PHARMACOGNOSTICAL ASPECTS OF *JASMINUM MULTIFLORUM*: A REVIEW

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Abstract

Jasminum multiflorum (Burm.f.) Andrews commonly known as Winter Jasmine got the top ranked position in Ashtanga Hridayama due to its incredible power of healing belongs to the family Oleaceae. It is widely distributed in subtropical parts of Himalayas and tropical parts of India. Ethnomedicinally its various parts are used to cure a wide range of ailments like ulcer, renal dysfunction, cephalagia, cardiac disorders, constipation, indigestion, inflammation, rheumatism and weakness of sight. The various secondary metabolites namely alkaloids, glycosides, flavonoids, steroids, terpenoids, irridoids, saponins, proteins and amino acids are substantiated in different parts of the plant. The pharmacological studies proved its efficacy towards antimicrobial, antioxidant, nemacitidal, antihelmintic, cardiovascular and central nervous diseases, analgesic, anti-inflammatory, cytotoxic, brochodialator activity upto now. This present work gives an eagle eye to the botanical information of plant as well as its scientific validations involving the distinct pharmacological and phytochemical benefits. Even this review highlights the lacking data and research gaps on this plant, which provides a platform for upcoming researchers for further studies on this species.

Key words:*Jasminum multiflorum*, Oleaceae, Botanical description, Phytochemistry, Pharmacological activities.

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INTRODUCTION

The treatment of ailments from ayurveda is renowned since Paleolithic time throughout the world. As the growth of the synthetic world in contemporary era is going on but still the part of modernity is unable to overcome the herbal medicines either due to their effectiveness or the spiritualness of the peoples towards them. The genus *Jasminum* is one of them, which is used by the people for their effectiveness as well by religiousness. This genera belongs to family Oleaceae possess almost 200 species. The plants of *Jasminum* genera are commonly shrubs or vines and inhabitant of tropical and warm temperate regions[1]. *J. multiflorum* commonly known as winter jasmine, which is an evergreen and twinner shrub with young branches dressed with velvety pubescence [2,3]. The plants possess white and pink flowers with sweet fragrance[4]. It is used as analgesic, relaxant, anti-inflammatory, antiseptic, aphrodisiac, sedative, expectorants, diuretic, and also to treat conditions like indolent ulcers, amenorrhea, ringworm infection, leprosy, and skin diseases[5,6]. Jasmine is conspicuously valued plant used in home gardens as well as in commercial cultivation. The flowers and buds of the plant are used for making garlands, bouquets and for spiritual offerings[7]. The fragrance of the flowers attracted mushroomers of the attar industries for the production of perfumes, hair tonics and ittars[8,9]. The plant contains glycosides, irridoids,secoirridoid, secoirridoid lactones, secoirridoid glucosides, terpenoids, essential oils, flavonoids, sterols, alkaloids, tannins, carbohydrates, proteins and amino acids [5, 10,11].The biological studies reported in literature proved its potency and efficacy as antimicrobial, antioxidant, nemacitidal, antihelmintic, antimicrobial, GIT, cardiotropic, anti-inflammatory, and in central nervous diseases [10,11]. Moreover, plant still has to go through scientific screening to establish its efficacy

clinically. This review highlights medicinal and traditional uses along with phytoconstituents and pharmacological studies explored for this plant.

TAXONOMICAL CLASSIFICATION

Table No: 1 Scientific & Taxonomical classification [12,13]

Kingdom	**Plantae**
Subkingdom	Tracheobionta – Vascular plants
Division	Magnoliophyta- Flowering plants
Class	Magnoliposida-Dicots
Subclass	Asteriadae
Order	Schrophulariales
Family	Oleaceae
Genus	*Jasminum*
Species	*Jasminum multiflorum(Burn.f) Andr*
Synonyms	*Jasminum pubescens wild* *Nyctanthes multiflora (Burm.f) Andr.*

CLASSICAL NAMES

Kundah, Mahha (Sanskrit); Kundphul (Hindi); Dolor, Mogra,kundkagado (Gujrati); Kundamu, Gajari (Telgu); Malligai, Makarandam (Tamil); Kund (Bangla); Kunda (Marathi), Magimallige, Kasturimallige (Kanada); Downy Jasmine, Star jasmine, Musk jasmine (English)[14,15].

AYURVEDIC PROPERTIES

It is sara, madhura, sheeta, kashaya and beneficial in reducing kapha and pitta[16,17]

PLANT DESCRIPTION

J. multiflorum(Figure: 1); is a large, tomentose, scandent, branching, spreading evergreen plant that reaches up to a height of 3-10 ft. tall. The plant grows at an altitude of 1300 meter. It is widely cultivated in tropical and subtropical region of Southwestern, Southeastern, Asia, India, Nepal, China, Bhutan, Burma, Pakistan, Australia, USA, Philippines, Myanmar and Sri Lanka[19,20].

Figure 1: Plant of *Jasminum multiflorum(Burm.f.)*

Morphology [10,12,13,15,18]

a) Leaves

Leaves are 4-9 cm long, ovate, heart shaped, rounded base with pointed tip. They are opposite to each other on the stem. The downy pubescences are covered all over the stems and leaves which make the plant overall greyish green.

b) Flowers

Flowers are star shaped, 7-10mm in diameter, white, dense, clustered, with crowded head. The hairy calyx about 5-6 cm long with linear lobes are present in the flowers. A 1.5 cm long corolla tube possessing 7-9 lobes which are oblong having 1.5-1.8 mm in length.

CULTIVATION AND COLLECTION

J. multiflorum is cultivated in well sapped loamy soil having pH 6.0 to 7.5, but it can also be grown in black, laterite and clay soil. As the plant is highly prone to water logging a well managed drainage scheme is required during cultivation. It can be promulgated by layering, cuttings or root suckers method. The first flowering starts with in the year and harvesting is done in the months of March to May.

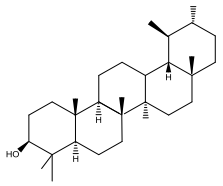
For the best yield, dead branches are removed by the end of January and bushes are pruned to almost half. After such treatment, when the temperature rises, farmyard manure is applied and irrigated to get new growths and flowering by the end of February or March[21].

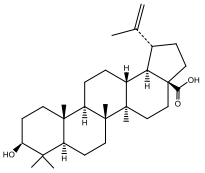
PHYTOCHEMICAL CONSTITUENTS

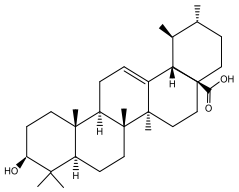
Literature revealed that the plant contains seco-irridoid, seco-irridoid lactone, seco-irridoid glucosides, and various forms of terpenoids and triterpenoids which have basic 10-hydroxyoleoside structure, derived from secologanin. The spectral analysis and chemical correlations established a novel bicyclic 2-oxo-oxepano [4, 5-] pyran ring system. The leaves contain friedelin, lupeol, botulin, α-amyrin, β-sterol, betulinic acid, ursolic acid, oleanoic acids (Figure: 2). Leaves and flowers reported to contain seco-irridoid lactones such as jasmolactones A ($C_{19}H_{22}O_8$), jasmolactones B ($C_{19}H_{22}O_9$), jasmolactones C ($C_{27}H_{32}O_{10}$), jasmolactones D ($C_{27}H_{32}O_{11}$), multiflorin, multifloroside, multifloricide, multiroside, jasmultiside, 10-hydroxyligustroside, and 10-hydroxyoleuropein [22-26].

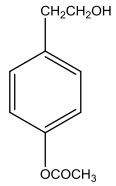
The oil from flowers contains highly aromatic compounds like eugenol,nrolidol, cadinol, jasmine, linalool, farnesol, β-farnesene, ethyl palmitate, methyl salicylate , benzyl alcohol, benzyl acetate, benzyl benzoate, hexyl benzoate, and indole [27]. A New compound, 2-p-acetoxyphenylethanol, has also been isolated from

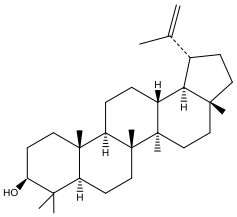
flowers of *J. multiflorum* along with long-chain saturated compounds n-tritetracontane and heptacosane [28].

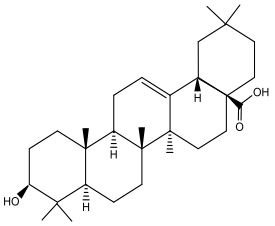

Alpha amyrin (1)

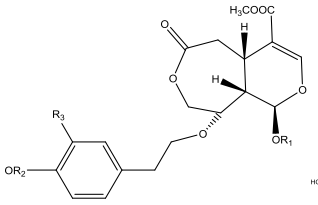

Betulinic acid (2)

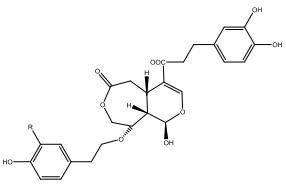

Ursolic acid (3)

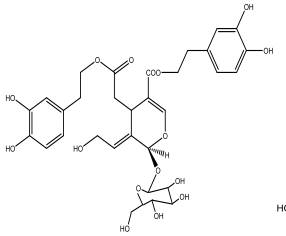

2-p-Acetoxy phenyl ethanol (4)

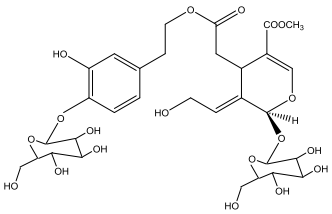

Lupeol (5)

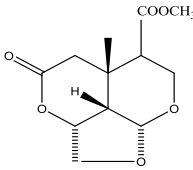

Oleanolic acid (6)

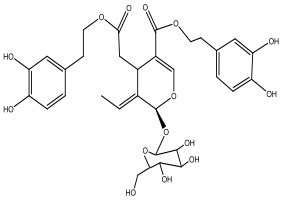

$R_1=R_2=R_3=H$; Jasmolactone A (7)
$R_1=R_2=R_3=OH$; Jasmolactone B (8)

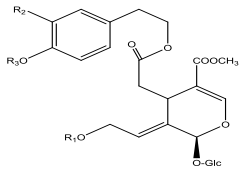

R=H; Jasmolactone C (9)
R=OH; Jasmolactone D (10)

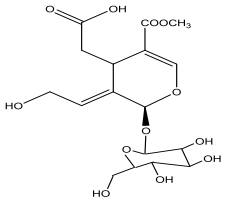

Multifloroside(11)


Multiroside (12)


Multiflorin (13)


Jasmultiside (14)


$R_1=R_3=H$, $R_2=OH$; 10-Hydroxyoleuropein (15)
$R_1=R_2=R_3=H$; 10-Hydroxyligustroside (16)


10-Hydroxyoleoside 11-methyl ester (17)

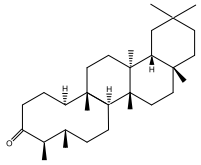

Fredelin (18)

Figure2: Chemical constituent reported from *Jasminum multiflorum*

USES OF PLANT

The whole Plant is used in healing of wounds and ulcers, constipation, flatulence, skin diseases, rheumatism, stomatitis, dysmenorrhea[12], coronary vasodilating and for cardiotropic activities[22-25].The leaves are used as antibiotics, diuretics, poultice, headache, rheumatism, skin diseases, allergy, itching, and inflammation[15], typhoid and in different types of ulcers[5,15].The flowers are acrid, alexipharmic, cardiotonic, detoxifying, digestive, emetic, laxative, and refrigerant, lactifuge, and herb of bath which fortifies the soul[29,30]. The root is used as antidote for snake bite, weakness of sight and emmenagogue (increase in menstrual flow)[2,10].Bark can be used to treat burns[17]. Also, the jasmine oils have various pharmacological properties like antioxidant, relaxant, analgesic, anxiety, antimicrobial, nemacitidal, and lactifuge[31-34]. Traditionally, it is used in cosmetic industry for making perfumes, oils and creams and also used as ornamental in form of bouquets and garlands[26].

BIOLOGICAL ACTIVITY

Antimicrobial Activity: The ethanolic fraction of the root of *J. multiflorum* at a concentration of 25mg/ml, 50 mg/ml and 100mg/ml for its antimicrobial potential by agar well diffusion method. The microorganisms selected for the estimation of antimicrobial activity were *Bacillius subtilis*, *Staphylococcus aureus*, *Escherichia coli* and *Klebsiella pneumonia.* Amoxicillin 100µg/ml is used as reference material.The extract showed maximum activity against *Klebsiella pneumonia* at100mg/ml with a zone of inhibition 0.5mm and for others it ranged from 0.3 to 0.4 mm[34].

The petroleum ether, chloroform methanolic and aqueous extracts of leaves of *J. multiflorum* for their antimicrobial efficacy against *Aspergillus niger, Scolorotium, Bacillus cereus, Escherichia*

coli, *Candida albican* and*Pseudomonas aeruginosa* at the concentration of 100-500 µg/ml. The result showed potent antimicrobial effect against *E. coli A. niger and C. albicans*. The assessment of antifungal activity and antibacterial activity was performed in terms of percentage of radial growth on saturated dextrose agar (SDA) and well diffusion method respectively. The methanolic extract showed a pronounced antimicrobial activity against the tested strains but less than to the standard drug Chloroamphenicol, Ampicillin and Streptomycin[35].

Antihelmintic activity:the antihelmintic potential of petroleum ether extract of aerial parts of *J. multiflorum* at a concentrarion of 5, 10, 25 mg/mL in normal saline containing 3 % Tween 80 and different extracts of roots of *Cocos nucifera* on *Pheretimac posthuma*. Piperzine citrate (15 mg/mL) and Albendazole (10 mg/ mL) were used as reference drugs. The inferences were made from the time taken to paralyses and/or death of individual worm up to 4 h of test period. The effect at 25 mg/mL concentrations was comparable with the reference standards [36].
It investigated the roots of *J. multiflorum* for anthelmentic activity. The petroleum ether extract was preapared and testedfor different concentration (5mg/ml – 50 mg/ml) against earthworm (*Pheretima posthuma*). The albendazole suspension (10mg/ml) was used as standard. The death and paralysis time were recorded and compared. Extract exhibit significant anthelmentic activity at (50mg/ml) concentration and found effective[34].

Nemacitidal activity: The aqueous extracts of flower *J. multiflorum* showed strong nematicidal activity against *Meloidogyne incognita* than *Mimosa* pudica extract on the hatching and larval stage[37].

GIT activity: Acetone, methanolic, ethanolic and xylene extracts of flowers of *Rosa indica*, *Tagetes*, *Bellisperennis*, *Gladiolus*, *P.tuberose*, *J.multiflorum* and *Gerbera* in the concentration of 50%, 75% and 100% by agar well diffusion method against different species of *Vibrio* (*V. parahemolyticus*, *V. alginolyticus*and *V. cholera*) causing gastrointestinal diseases. Ciprofloxacin 1000ppm was used as reference material. The acetone, methanolic and ethanolic extracts of flowers of all varities has higher efficacy against *Vibrio* species but less than Ciprofloxacin whereas on inhibitory effect was seen in xylene extracts[38].

Efects on Cardiovascular system: The coronary vasodilating and cardiotropic properties were exhibited by compounds like Jasmolactones A, B, C, and D, isolated from the aerial parts of plant[22].10-hydroxyoleuropein and multifloroside, which was isolated from the water soluble fraction of aerial part of the plant showed both coronary dilating and cardiotropic activities[23].

CNS Activity: The ethanolic extract of leaves of *J. multiflorum* for its antiepileptic activity by topically applied biculline (a model foracute simple partial epilepsy) and maximal electroshock(a model for generalized tonic-clonic seizure), motor coordination effect using rotarod treadmill, and anxiolytic activity by elevated plus maze methods in Sprague dawley rats. The drug was given by oral route or intraperitoneally and the standard used was diazepam (2mg/kg).The result showed that the extract has significant affect on acute partial complex epilepsy and considerable anxiolytic effect but negative response on motor co-ordination[39].

The anticonvulsant and hypnotics effects of ethanolic extracts prepared from the aerial parts of *J.multiflorum* on albino mice. The anticonvulsant activity of ethanolic extract in the doses ranging from 50, 75 and 100 mg/kg, i.p. was studied by Maximum electroshock (MES) and Pentylene tetrazole (PTZ) inducedseizure methods. In MES method, the extract was administered 0.5 h before application of electric shock.The duration oftonic hindleg extension was noted. The results revealed that the mice treated with ethanolic extract exhibited hindleg extension for 14.65 ±1.17, 18.35 ± 1.82 and 16.41 ± 1.41, respectively.
In PTZ induced seizure,the extract was administered 0.5 h prior to the administration of Pentylene tetrazole (80 mg/kg, i.p.). The onset of myoclonic spasm, incidence, nature and severity of convulsions and death/recovery were noted.Diazepam (2.0 mg/kg, i.p.) was used as a reference standard. The ethanolic extract significantly dose dependently inhibited the onset and incidence ofconvulsion. The mice treated with a dose of 50 mg/kg, i.p.exhibited seizures in 68.5%and all animals exhibiting seizures died within 0.5 h. No mortalitywas observed in the groups treated with 75 and 100 mg/kg even after 24h.
The general behavioural effects like righting reflex, pinna reflex, corneal reflex, awareness, grip strength, touch and pain responses on mice by conventional methods was studied using a dose of 25, 50, 75 mg/kg, i.p.Chlorpromazine (5 mg/kg,

i.p.) was used as a reference drug. The results showed depressed awareness and alertness, touch and pain responses, grip strength, altered righting, pinna and corneal reflexes in the mice treated with extract when compared to the control but less than standard.
The hypnotic activity was experimented by seeing the effect on sleeping time using the doses ranging from 35, 50 and70 mg/kg, i.p.The extract was administered 0.5 h prior to the administration of pentobarbitone sodium (40 mg/kg, *i.p.*),diazepam (3 mg/kg, *i.p.*) and meprobamate (100 mg/kg, *i.p.*). The sleepingtime was noted by recording the interval between the loss and regaining of righting reflex. The sleeping time was significantly increased in the extract treated animals[40].

Analgesic activity: The analgesiceffects of ethanolic extracts prepared from the aerial parts of *J. multiflorum* at a dose of 30, 40 and 50 mg/kg, i.p. by acetic acid induced writhing method. The number of abdominal constrictions (writhing) and stretching with ajerk at the hind limbs were counted between 5 and 15 min after administering acetic acid. The results were compared with acetyl salicylic acid (68 mg/kg), paracetamol (68mg/kg) andmorphine sulphate (1.15 mg/kg).
The animal treated with extracts significantly reduced the number of writhes and stretches. The percentage of protection was by 70.5 %. , 88.2 % and 100% respectively. The analgesic compounds acetyl salicylic acid (68 mg/kg), morphine sulphate(1.15 mg/kg) and paracetamol (68 mg/kg) gave 60.15, 70.12 and 61.43 %,protection, respectively [40].

Antioxidant activity: The antioxidant activity of hydromethanolic extract of leaves of *Jasminum multiflorum* usingβ-carotene-linoleic acid and Ferric reducing antioxidant power assays.The extract showed maximum inhibition activity at 75mg/ml concentration, 68.23±0.35 % inhibition and 60.30±0.60 for β-Carotene-linoleic assay and FRAP assay; respectively.The results showed that the leaves of *J. multiflorum* have antioxidant potential [41].

The antioxidant potential of methanolic extract of flowers of *J. multiflorum* by hydrogen peroxide scavenging assay. The concentration used for both the extract and standard (Ascorbic acid) was 20-60µg/ml. The results demonstrated that as the concentration increases the activity also increased. The IC_{50} was calculated and found to be 16.25[42].

Methanolic, ethanolic, ethyl acetate and aqueous extracts of leaves and flowers of *J. multiflorum* for its antioxidant activity by DPPH, ABTS and chelating potential methods. Total phenolic and flavonoid contents were also determined. The Ec_{50}results revealed that the ethanolic extracts of leaves and flowers has maximum antioxidantal potential (leaves 141.2 ±1.24 µg/ml & flowers 252.4 ±2.41 µg/ml in DPPH; leaves and 149.3 ± 2.41 µg/ml and flowers 101.4 ±2.35 µg/ml in ABTS and leaves 28.90 ±1.26 µg/ml and flowers 59.64 ± 0.98 µg/ml in chealting potential) as compared to other extracts of leaves and flowers, but more than that of ascorbic acid [43].
The total phenol and flavonoid content were found maximum (leaves 31.58 ±1.61 mg/g TPC and 13.54 ±0.69 mg/g TFC and Flowers 25.98 ±1.32 mg/g TPC and 11.89 ± 0.61 mg/g TFC) in the ethanolic extracts of leaves and flowers as compared to other extracts. But in comparison to leaves and flowers, the leaves have more potency.

The antioxidant activity of methanolic extracts of flowers. The extract was tested by DPPH free radical (2, 2-diphenyl-1-picrylhydrazylhydrate).The results showed that the oxidation was effectively inhibited by the extract with IC_{50} 81µg/ml. The positive control used was butylatedhydroxyl toluene (BHT) having IC_{50} 12.5µg/ml[44].

Anti-inflammatory activity: The anti-inflammatory activity of hydromethanolic extract of leaves of *Jasminum multiflorum*by histamine release assay.The tested extract possessed anti-inflammatory activity with IC_{50} 67.2 µg/ml[41].

Cytotoxic activity: The cytotoxic effect of hydro-methanolic extract of leaves of *Jasminum multiflorum.* Cytotoxicity was performed using a neutral red uptake assay towards breast cancer (MCF-7) and colorectal cancer (HCT 116) cell lines.*J. multiflorum* showed high cytotoxic activity with IC_{50} of 24.81 µg/ml and 11.38 µg/ml for MCF-7 and HCT 116 cell lines, respectively.

Bronchodilator activity: The bronchodilator effect of methanolic extract of leaves of *J. multiflorum* on goat tracheal tissue. The histamine (2000µg/ml) with doses of 0.1ml, 0.2ml, 0.4ml, 0.6 ml, 0.8ml and 1.6mlinduced contraction of isolated goat trachea were recorded in absence and presence of methanolic extract(100 &200µg/ml). Chlorpheniramine Maleate (10g/ml) was used a standard drug.
Similarly, the bronchodilator effect of acetylcholine (2000µg/ml) was measured on a tracheal strip with doses of 0.1ml, 0.2ml, 0.4ml, 0.8ml, and 1.6ml in the absence and presence of

methanolic extract of "*Jasminum multiflorum*" L (100 & 200µg/ml). The standard drug used was aminophylline (10g/ml). The methanolic extract showed the response in dose dependent manner [45].

CONCLUSION

Herbs are striding in the fields of medicine to treat various ailments due to their lesser undue effects. Conscientious survey of literature showed that *J.multiflorum* is one of the most popular remedy even in the ancient era due to the presence of pharmacologically active secondary metabolites. Upto now only few compounds have been substantiated from this plant by various phytoresearchers and others still awaiting. Pharmacologically a little work has been done on this plant by exploring for its antimicrobial, antioxidant, antimicrobial, antihelmintic, nemacitidal,gastrointestinal, CNS, and cardiovascular system related activities,analgesic, anti-inflammatory, cytotoxic, Brochodialator activitybut many other biological studies are yet to be explored. The assiduous literature study reveals that a detailed research is required with the aim to explore the hidden treasure of secondary metabolites owing various pharmacological activities of *J .multiflorum* which will provide a smooth path for future researcher.

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