hesperidin were the significant phenolic compounds with therapeutic potential.[40]

Pharmacological Activity

Allelopathic activity

Effects of inhibition on seed imbibition, germination, and induction of alpha-amylase activity in *E. crus-galli* (L.) Beauv. A wettable powder made from a methanolic extract of *J. officinale* f. leaf. var. *grandiflorum* Linn. *Echinochloa*

crus-galli (L.) (JWP) weeds inhibited Beauv seedling growth and germination. The *E. coli* inhibition percentages While the percentages of suppression on a shoot and root lengths varied from 19.04 to 71.82% and 76.31 to 100%, respectively, for *crus-galli* seed germination administered with 500 to 8,000 ppm for 7 days, they ranged from 0 to 70%. The permeation and -amylase action in the treat E. crus-galli seeds rapidly declined as JWP concentrations increased. The findings demonstrate that JWP significantly reduced *E. crus-susceptibility* galli's to allelopathy. *E. crus-galli* germination was 12.5% suppressed at a dosage of 2000 ppm. The amplitude of the inhibition was enhanced to 40 and 70%, respectively, by increasing the application dose at 4000 and 8000 ppm. JWP considerably decreased the shoot and root elongation of *E. crus-galli*, and the impact was concentration-dependent.[41]

Anti-inflammatory activity

Four new sesquiterpenes' anti-inflammatory potential was investigated using the LPS-induced murine macrophage RAW264.7. With different IC_{50} values, these substances demonstrated a modest decrease in LPS-induced nitric oxide (NO) production in RAW264.7 cells. 11 widely used Jordanian herb, including *J. officinale*, were tested for their anti-nociceptive properties using a hot-plate test and mice that were given acetic acid to cause writhing. According to the results, *J. officinale* is effective at reducing inflammation in both immediate (xylene-induced ear edema) and chronically (cotton-pellet granulation) inflammation. The effects on pain and inflammation were dose-dependent. [42]

Anti-hepatitis B activity

Evaluation of anti-hepatitis B virus activity of 8-epi-Kingiside in *J. officinale var. grandiflorum*. ELISA was used to measure the levels of extracellular hepatitis B antigen (HBsAg) and hepatitis B surface protein (HBsSP) in the medium of cell culture, respectively. The anti-hepatitis b virus effects of 8-Epik also were shown in the DHBV model. The i.p dosages of 8-Epik (0.02, 0.04, and 0.08 g/kg, b.i.d) were administered to the ducklings with DHBV for 10 days. The aqueous alkaline fluid feed was the control group, and lamivudine (50 mg/kg, twice daily) was a positive control. Dot blotting was used to measure the amount of DHBV DNA on days 0 (T0), 5, 10, and 3 (P3) after the end of treatment. The Findings 8-Epik significantly and dose-dependently inhibited HBsAg secretion in HepG2 2.2.15 cells [IC50 = (19.4 1.04) g/mL]. In DHBV-infected ducks, 8-Epik (40 or 80 mg/kg, i.p, twice day) also decreased viremia.[43]

Jasminum Humile

It is a species of a tree or shrub in the family Oleaceae. *J. humile*, often known as jasmine 22 or yellow jasmine, is indigenous to Pakistan, Nepal, Afghanistan, Tajikistan, the Himalayas. The species is apparently naturalized and widely cultivated in Greece and the former Yugoslavia.[44] Antimicrobial, antiviral, and cytotoxic effects of this plant have already been studied.

Chemical Constituents Jasminum Humile

J. humile contains flavonoids, alkaloids, tannins, glycosides, phenols available in this plant.[45]

Pharmacological Activity

Antimicrobial activity

Evaluation of the ethanol extracts of *J. humile* leaves' antibacterial properties. The antibacterial activity of *J. humile's* methanolic extract was assessed using the agar well dispersal technique. The extract antimicrobial activity was noted when the zone of inhibition was larger than 6 mm. *J. humile's* methanol extracts showed substantial antibacterial activity with respect to all tested strains of bacteria (three Gram -ve and two Gram +ve bacteria) at various doses, according to the antibacterial screening. However, when compared to ciprofloxacin, the extract's antibacterial activity against *S. aureus* reached its peak (3.7 cm zone of inhibition) at 50 mg/mL.Significant antibacterial activity against all the studied bacterial organisms was also demonstrated by the methanolic extracts of *J. humile* leaves, however, it was dose-related.[46]

Antioxidant activity

Evaluation of antioxidant properties of *J. humile* leaf methanolic extract using two complimentary test systems, 2,2-diphenyl-1-picrylhydrazyl (DPPH), and H_2O_2 (hydrogen peroxide) scavenging activity. For both assays, ascorbic acid was used as a reference antioxidant against these varied antioxidant activities. The hydrogen peroxide scavenging activities of the *J. humile* leaves extract shown a significant ($p<0.05$) dose-dependent response. ascorbic acid and *J. humile* leaf extract's IC_{50} values were reported to be 60.79 and 38.84 µg/mL, respectively. Maximum scavenging activity (67.01%) was seen at a 100 µg/mL concentration.[46]

Jasminum Flexile Vahl

There *Jasminum* species, specifically *J. flexile Vahl*, which is grown in subtropical and Asian nations, including Japan, France, Italy, Morocco, and Egypt. According to reports, the plant has anti-inflammatory and antibacterial properties.

Chemical Constituents J. Flexile Vahl

We previously reported on the physicochemical properties, fingerprinting, antibacterial, and antioxidant analyses of the *J. flexile* leaf extracts in hexane and hydro ethanol.[47] Benzyl benzoate, benzyl salicylate, (2E,6E)-farnesol, and benzyl acetate are the primary components of flexile flower absolute.[48]

Pharmacological Activity

Antibacterial activity

In a study, the antibacterial effect of *J. flexile's* main fractions and constituents was evaluated using the agar well diffusion assay. Positive controls produced a 10–14 mm zone of inhibition in every sample tested, but DMSO-treated wells showed no zone of inhibition.[49]

Anti-inflammatory activity

All fractions and compounds had their anti-inflammatory potency evaluated using the hemolysis assay. Red blood cells were subjected to varied doses of each fractionate and separated component in the hydroethanolic extract, and the

findings were expressed as a percentage inhibition. The samples' expressed percentage hemolysis, which reveals their anti-inflammatory potential, reveals the percentage inhibition. At a concentration of 1,000 ppm, the dewaxed hydroalcoholic extract shown a 51.4% anti-inflammatory potential. The parent extract had a smaller share of anti-inflammatory effect than the column major fractions MF 2,5,6,9,14,15,19,24 at the same concentration.[49]

Johnsonia Pubescens

J. pubescens essential oil yields from the flowers and leaves were 0.02 and 0.04% (w/w), respectively. Using chromatography analysis 63 and 64 chemicals, or 91.9% of the oil in 95.0% of the oil is in the leaves and flowers, have been characterized. Both oils predominantly comprised non-terpene compounds (50.8 and 58.2%, respectively), with carbonyl compounds making up 44.7% of the essential oil from the leaves. The predominant non-terpene components of the floral oil included acids, esters, and ketone (38.1%), in addition to acetaldehyde (14.3%) as well as other carbonylic chemicals.[50] According to reports, the plant has antioxidant and antibacterial properties.

Chemical Constituents of J. Pubescens

It contains a wide range of phytoconstituents, including glycoside, protein, tannins, steroids, terpenoids, flavonoids, and alkaloids. *J. pubescens* included the essential oil components benzyl salicylate, beta-Pinene, n-Pentacosane, n-Tetracosane, n-Tricosane, and n-Docosane. Numerous active metabolites, including sesquiterpene hydrocarbons, monoterpene hydrocarbons, diterpenes, and non-terpene derivatives, are found in the plant's leaf. benzaldehyde, benzoic acid, (E, E)-2,4-Heptadienal, nonanal, linalool, n-Peicosane, n-tricosane, mlethyl salicylate, 4-Terpineol, (Z)-Jasmone, caryophyllene oxide, (E)-Geranyl acetone, humulene epoxide II, trans-nerolidol, abietadiene, and trace elements such as p-cymene, eugenol are examples of such compounds.[51]

Pharmacological Activity

Antimicrobial activity

The agar-well diffusion method was employed to assess the antimicrobial activities of leaf extracts. Molten agar media was combined with the incubated bacterial cultures of microorganisms, then poured into presterilized agar plates. After the prepared agar plates had solidified, sterile bores of 6 mm in diameter were formed, appropriately sealed with molten agar to avoid loss of the test substance and filled with 0.45 l of 200 mg/mL of extracts. Ofloxacin is employed routinely. When comparing to the industry STD ofloxacin, MEOH-E showed substantial antibacterial activity, based on the antimicrobial activity results. In comparison to other extracts, MEOH-E demonstrated the strongest antibacterial activity (expressed as ZOI) against S. *aureus* (25.70.84 mm). *S. aureus* (19.30.65 mm), *B. subtilis* (17.70.23 mm), and other microorganisms were among those against which Aq.-E was discovered to be active and *E. coli* (14.3 ± 0.46 mm), *P. aeruginosa* (12.4 ± 0.77 mm) and Pet. E-E as S. *aureus* (13.7 ± 0.33 mm), *B. subtilis* (11.5 ± 0.33 mm), *E. coli* (9.1 ± 0.86) and *P. aeruginosa* (8.8 ± 0.29 mm), respectively.[52]

Antioxidant activity

Jasmine leaves' capacity to scavenge free radicals was demonstrated by the antioxidant concentration of MEOH-E, which were evaluated using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method and found to be 12 to 35 mg/g, respectively. Flavonoids, total phenolic content, and antioxidant concentrations (FRAP) of jasmine leaves in MEOH-E are 31, 4, and 34 mg/g, respectively. According to the study's findings, *J. pubescens* MEOH-E has strong antioxidant capacity.[52]

Jasminum Polyanthum

J. polyanthum and the discovery of possible medical applications. To make the extract, water was added to powdered plant leaves and blossoms. Both leaf and flower extract were investigated for phytochemical compounds, anticancer, antioxidant, anti-inflammatory, antimicrobial, antidiabetic, and DNA nicking assay. Maximum phytochemical components that result in the presence of different bioactive qualities were present in the flower and leaf extract. While the flower has a high total phenolic content and good FRAP activity, the leaf has good DPPH activity. Both the flower and the leaf have strong antidiabetic and anti-inflammatory properties. Leaf extract has greater antibacterial activity than flower extract, while the opposite is true for antifungal activity. According to reports, the plant has antidiabetic properties.

Chemical Constituents J. polyanthum

J. polyanthum consists of terpenoids, flavonoids, saponin, sugar, alkaloids, quinines, steroids, proteins, and phenolic compound.[53]

Pharmacological Activity

Antidiabetic activity

The total serum levels of cholesterol of insulin-dependent treated groups with JPH (0.2 and 0.4 g/kg b.w p.o.) showed a significant ($p<0.001$ and ns, respectively) decrease in cholesterol level, and the total cholesterol level in STZ-induced diabetic rats significantly ($p<0.0001$) increased when compared to control rats. In one study, the blood sugar level was significantly ($p<0.001$) reduced when given the JPH extract orally at 200 mg/kg body weight.[54]

Jasminum sambac L.

Jasminum sambac (Arabian *Jasminum*) species of *Jasminum*. It is cultivated in many places like West ASIA, South Asia, and Southeast Asia. The plant is reported to possess a vasodilation effect, anti-peptic ulcer activity, multiple physiological activity.

Chemical Constituents J. sambac L.

The presence of phytoconstituents such as alkaloids, carbohydrates, flavonoids, terpenoids, proteins, phenols, saponins, phytosterol, tannins, and phytosterols.[55] The major phyto-constituents present in J. sambac were iridoidal glycosides, benzyl 6-O-β-Dxylopyranosyl-β-D-glucopyranoside (β-primeveroside) etc.[56]

Pharmacological Activity

Vasodilation effects

The *J. sambac L.* flower extract was tested for its ability to vasodilate aortic artery endothelial cells. The results demonstrated that the endothelium-dependent vasodilation effect of the ethanolic *J. sambac* flower extract reduced contraction to less than 43% of the peak contraction at a dose of 400 g/mL. According to the reports, flavonoids provide most plant extracts vasorelaxant effects. As a result, the high flavonoid concentration of *j. sambac* flower extract should be responsible for its vasodilation activity.[57]

Anti-peptic ulcer activity

evaluates *J. sambac's* potential to treat stomach ulcers. For this investigation, wistar albino mature rats, both sexes weighing 200–300 g,12–16 weeks old, were used. Using 1.5 mg/L 2,4-D as the only hormone in MS medium, the plant displayed greater activity in the percentage of callus production. In both individual and combined hormone concentrations, the friable callus was seen. The fact that the callus extract considerably decreased gastrointestinal capacity, total and free acidity, and raised the acidity of the gastric fluid further supported its antisecretory effects. The findings of this investigation demonstrated that the examined callus extracts exhibited strong antiulcerogenic activity and dose-related action.[58]

Multiple physiological activity

Evaluation of goods with floral fragrance and many physiological actions that contain *J. sambac* flower extract. However, the 100% SFE compound displayed poor physiological responses (containing 38.6–45.9% radical scavenging activity and 6,518 to 15,003 mg/L half-maximal inhibitory concentration [IC_{50}] of antioxidant activity), 50.7% anti-tyrosinase activity. it was harmless to CCD-996SK and HEMn cells. It also tasted strongly of jasmine. However, its residue (also known as RO) demonstrated little cytotoxicity, a slight jasmine-like flavouring, and high biological function (94.2–100%) at a level of 4,000 mg/L. The mixture obtained by combining 100% SFE and RO in a 2:8 ratio showed non-cytotoxicity, high antioxidant activity (IC_{50}: 273–421 mg/L), >91.3% scavenging of radicals high overall phenolic content (172.15 mg–GAE/g-extract), 100% antityrosinase activity, and a moderately potent jasmine-like flavour. The predominant fragrance components in the combination of the 2:8 extracts were citronellol, pentadecyl-2-propyl ester, farnesol, Jasmin, linalool, and jasmone, benzyl acetate, lactone. The 2: 8 mixtures of extracts of *J. sambac* flowers should be used by the cosmeceutical, and food industries, pharmaceutical as an effective antioxidant, whitening, and nontoxic component. This is because of the results. Comparatively, to other *J. sambac* flower extracts, 100% SFE included less antioxidant chemicals but more flavoring substances (such as citronellol, jasmone, farnesol, linalool, and benzyl acetate). This led to comparatively modest physiological activities, a potent scent, and non-cytotoxicity. 100% SFE and RO were blended in a 2:8 ratio, considering both their benefits and drawbacks. The resulting mixture had acceptable multifunctional physiological activities, was noncytotoxic, had a potent jasmine-like flavor, and was cost-effective. There are no similar goods on the market or in the literature. Therefore, we firmly advise that the 2: 8 isolated mixtures prepared from *J. sambac* flowers be used by the food, cosmetics, and even pharmaceutical industries as an effective antioxidant and whitening ingredient.[59]

Jasminum Angustifolium

Originally from India, Sri Lanka, and the Andaman Islands, wild jasmine is known as *J. angustifolium*. A climbing shrub, it has branchlets that are barely pubescent and a smooth stem. The flowers have seven or eight slender petals and measure around 25 mm (1 in) in diameter. They bloom from June through August. The conventional methods of Siddha and Ayurvedic have employed the Oleaceae plant *J. angustifolium Linn* to treat a variety of ailments, either on its own or in conjunction with other medicinal plants. The tribes in south India have employed the plant to prevent tumor-like illness in their own population, it has been discovered. However, ethanol and aqueous extracts have been shown to have hepatoprotective and anticancer action against Dalton's ascitic lymphoma.[60] According to reports, the plant has antifungal, antitumor, antioxidant, and hepatoprotective properties.

Chemical Constituents J. Angustifolium

Phytoconstituents like terpenoids, polysaccharides, saponins, phlobatannins, and alkaloids were detected in the early screening.[61]

Pharmacological Activity

Antifungal activity

The *in-vitro* antifungal activity of successively extracted various solvent extracts of *J. angustifolium* leaves against plant fungal pathogens like *Trichoderma* spp., *Alternaria* spp., *Aspergillus* spp., *Penicillium* spp., *Fusarium* spp., and *Aspergillus* spp., was evaluated in the study using the traditional agar well diffusion method. After 48 and 72 hours of incubation, ethyl acetate leaf extract significantly differed from standard mancozeb in its ability to affect *Penicillium* spp. (22,17 mm) and *Fusarium* spp. (20,15 mm). After 24 hours of incubation, methanol leaf extract significantly inhibited the growth of *Alternaria* spp. (14 mm) and *Trichoderma* spp. (18 mm). After a 72-hour incubation period, hexane leaf extract greatly reduced the development of *Fusarium* spp. (18 mm). Comparing the three leaf extracts, methanol leaf extract had a substantially bigger impact on the growth of fungi. Extracts from methanol, hexane, ethyl acetate, and hexane were produced in that order, and phytochemical analysis revealed that each contained different kinds of phytochemicals. This study found that *J. angustifolium* leaves contained a variety of phytochemical substances and showed antifungal action against a few plants' pathogenic fungus.[61]

Antitumor activity

The anticancer properties of EEJA and AEJA were demonstrated by the significant reduction in the percentage increase in body

Table 1: Chemical constituents present in *Jasminum* species

Species	*F*	*A*	*C*	*T*	*S*	*T*	*Ph*	*Pr*	*G*	*M*	*R*
J. auriculatum vahl	+	+	+	+	+	+	+	+	+	+	-
J. grandiflorum Linn	+	+	+	+	+	+	+	+	+	-	+
J. multiflorum	+	+	+	+	+	+	+	+	+	-	-
J. officinale	+	+	+	+	+	+	+	+	+	-	-
J. humile	+	+	-	+	-	-	+	-	+	-	-
J. flexile vahl	-	-	-	-	-	-	+	-	-	-	-
J. pubescens	+	+	+	+	+	+	+	+	+	-	+
J. polyanthum	+	+	-	-	+	+	+	+	+	-	-
J. sambac L.	+	+	+	+	+	+	+	+	-	-	-
J. angustifolium	-	+	-	-	-	+	+	-	-	-	-

F-(flavonoids), A-(alkaloid), C-(carbohydrate), T-(tannins), S-(steroids), T-(terpenoids), Ph-(phenols), Pr-(protein), G-(glycoside), M-(mucilage's), R-(resin), (+) present, (-) not present.

masses of treated animals with the extracts ($p>0.01$ compared to EAC-tumor-bearing mice). It was further reinforced by the fact that both extract treatments significantly reduced packed cell volume and the number of viable tumor cells compared to the EAC control. When compared to animals harboring EAC, 14 days of extract treatment brought the %ILS levels back to normal. The Hb content, RBC, lymphocytes, and monocytes were all dramatically elevated after treatment with EEJA and AEJA, whereas the neutrophil count was markedly reduced to a level that is about typical.[62]

Antioxidant activity

The remarkably strong response of the ethanol and aqueous extracts in compared to ascorbic acid demonstrates the antioxidant activity. IC_{50} values for EEJA and AEJA, which are around 4- and 2-times greater than ascorbic acid's IC_{50} value, were 977.3, 39.4 and 583.3 18 for the DPPH level, respectively.[62]

Hepatoprotective activity

A total of 0.35 g/kg of an extract of *J. angustifolium Linn*. dissolved in chloroform and ethanol lowers elevated serum enzyme levels, returning them to nearly normal levels while improving serum lipid profile. The outcomes are extremely comparable to Silymarin (standard drug). *J. angustifolium Linn.* According to the results of the current study, has a potent hepatoprotective effect against carbon tetrachloride-induced hepatic fibrosis in rats.[63] Various Species of Jasminum have been shown versatile pharmacological activites due to presence of various phytochemicals constituents as listed in in Table 1.

CONCLUSION

Reviewing various traditional and customary techniques of *Jasminum* species shows they have several medicinal effects. According to the review survey, different species of *Jasminum* have been linked to ACE inhibitor activity, anti-oxidative, vasodilation effect, antiaging and antiulcer, wound healing, antimicrobial, lipid peroxidation, anti-acne, spasmolytic, anti-inflammatory, and protective function. The majority of *Jasminum's* therapeutic potentials were linked to its phenolic contents, except for aromatherapy, antibacterial, anti-acne, and spasmolytic actions (Table 1). Essential oils' extensive use in the cosmetics and fragrance industries is their main contribution to fragrance. These studies show that linalool, an essential oil with antibacterial characteristics and effects on the brain's central nervous system, is present in large amounts in the majority of *Jasminum* species. The strongest spasmolytic effects were discovered to be geranium oil, geraniol, and citronellol. Hence, studies determined that the combined effect of essential oils was what gave rise to their aromatherapy, antibacterial, anti-acne, and anti-spasmodic effects. The quantity of phenolic and antioxidant chemicals in the plant extract affects the remaining pharmacological actions.

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