Jasminum grandiflorum Linn (Chameli): Ethnobotany, Phytochemistry and Pharmacology – A review

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Summary

Jasminum grandiflorum Linn (Chameli / Yasmin; Oleaceae) is native to Tropical and warm Temperate regions and cultivated in France, Italy, China, Japan, India, Morocco and Egypt. The plant is documented to possess beneficial effects as odontalgic, thermogenic, aphrodisiac, antiseptic, emollient, anthelmintic, deobstruant, suppurative, tonic, in fixing loose teeth, ulcerative stomatitis, leprosy, skin diseases, ottorrhoea, otalgia, wounds, corns and aromatherapy. Pharmacological activities of the plant reported so far are spasmolytic, anti-inflammatory, anti-microbial, antioxidant, antiulcer, cytoprotective, chemoprotective, wound healing and anti-acne activity. The present review is an attempt to highlight the various ethnobotanical and traditional uses as well as phytochemical and pharmacological activities reported so far from J. *grandiflorum*.

Key words: *Jasminum grandiflorum* Linn, ethnobotany uses, pharmacognosy, phytochemistry, pharmacological activities, review.

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Introduction

Jasminum grandiflorum is a large scrambling sub erect twining evergreen shrub, which grows up to 10 to 15 m. high[1, 2]. It is native of Asia, Kashmir, Afghanistan and Persia ascending to an altitude of 700- 2700 m, cultivated in India, wild in sub tropical North-West Himalayas, Western Ghats, Nilgiris, hill of Tinnavally above 1400 m, France, Italy, China, Japan, India, Morocco and Egypt[3, 4,5,6]. The plant is documented to possess beneficial effects as odontalgic, thermogenic, aphrodisiac, antiseptic, emollient, anthelmintic, deobstruant, suppurative, tonic, in fixing loose teeth, ulcerative stomatitis, leprosy, skin diseases, ottorrhoea, otalgia, wounds, corns and aromatherapy[7]. Our thorough literature search revealed an interesting fact that though the plant is a popular remedy for a variety of ailments, very little effort have been made to verify its efficacy through scientific screenings in animal model and clinical trials. The present review highlights the various folk, Ayurvedic uses, pharmacognostical, phytochemical and pharmacological studies conducted on *J. grandiflorum* and also highlight unexplored potential of it.

Taxonomical/ Scientific Classification[8]:

Kingdom: Plantae- Plants

Subkingdom: Tracheobionts- Vascular plants

Division: Magnoliophyta- Flowering plants

Class: Magnoliopsida- Dicotyledons

Order: Scrophulariales

Family: Oleaceae- Olive family

Genus: *Jasminum*

Species: *grandiflorum*

Classical Names[9, 10]:

Jati, Sauanasyayani, Sumama, Chetika, Hridyagandha, Malati, Rajaputrika.

Botanical Description[11, 12]:

A climbing shrub. The leaves are opposite, with 3 to 7 lance-shaped, [entire] ovate to some what elliptic in shape with acuminate mucronate apex, petiole almost lacking, imparipinnately compound, with three paired foliates ending with a single leaf at the tip. The leaflets are elongate-lanceolate, acute, 7 to 11 terminal leaflet somewhat large than laterals, narrowing at the base, ovate-lanceolate, acute or acuminate, laterals ovate, terminal one larger than laterals and often partially united with surfaces with a ciliate margin. Flowers are terminal and axillary cymes, calyx lobes long and linear, more than half as long as the corolla tubes. The fruit is a black berry, elliptic, globose berries when ripe.

Climate, Soil and Propagation:

The plant is cultivated in well drained loamy soil and also on a variety of soils such as black, lateritic and clay loam with good drainage system as the plant is highly susceptible to water logging[13, 14]. It can be propagated by shoot tip culture method. Flowering of jasmine plants starts in the first year itself. The yield being ½, 5 and 10 tonnes/ha flowers within first, second and third year respectively[15, 16]. The harvesting of the flower is done in the month of May to December (in South India) and July to November (in North India)[17].

Pharmacognostical Studies

Macroscopical Characteristics[12]:

The leaves are entire, ovate to somewhat elliptic in shape with acuminate mucronate apex, petiole almost lacking. The leaves are pale-green in colour and appear glabrous on both the surfaces. The lower surface is comparatively rough with prominent midrib and pinnate venation. Different leaves measure 6.8 to 8.2 in length and 4.5 to 5 cm in breadth. The leaves give no odour and are slightly bitter in taste.

Microscopical and Powder Characteristics:

A transverse section of leaf shows a central midrib with lamina expanded on both the sides, having several groups of vascular tissues. It shows a typical dorsiventral leaf structure having uniseriate adaxial epidermis, covered with a thin cuticle. A few simple trichomes are present on the adaxial surface. The mesophyll consists of a uniseriate layer of rod shaped palisade parenchyma, present below the adaxial epidermis and 4-6 layers of spongy parenchyma. Stomata present on the lower surface only, are of anomocytic type. Several vascular strands are present in the mesophyll. The midrib region shows a deeply concave abaxial surface while the adaxial surface is only slightly depressed. The abaxial epidermal cells are slightly papillose. The adaxial epidermis is followed by 2-3 layers of parenchyma having chloroplast and appearing similar to spongy parenchyma in structure. The centre is occupied by a rather large vascular bundle composed of a bundle sheath having 10-12 strands of xylem in the center. The vascular bundle is collateral having phloem external to the xylem. The cell adjacent to the vascular bundle shows chloroplast while the rest of the regions below the vascular bundle consist of only parenchyma. Rosettes of calcium oxalate are frequently present throughout the mesophyll cells[18, 19].
The leaf powder is light green in color. The important powder characteristics of the leaf are simple, unbranched trichomes, vessels with simple pits and spiral thickenings, glandular trichome, starch grains and calcium oxalate crystals[18, 19].

The physical constants[6] of the plant are given in the Table No. 1.

Medicinal Uses

Traditional Uses[7]:

Plant parts used: whole plant

The plant is bitter, astringent, acrid, thermogenic, aphrodisiac, antiseptic, anodyne, depurative, emmenagogue, emollient, diuretic, anthelmintic, deobstruant, dentrifrice, suppurative and tonic.

Roots: They are useful in cephalalgia, vitiated condition of vata, paralysis, facial paralysis, mental debility, chronic constipation, flatulence, strangury, sterility, dysmenorrhoea, amenorrhoea, ringworm, leprosy, skin diseases and giddiness.

Leaves: They are useful in odontalgia, fixing loose teeth, ulcerative stomatitis, leprosy, skin diseases, ottorhoea, otalgia, strangury, dysmenorrhoea, ulcers, wound and corns.

Flowers: They are useful in stomatopathy, cephalopathy, odontopathy, ophthalmopathy, leprosy, skin diseases, pruritis, strangury, dysmenorrhoea, ulcers, as refrigerant, ophthalmic and vitiated conditions of pitta.

Table No. 1: Physical Constants of *Jasminum grandiflorum* Linn

Sl no.	Physical constant	% w/w
1.	Total ash	10.89
2.	Acid insoluble ash	1.29
3.	Water soluble ash	2.92
4.	Loss on drying	4.25
5.	Petroleum ether extractive value	2.61
6.	Chloroform extractive value	3.58
7.	Acetone extractive value	8.72
8.	Alcohol extractive value	11.57
9.	Water extractive value	12.14

Ethnobotanical Uses

Asian and Indian folk practitioners recommend Jasmine for liver complaints, dysentery, various types of pain including painful menstruation, and skin diseases such as leprosy. In addition, Jasmine oil applied externally is used to soften and smooth the skin, for cancer, heart disease, and a variety of other ills. Aroma therapists believe Jasmine oil can be useful as an antidepressant, as a calming agent to soothe stress, pain, and anxiety, and as an aphrodisiac. Its reputation as an intoxicant is legendary. Apart from that inhaling Jasmine scent increases beta waves in the brain, which are associated with increased states of alertness[10].

Uses Described in Ayurveda

Leaves are chewed in aphthae, stomatitis, toothache, ulcer in the mouth and leaf-juice or oil obtained from it is dropped in to the ear (Bhavaprakash[20]). A decoction of the leaf was also used as a gargle (Bhavprakash and Varindamaadhava[21]). The oil cooked with juice of jati leaves was prescribed in purulent discharge from the ear (Varindamaadhava and Bangasena[21]). Fresh juice of the leaves is a valuable application for sort corns between the toes, for ulceration in the mouth, throat and gums, the leaves fried in ghee are recommended to be applied (Chakradatta[20]**).** The use of flowers applied as a plaster to the loins, genitals and pubes as an aphrodisiac. The plant is used in scorpion-string (Mahomedan[22]). Charaka used the sprouts or dried flowers, in prescriptions, externally in coryza, nasal hemorrhage and dermatosis. Sushruta used Malati as an ingredient of a medicated clarified butter for external application on infected wounds, for cleansing and sterilizing the interior of ulcer, as an ingredient of hair oil for baldness and alopecia and as an ingredient of an eye-salve for loss of vision.

Malati was used externally in leprosy, malignant ulcers and other virulent skin diseases. The root of Jaati, cooked in goat's milk and mixed with sugar was prescribed for giving relief in pain due to retention of urine and for expelling calculus (Raaja Maarttanda[20]).

Ayurvedic Propereties[6, 23]:

Rasa: Tikta, Kashaya

Guna: Laghu, Snigdha, Mridu

Veerya: Ushna

Vipaka: Katu

Doshaghnata: Tridoshashamaka

Rogaghnata: Tridoshajavikara, Dantashoola, Dantadaurbalya, Mukharoga.

Karma: Mukharoganashaka, Saumanasyajanana, Medhya, Vajikarana.

Phytochemical studies:

Very little phytochemical work has been carried out with the plant *J. grandiflorum*[24, 25,26].

Leaves: 2"-epifraxamoside, demethyl-2"-epifraxamoside, jasminanhydride[27], oleacein, 2-(3,4-dihydroxy phenyl)-ethanol, isoquercitrin, ursolic acid[28], resin, salicylic acid, jasminine, indole oxygenase[29], 3,4-dihydroxy benzoic acid, 2-hydroxy-30, 40-dihydroxyacetophenone and oleanolic acid[27].

Flowers: Cis-3-hexenol, 2-vinyl pyridine, indole, myrcene, linalool, geranyl linalool, α-terpineol, geraniol, linalyl acetate, nerolidol, phytol, isophytol, farnesol, eugenol, benzyl alcohol, p-cresol, methyl benzoate, benzyl cyanide, benzyl acetate, methyl dihydrojasmonate, methyl anthranilate, jasmone, methyl- N-methyl anthranilate, vanillin, cis-3-hexenyl benzoate, benzyl benzoate, methyl palmitate, methyl linoleate[25], jasgranoside, jaspolyoside, 8-epi-kingiside, 10-hydroxy- oleuropein, 10-hydroxy ligstroside, oleoside-7,11-dimethyl ester[30],3-O-α-L-rhamnopyranosyl (1→2)-β-D-xylopyranosyl-hederagenin-28-O-β-D-galactopyranosyl (1→6)-β-D-galactopyranosyl ester, hederagenin-3-O-β-D-glucopyranosyl (1→3)-α-L-arabinopyranoside, 2- α,3β,23-trihydroxyolean-12-en-28-oic –O-β-D-glucopyranosyl ester, hederagenin-3-O-β-D-xylopyranosyl (1→3)-α-L-rhamnopyranosyl (1→2)-α-L-arabinopyranoside, 2α,3β,23-trihydroxyolean-12-en-28-oic –O-α-L-rhamnopyranosyl (1→4)- β-D-glucopyranosyl (1→6)- β-D-glucopyranosyl ester, hederagenin-3-O-α-L-rhamnopyranosyl (1→2)-α-L-arabinopyranoside[31], kaempferol-3-O-α-L-rhamnopyranosyl (1→3)-[α-L-rhamnopyranosyl (1→6)-β-D-galactopyranoside, kaempferol-3-O-rutinoside, 7-ketologanin, oleoside-11-methyl ester, 7-glucosyl-11- methyl oleoside, ligstroside and oleuropein[32].

Jasmine oil: Methyl jasmonate[24], benzyl benzoate, linalool, linalyl acetate, benzyl alcohol, indole, jasmone, methyl anthranilate, P-cresol, geraniol, racemic (5-pent-2-enyl)-5,1-pentanolide, benzyl benzoate, nerol, 1-α-terpineol, d and dl-linalool, γ-jasmolactone, farnesol, nerolidol and eugenol[6, 26].

Pharmacological Activities:

Spasmolytic activity:

Jasmine has spasmolytic activity on guinea pig ileum (post synaptic and not atropine-like) and rat uterus *in vitro*. The spasmolytic effect of Jasmine absolute was most likely to be mediated through cAMP, and not through cGMP. The contradictory effect *in vitro* and *in vivo* has been suggested probably due to the solely physiological effects of jasmine absolute *in vitro* (producing a relaxation) compared with that *in vivo*, where it has a strong psychological input, producing a stimulant effect in man and enhanced movement in animals[33].

Anti-inflammatory activity:

Topical anti-inflammatory activity of a polyherbal formulation, Jatyadi ghrita, consists of *Jasminum officinale*, *Azadirachta indica*, *Berberis aristata*, *Curcuma longa*, *Picrorrhiza kurroa*, *Rubia cordifolia*, *Trichosanthues dioica*, *Aristolochia indica*, *Hemidesmus indicus*, *Randia spinosa* and *Glycyrrhiza glabra* has been evaluated. The preparation showed nearly 50 percent inhibition of croton oil induced ear edema when compared to Diclofenac sodium, which showed 33 percent inhibition[34].

Antimicrobial activity:

The antimicrobial activity of ethanol callus extracts of two species of *Jasminum*, (*J.grandiflorum* and *J. sambac*) were evaluated. Preliminary phytochemical analysis of the callus extracts reveled the presence of alkaloids, glycoside, flavanoid, terpines, tannin, resin, and salicylic acid. The extracts were subjected for screening of *in-vitro* antimicrobial activity against selected disease causing pathogens, viz., *Staphylococcus albus*, *Proteus mirabilis* and *Salmonella typhii*, at the concentrations of 500 mg/ml and 250 mg/ml. The results of antimicrobial activity revealed that all the extracts showed significant antibacterial activity[35].

Antiulcer and antioxidant activities:

The antiulcer and antioxidant activities of 70% ethanolic extract of leaves of *J. grandiflorum* (JGLE) were evaluated. Antiulcerogenic activity of JGLE (100 and 200 mg/kg, b.w. orally) was evaluated employing aspirin + pylorus ligation (APL) and alcohol (AL) induced acute gastric ulcer models and ulcer-healing activity using acetic acid induced (AC) chronic ulcer model in rats. The antioxidant activity of JGLE has been assayed by using *in vitro* methods like 2,2-diphenyl-1-picrylhydrazylhydrate (DPPH) assay, reductive ability, superoxide anion scavenging activity, nitric oxide scavenging activity and total phenolic content, in order to explain the role of antioxidant principles in the antiulcerogenic activity of the extract. There was a significant dose-dependent decrease in the ulcerative lesion index produced by all the three models in rats as compared to the standard drug famotidine (20 mg/kg, b. w. orally). The reduction in gastric fluid volume, total acidity and an increase in the pH of the gastric fluid in APL rats proved the antisecretory activity of JGLE. Additionally, JGLE completely healed the ulcer within 20 days of treatment in AC model as evidenced by histopathological studies. The free radical scavenging activities of JGLE depends on concentration and increased with increasing amount of the extract. These results suggest that leaves of *J. grandiflorum* possess potential antiulcer activity, which may be attributed to its free radical scavenging activity[36].

Cytoprotective activity:

The cytoprotective effects of J. *grandiflorum* flowers and leaves in 7,12-dimethylbenz (a) anthracene (DMBA) induced chromosomal abnormalities in bone marrow of female wistar rats were evaluated. Oral pretreatment of *J. grandiflorum* flower and leaf extracts to DMBA treated rats significantly reduced the frequency of micronucleated polychromatic erythrocytes in the rat bone marrow. Also, the plant extracts significantly decreased the percentage of aberrant cells; the number of chromatic and chromosomal breaks in DMBA treated rats which proves its cytoprotective effect[37].

Chemopreventive and Lipid peroxidative activities:

The chemopreventive efficacy and anti-lipid peroxidative potential of *J. grandiflorum* Linn. on 7,12-dimethylbenz (a) anthracene (DMBA)-induced rat mammary carcinogenesis were evaluated. Oral administration of ethanol extract of *J. grandiflorum* flowers (JgEt) at a dose of 300 mg/kg body weight for 14 weeks to DMBA-injected animals completely prevented the formation of tumors in the pre-initiation period. *Jg*Et also exerted significant anti-lipid peroxidative effect and improved the antioxidant defense system in DMBA-treated rats suggesting clearly that *Jg*Et has potent chemopreventive efficacy[38].

Breast cancer:

Flowers of *J. grandiflorum* are useful to women when brewed as a tonic as it aids in preventing breast cancer and stopping uterine bleeding[39].

Wound healing activity:

The effect of flower extract of *J. grandiflorum* was studied for its wound healing activity at a dose of 250 mg/kg body weight orally for 10 days using excision and dead space wound models in rats. Extract treated rats exhibited 65% reduction in the wound area when compared to controls (54%). The wet and dry granulation tissue weight, and hydroxyproline content in a dead space wound model were increased significantly when compared to controls. Histological studies of the tissue obtained on day 10 from the extract-treated group showed increased well organized bands of collagen, more fibroblasts and few inflammatory cells when compared to controls which showed inflammatory cells, scanty collagen fibers and fibroblasts which suggests the use of *J. grandiflorum* flower extract in the management of wound healing[40].

Anti-acne activity:

The anti-acne activity of ten natural products being used as traditional medicine in various skin disorders has been investigation against *Propionibacterium acnes* by broth dilution method. Minimal inhibition concentrations (MIC) of *J. grandiflorum* extract was found to be below 800 µg/ml[41].

Angiotensin Converting Enzyme (ACE) Inhibitor Activity:

Bioactivity guided fractionation of extract of aerial parts of *J. grandiflorum* led to the isolation of oleacein. The IC_{50} values of purified ACE inhibitor were between 26-66 mM[28].

Clinical Evaluation:

A clinical trial was conducted to assess the effect of Jatyadi taila of which J. grandiflorum was one of the main ingredients. Group A (8 patients of eczema) were treated with Raktashodhaka vati (2 tab t.d.s), Surakta strong syrup (2 tsf b.d.), Panchatikta ghrita guggulu (15 mg b.d.) and external application of Marichyadi taila and group B (n=8) were administered the same schedule as group A except that Jatyadi taila was applied externally instead of Marichyadi taila. The duration of treatment was continued for 3 months and reviewed after 4 weeks. In group A, only 37.5 % patient s were cured whereas group B cured 62.5 % patients which suggests that Jatyadi taila was more effective in eczema patients[42].

Conclusion

In recent years, ethnobotanical and traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. They obviously deserve scrutiny on modern scientific lines such as phytochemical investigation, biological evaluation on experimental animal models, toxicity studies and investigation of molecular mechanism of actions of isolated phytoconstituents. Thorough screening of literature available on *J. grandiflorum* depicted the fact that it is a popular remedy among the various ethnic groups, Vaidyas, Hakims and Ayurvedic practitioners for cure of variety of ailments. Following the traditional and folk claims, very little efforts have been made by the researchers to explore the therapeutic potential of this plant. From the literature, *J. grandiflorum have* been screened for some pharmacological activities and found to possess spasmolytic, anti-inflammatory, antimicrobial, antiulcer, antioxidant, cytoprotective, chemopreventive, breast cancer, wound healing and anti-acne activities but number of other pharmacological activites are yet to be explored. In future study, the isolated principles from Chameli needs to be evaluated in scientific manner using specific experimental animal models and clinical trials to understand the molecular mechanism of action, in search of lead molecule from natural resources.

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