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PHARMACOLOGY AND MEDICINAL PROPERTIES OF *JASMINUM OFFICINALE*- A REVIEW

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Abstract:
The phytochemical analysis of Jasminum officinale indicated the presence of alkaloids, coumarins, flavonoids, tannins, terpenoids, glycosides, emodine, leucoanthcyanins, steroids, anthocyanins, phlobatinins, essential oil and saponins. Pharmacological studies revealed that the plant exerted antimicrobial, insecticidal, antioxidant, antifertility and dermatological effects. This review described and discussed the chemical constituents and pharmacological effects of Jasminum officinale.

Keywords: *chemical constituents, pharmacology, Jasminum officinale.*

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INTRODUCTION:

The pharmacological treatment of disease began long ago with the use of herbs. Subsequently, herbs became the sources of many important drugs because of its wide range of pharmacological and therapeutic effects[1-10]. The phytochemical analysis of *Jasminum officinale* indicated the presence of alkaloids, coumarins, flavonoids, tannins, terpenoids, glycosides, emodine, leucoanthcyanins, steroids, anthocyanins, phlobatinins, essential oil and saponins. Pharmacological studies revealed that the plant exerted antimicrobial, insecticidal, antioxidant, antifertility and dermatological effects. In this review we describe and discuss the chemical constituents and pharmacological effects of *Jasminum officinale*.

Plant profile:

Synonyms:

Jasminum affine Royle ex Lindl., *Jasminum officinale* var. *acutum* Stokes, *Jasminum officinale* var. *affine* [Royle ex Lindl.] G. Nicholson, *Jasminum officinale* f. *affine* [Royle ex Lindl.] Rehder, *Jasminum officinale* var. *argenteovariegatum* Weston, *Jasminum officinale* var. *aureovariegatum* Weston, *Jasminum officinale* f. *aureovariegatum* Weston Rehder, *Jasminum officinale* var. *aureum* Bean, *Jasminum officinale* var. *bosphoricum* K. Koch., *Jasminum officinale var. officinale*, *Jasminum officinale* var. *piliferum* P.Y.Pai, *Jasminum officinale* var. *pumilum* Stokes, *Jasminum officinale* var. *tenuifolium* Stokes and *Jasminum officinale* var. *tibeticum* C. Y. Wu[11]

Taxonomic classification:

Kingdom: Plantae, **Subkingdom**: Viridiplantae, **Infrakingdom**: Streptophyta, **Superdivision**: Embryophyta, **Division**: Tracheophyta, **Subdivision**: Spermatophytina, **Class**: Magnoliopsida, **Superorder**: Asteranae, **Order**: Lamiales, **Family**: Oleaceae, **Genus**: *Jasminum*, **Species***: Jasminum officinale*[12].

Common names:

Arabic: Yasamin, Yasamin Abiadh, Yasamin Adi, Yasamin Turki; **Bengali**: Umbustha, Gunica, Yothica; **Chinese:** Su fang hua; **English:** Common jasmine, Jasmine, Jessamine, Poet's jasmine, Summer jasmine, White jasmine; **French**: Jasmin commun, Jasmin officinal; **German:** Echter Jasmin, Weißer jasmin; **Hindi**: Juhi, Chameli; **Italian:** Gelsomino, Gersuminu; **Portuguese:** Jasmin, Jasmim; **Spanish**: Jazmín blanco; **Swedish:** Parfymjasmin; **Unani**: Yaasmin[13-14].

Distribution:

It was native to Asia: Georgia, China, Tajikistan, Afghanistan, Iran, Iraq, Turkey, Bhutan, India, Nepal and Pakistan[13]. It was widely cultivated in Mediterranean, Caucasus, Northern Persia, Eastern Afghanistan, Hindukush, India, China and Pakistan for its attractive fragrant flowers[15].

Description:

Shrubs scandent, 0.4-5 m. Branchlets angular or grooved, glabrous, sparsely pubescent, or appressed hairy. Leaves opposite, imparipinnate, 5-12.5cm long, petiole and rhachis margined. Leaflets 7-11, the terminal 2.5 – 3.8 by 1.3 – 1.8 cm, rhomboid-ovate or lanceolate, acute or acuminate; the lateral ovate, usually obtuse, mucronate, the intermediate sessile. Flowers 3-3.8cm across, white, often tinged [or streaked] with pink outside, in lax, axillary and terminal cymes longer than the leaves; pedicels 1.3-2.5 cm long; bracts, the lower often large, ovate to spathulate-oblong, foliaceous, the upper small, linear. Calyx 5-10 mm. long, Glabrous, tube 2.5mm long or less; lobes 5, subulate2-8 times long as the tube. Corolla - tube 1.8-2.5 cm long; lobes 5; elliptic or obovate[14,16].

Traditional uses:

Leaves were chewed in aphthous, stomatitis, toothache and ulcer in the mouth. Leaf juice or oil obtained from it was dropped into the ear**.** Fresh juice of the leaves was used for sort corns between the toes, for ulceration in the mouth, throat and gums[14, 17].

Jasminum officinale was also used traditionally for the treatment of urinary tract infections[18], as CNS depressant, sedative, mild anesthetic and astringent[17, 19].

In addition, it was used in depression, nervous exhaustion and stress related conditions, It was said that the plant was also used to produce the feeling of optimism, confidence, euphoria, and it was good in cases of apathy, indifference, or listlessness. It was also used for catarrh, coughs, laryngitis, dysmenorrhoea, labor pains, uterine disorders, skin problem such as dry, greasy, irritated, sensitive skin, and for muscular spasms and sprains[20].

The buds of *Jasminum officinale* L. var. *grandiflorum* [L.] were used as a folk remedy for the treatment of hepatitis, dysmenorrhea, stomatitis, and duodenitis in South China[21].

Part used medicinally: Leaves, juice, buds and oil [14, 17].

Physicochemical characteristics:
The physicochemical characteristics [%] were total ash 10.89, acid insoluble ash 1.29, water soluble ash 2.92, loss on drying 4.25, petroleum ether extractive value 2.61, chloroform extractive value 3.58, acetone extractive value 8.72, alcohol extractive value 11.57 and water extractive value 12.14[14, 22].

Chemical constituents:
The preliminary phytochemical analysis of the aqueous extract of *Jasminum officinale* leaves indicated the presence of alkaloids, coumarins, flavonoids, tannins, terpenoids, glycosides, emodine, leucoanthcyanins, steroids, anthocyanins, phlobatinins, essential oil and saponins[15, 23-25].

Chemical analysis of the bud of the flowers of *Jasminum officinale* var. grandiflorum revealed the presence of six triterpenoid saponins [as 3-O-α-L-rhamnopyranosyl [1→2]-β-D-xylopyranosyl-hederagenin28-O-β-D-galactopyranosyl[1→6]-β-D-galactopyranosyl ester; hederagenin-3-O-β-D-glucopyranosyl[1→3]α-L-arabino pyranoside; 2α,3β,23-trihydroxyolean-12-en-28-oic-O-β-D-glucopyranosyl ester; hederagenin-3-O-β-D-xylopyranosyl[1→3]-α-Lrhamnopyranosyl[1→2]-α-L-arabino pyranoside; 2α,3β,23-trihydroxyolean-12-en-28-oic-O-α-L-rhamnopyranosyl[1→4]-β-D-glucopyranosyl[1→6]-β-D-glucopyranosyl ester and hederagenin-3-O-α-L-rhamnopyranosyl[1→2]-α-L-arabinopyranoside[26].
Cell-free extracts from callus of *Jasminum officinale* contained epoxidase activities with isopentyl pyrophosphate, isopentenol, geraniol and nerol as substrates and also hydratase activities towards the resulting terpene oxides[27].

Six iridoid glycosides were identified from the buds of *Jasminum officinale* var. grandiflorum: jasgranoside B, 6-O-methy-catalpol, deacetyl asperulosidic acid, aucubin, 8-dehydroxy shanzhiside and loganin[28].

Secoiridoid glucosides: [20*R*]-20-methoxyoleuropein, [20*S*]-20-methoxyoleuropein, oleuropein, ligstroside, demethyloleuropein and oleoside dimethyl ester, a lignan, [2]-olivil and *p*-hydroxyphenethyl alcohol were isolated from the dried leaves of *Jasminum officinale* var. *grandiflorum*[29].

Six secoiridoids were identified in the flowers of *Jasminum officinale* L. var. grandiflorum included jasgranoside, jaspolyoside, 8-epi-kingiside, 10-hydroxy-oleuropein, 10-hydroxy-ligstroside and oleoside-7, 11-dimethyl ester[30].

Seven glycosides were isolated from the flower of *Jasminum officinale* var. grandiflorum included kaempferol-3-O-alpha-L-rhamnopyranosyl [1→3]-[alpha-L-rhamno pyranosyl [1→6]]-beta-D-galactopyranoside, kaempferol-3-O-rutinoside, 7-ketolo ganin, oleoside-11-methyl ester, 7-glucosyl-l1-methyl oleoside, ligstroside and oleuropein[31].

Thirty compounds were identified in the essential oil of *Jasminum officinale* L. var. grandifloroum. The major volatile components were phytol [25.77 %], 3,7,11-trimethyldodeca -1,6,10-trien-3-ol [12.54%] and 3,7,11- trimethyldodeca-6,10-dien-3-ol [12.42%]. However, the compounds identified in the *Jasminum officinale* L. var. grandifloroum oil [%] were: benzyl acetate 0.33; nerolidol 0.11; methyl myristate 0.75; 7-tetradecene 0.20; benzyl benzoate 4.84; neophytadiene 0.23; perhydrofarnesyl acetone 4.85; phytol acetate 0.22; nonadecane 0.14; geranyl linalool 0.12; methyl palmitate 1.57; 3,7,11,15-tetramethyl -1-hexadecen-3-ol 12.42; hexadecanoic acid 9.16; 3,7,11-trimethyl-1,6,10-dodecatrien-3-ol 12.54; 3,7,11,15-tetramethylhexadecanoic acid methyl ester 0.60; 9,12,15-octadecatrienoic acid methyl ester 1.33; heneicosane 3.12; Phytol 25.77; octadecanoic acid methyl ester 0.56; 9,12,15-octadecatrienoic acid 4.82; docosane 0.25; tricosane 4.00; tetracosane 0.58; pentacosane 1.51; hexacosane 2.54; heptacosane 1.86; octacosane 1.26; squalene 0.46 and nonacosane 3.00[25].
The total phenolic contents of the aqueous extract of *Jasminum officinale* leaves was
104.02 ± 1.28 mg/g gallic acid equivalent, the total flavonoids content was 10.76 ± 0.83 mg/g quercetin equivalent and the total flavonols content was 5.65 ± 0.45 mg/g quercetin equivalent[23].

Pharmacological effect:
Antimicrobial effect:
The *in vitro* anti-bacterial activity of ethanolic extracts of different parts [flowers, stems plus leaves and roots] of *Jasminum officinale* was evaluated against four reference bacteria [*Staphylococcus aureus* ATCC 29213, *Enterococcus faecalis* ATCC 29212, *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* ATCC 27853]. The ethanolic extracts of all parts of the plant showed considerable activity against all the tested bacteria. The MIC of the ethanolic extracts of flowers and stems plus leaves against all the tested bacteria was 2 mg/ml and the MIC of roots against *S. aureus*, *E.*

faecalis and *E. coli* was 4 mg/ml, while the MIC of root extract against *P. aeruginosa* was 2 mg/ml[18].
The *Jasminum officinale* flowers extracts were evaluated for antifungal activity against *Candida albicans* and *Aspergillus niger*, and antibacterial activity against *Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella pneumoniae, Bacillus pumilis, P. vulgaris* and *E.coli.* In antifungal effect, n-butanol fraction showed more activity than the standard drug with zone of inhibition of 20.9 ±1.2mm for *Candida albicans* and almost equal to the effect of the standard drug against *Aspergillus niger* with zone of inhibition of 18.2±1.1mm. Chloroform fraction showed moderate activity against both organism *Candida albicans, Aspergillus niger* with zone of inhibition of 13.1±1.3 and 12.3±0.6mm respectively, and n-hexane fraction showed very poor antifungal activity 2.1±1.3 3.2±1.8mm. In antibacterial study, the n-butanol fraction displayed antibacterial activity more than the standard drug [ampicillin] against *Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella pneumoniae, Bacillus pumilis, P.vulgaris* and *E.coli* with zone of inhibition of 19.2±0.8, 20.1±1.2, 20.1±1.5, 22.0±1.2, 19.4±1.0 and 24.0±0.8mm respectively, on the other hand, chloroform faction displayed significant antibacterial activity with zone of inhibition of 14.8±1.3, 16.2±1.4, 16.2±1.9, 17.4±1.3, 14.2±1.2 and 18.2±1.6 respectively, while n-hexane fraction displayed very low activity[32].

The antimicrobial activity of different solvent extracts [methanol, DCM] of the flowers and whole plant [leaves, barks and roots] was studied against both Gram positive strains [*Staphylococcus aureus, Bacillus pumilus, Streptococcus pneumoniae*] and Gram negative strains [*Escherichia coli, Citrobacter freundii* and *Klebsiella pneumoniae*] and two fungal species [*Candida albicans, Aspergillus niger*]. Whole plant extract [methanol] showed significant antimicrobial activity with relative percentage of inhibition [mm] of 83.60 [G +ve], 70.25 [G-ve] and 61.15 [fungi], while flowers extract [methanol] showed 64.30, 51.88 and 51.97 relative percentage of inhibition against G +ve, G-ve and fungi respectively. The diameters of growth inhibition were 11.00-15.15, 9.90-11.95 and 10.95-11.95mm against G+ve, G-ve and fungi for DCM flowers extract, and 13.35-16.35, 10.45-12.50 and 11.45-12.25mm against G+ve, G-ve and fungi for methanol flowers extract respectively, whereas, the diameters of growth inhibition were 18.00-20.00, 14.10-16.80 and 15.45-16.60 mm against G+ve, G-ve and fungi for DCM whole plant extract, and 18.55-20.35, 14.50-17.00 and 16.15-17.00 mm against G+ve, G-ve and fungi for methanol whole plant extract respectively[15].

The antibacterial effect of different extracts of leaves of *Jasminum officinale* were studied against *E. coli, Bacillus sp., Streptococcus sp., Salmonella sp., Pseudomonas sp., Serratia marcescens, Klebsiella pneumonia* and *Staphylococcus aureus*. Methanol extract exhibited the maximum activity against *Klebsiella pneumonia*, chloroform extract against *Bacillus subtillis* and *Staphylococcus aureus*, and hexane extract against *Serratia marcescens* and *E. coli*, while minimal activity was recorded for the ethanol extract against *Staphylococcus aureus*, for chloroform extract against *Salmonella* and *pseudomonas aeruginosa*, and for diethyl ether extract against *Streptococcus sp*[33].

Jasminum officinale extracts of flowers powder macerated in ethanol, were tested against *Propionibacterium acnes* and *Staphylococcus epidermidis*, as pus-forming bacteria triggering an inflammation in acne, using disc diffusion and broth dilution methods. MIC and MBC against *Propionibacterium acnes* was 5 and >5 mg/ml respectively, and MIC and MBC against *Staphylococcus epidermidis* was >5 mg/ ml[34].
The antiviral effect of oleuropein derived from the flowers of *Jasminum officinale* was studied on hepatitis B virus [HBV] replication in HepG2 2.2.15 cell line *in vitro* and duck hepatitis B virus [DHBV] replication in ducklings *in vivo*. Oleuropein blocked effectively HBsAg secretion in HepG2 2.2.15 cells in a dose-dependent manner [IC50 =23.2 microg/ml]. Oleuropein [80 mg/kg, intraperitoneally, twice daily] also reduced viremia in DHBV-infected ducks[35].

The effect of 8-*epi*-kingiside [8-Epik] derived from the buds of *Jasminum officinale* var. *grandiflorum* [JOG] was evaluated on hepatitis B virus [HBV] replication in HepG2 2.2.15 cell line *in vitro* and duck hepatitis B virus [DHBV] replication in ducklings *in vivo*. 8-Epik effectively blocked HBsAg secretion in HepG2 2.2.15 cells in a dose-dependent manner [IC50 = 19.4 ± 1.04 µg/ml]. 8-Epik [40 or 80 mg/kg, ip, twice daily] also reduced viremia in DHBV-infected ducks[36].

Insecticidal effect:
Jasminum officinale were tested for the larvicidal efficacy against the third instar larvae of *Culex quinquefasciatus* at concentrations of 62.5, 125, 250, 500, 1000, 2000, 4000 and 8000 mg/l. Mortality was recorded after 24 and 48 h. The hexane and chloroform extract possessed 14 and 13.3% mortality at 4000 mg/l after 24 h, and 18.66 and 18% mortality at 4000 mg/l after 48 h. LC50 was 3136.68 after 24 h and 6231.08 after 48 h[37].

The crude chloroform, methanol and aqueous flower extracts of *Jasminum officinale*, were tested for the larvicidal efficacy against the third instar larvae of *Aedes aegypti* at concentrations of 62.5, 125, 250, 500, 1000, 2000, 4000 and 8000 mg/l. Mortality was recorded after 24 and 48 h. The crude methanolic flower extracts of *Jasminum officinale* caused 20% mortality after 48 h at concentration of 8000 mg/l[38].

Antioxidant effect:

The antioxidant potential of the aqueous extract of *Jasminum officinale* leaves was evaluated *in vitro* using free radical scavenging assays for DPPH, NO, superoxide and ABTS radicals in addition to reducing power assessment. The extract possessed significant antioxidant potential. The IC50 values for DPPH, NO, superoxide and ABTS radicals were 41.16, 30.29, 20.19, and 29.48 µg/ml respectively as compared to the standard, ascorbic acid, which showed 42.79, 36.74, 38.22, and 45.57 µg/ml, for the same radicals [23].

The antioxidant property of *Jasminum officinale* methanol and ethanol extracts was determined by hydrogen peroxide method. Both extracts possessed antioxidant activity, but the ethanolic extract showed the more potent activity[39].

The antioxidant activity of *Jasminum officinale* methanol and ethanol extracts was analysed using DPPH scavenging compared with a standard compound, ascorbic acid. The antioxidant activity in both methanolic and ethanolic extracts showed increase in activity with increase in sample concentration. The ethanolic extract showed better antioxidant activity when compared to the methanolic extract[40].

Antifertility effect:

The antifertility effect of an aqueous extract of fresh floral buds of *Jasminum officinale* var. *grandiflorum* was studied in female rats. The extract at oral doses of 250 and 500 mg/kg produced a dose dependent significant antiimplantation effect, but didn't produce complete infertility. Treatment of animals during day 8 to day 12 to day 20 of pregnancy did not produce any significant abortifacient activity. There was no significant change in the weight and length of the fetuses delivered by rats treated with extract and no abnormalities were seen in the organs of the offspring. The extract produced a significant decrease in serum progesterone levels on day 5 of pregnancy which may be responsible for the antiimplantation effect[41].

Dermatological effect:

Ampucare was a topical oil-based preparation containing *Azadirachta indica, Berberis aristata, Curcuma longa, Glycyrrhiza glabra, Jasminum officinale, Pongamia pinnata,Rubia cordifolia, Terminalia chebula, Trichosanthes dioica, Symplocos racemosa, Ichnocarpus frutescens, Capsicum abbreviata, Nymphaea lotus* etc. Application of ampucare in second-degree burn showed burn healing effect with enhancement of antioxidant function. It increased wound contraction, decreased NO, decreased xanthine oxidase activity, increased protein level, increased vitamin C, reduced glutathione and decreased MDA in blood samples[42-44].

CONCLUSION:

This review discussed the chemical constituent, pharmacological and therapeutic effects of *Jasminum officinale* as promising herbal drug because of its safety and effectiveness.

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