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# Healing volatiles of *Rosa* and *Jasminum* species: In-depth exploration of their pharmacological properties and therapeutic significance

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**Abstract**

The genera *Rosa* and *Jasminum* are renowned for their aromatic flowers and diverse bioactive compounds possessed within, offering significant therapeutic potential. This review systematically examines the volatile organic compounds (VOCs) and pharmacological properties of these plants. *Rosa* species, particularly *R. damascena* and *R. rugosa*, which are globally cultivated, are rich in phenethyl alcohol, citronellol and quercetin glycosides, demonstrating notable antioxidant, antimicrobial, anticancer and neuroprotective effects. Similarly, *Jasminum* species (*J. sambac, J. grandiflorum*) contain benzyl acetate, linalool and oleuropein, also exhibit antimicrobial, antiviral, anti-inflammatory and dermatological benefits. Both genera show remarkable free radical scavenging activity, with *Rosa* extracts mitigating oxidative stress-related diseases and *Jasminum* constituents enhancing skin health and metabolic function. *Rosa* volatiles contribute to cardiovascular and cognitive health, while *Jasminum* essential oils modulate autonomic nervous system activity, improving respiratory and cognitive parameters. Additionally, *Jasminum*-mediated nanoparticles and *Rosa's* anti-HIV compounds highlight the recent innovative applications in drug development. The synergy between traditional uses and modern scientific validation underscores their potential in pharmaceuticals, nutraceuticals and cosmeceuticals. This comprehensive analysis consolidates existing knowledge on *Rosa* and *Jasminum* bioactives, emphasizing their multidisciplinary applications and future research directions for harnessing their full therapeutic potential.

## 1. Introduction

Floriculture, a specialized branch of horticultural science, is dedicated to the cultivation, management, maintenance and commercialization of ornamental plants. This sector has witnessed rapid growth in recent years, fueled by increasing global demand, which underscores the dynamic and evolving nature of the ornamental plant industry on an international scale (Wani *et al.,* 2018). As a significant contributor to agricultural economies, floriculture generates substantial revenue through the cultivation, processing and distribution of floral products for both domestic and international markets (Adebayo *et al.,* 2020).

Flowers have been utilized for centuries not only for their aesthetic appeal but also for their diverse functional applications, such as in gastronomy, where their pigments (like carotenoids, flavonoids and betalains) enhance the visual appeal of dishes, while their unique flavors and aromas make them a valuable alternative food source. Historically, flowers have also been employed for dyeing fabrics, showcasing their versatility in cultural and artistic practices. They have played a significant role in traditional medicine, with plant parts often consumed as medicinal infusions or decoctions. Additionally, flowers possess remarkable therapeutic properties, making them a vital component in promoting physical and mental well-being (Deepikakrishnaveni *et al*., 2024).

Flower therapy, a holistic healing practice, utilizes various floral derivatives such as essential oils, flower waters, flower juice, fresh and dried petals and aromatic compounds to promote mental and physical well-being. Flowers, owing to their medicinal properties, have been increasingly integrated into modern medicine, with their extracts now widely used in pharmaceutical formulations for therapeutic purposes (Reddy *et al.,* 2015). Among these derivatives, flower juice, fresh and dried petals and floral aromatic compounds are scientifically recognized for their therapeutic applications, particularly in enhancing mental and physical health (Arya *et al.,* 2014). Essential oils extracted from flowers, such as rose, jasmine and tuberose, are extensively employed in cosmetic formulations and aromatherapy due to their bioactive properties, which contribute to relaxation, skin health and overall rejuvenation (Patil *et al*., 2024).

Essential oils are concentrated, hydrophobic liquids containing volatile compounds extracted from plants, offering a unique scent and flavor (Mehrotra, 2021) which could also be extracted from various species of *Rosa*. Notably, rose oil of *R. damascena* is one of the most highly prized products in the flavor and fragrance industry,

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which has gained significant attention for its therapeutic applications, particularly in aromatherapy. Scientifically, rose essential oil is recognized for its calming effects on emotional well-being, with notable efficacy in alleviating conditions such as depression, apathy and grief (Tanjga *et al.,* 2022). Inhalation of essential oils has been shown to positively influence mental, physical and emotional health (Takasi *et al.,* 2024). Rose flowers are also believed to possess vibrational energy, which is harnessed in flower therapy to enhance positive emotions and sensations (Mohapatra *et al.,* 2023). Rose hips are traditionally used as medicinal agents for treating a broad range of ailments. Their therapeutic potential is primarily attributed to their potent antioxidant properties (Mármo *et al.,* 2017). These plants exhibit a wide range of pharmacological effects, including antiageing, anti-tyrosinase and antidepressant activities. They also positively influence intestinal health and demonstrate antioxidant, anticancer, anti-inflammatory, antimicrobial, antiepileptic, antimigraine and antiallergic effects (Kunc *et al.,* 2024).

Another notable genus, *Jasminum* (Oleaceae), comprising approximately 200 tropical and subtropical species, is also commercially cultivated for its aromatic flowers and essential oils (Rattan, 2023). These species serve multiple commercial purposes, ranging from ornamental horticulture and landscape design to floral garland production and cosmetic applications, with their essential oils being particularly valuable (Kalayarasi *et al.,* 2019). The floral scent profile of *Jasminum* species is biosynthetically derived from three major compound classes: fatty acid derivatives, phenylpropanoids/benzenoids and terpenoids, which contribute to their characteristic fragrance. Pharmacological investigations have revealed that *Jasminum* species possess diverse bioactive properties, including antimicrobial and antiviral effects, antiulcerogenic activity mediated through mucosal protection and anti-inflammatory actions *via* cytokine modulation (Tharakan, 2021). Furthermore, these plants exhibit wound-healing properties, significant antioxidant capacity through free radical scavenging, show antiageing potential *via* collagen stabilization and display antidepressant activity associated with neurotransmitter regulation. The cosmetic and fragrance industries extensively utilize *Jasminum* species due to their rich content of aromatic volatile compounds, particularly benzyl acetate and linalool, which are prized for their complex scent profiles in perfumery. These floral components are incorporated into various skincare formulations, including shampoos, soaps and creams, where they function as natural emollients and fragrance enhancers while providing hydrating benefits (Ratan, 2023).

*J. officinale*, a particularly fragrant species, is cultivated extensively for both its ornamental value and commercial applications. Ethnomedical traditions have employed this species for treating various conditions, including peptic ulcers, ocular disorders, urinary tract infections, breast carcinomas and dermatological conditions, with its therapeutic effects attributed to anti-inflammatory, antimicrobial and antioxidant phytoconstituents (Shoukat *et al.,* 2023).

Like medicinal and aromatic plants, flowers are also integral to enhancing physical, emotional and mental well-being, while fostering innovation in drug synthesis and therapeutic practices. This review will further explore the volatile compounds of rose and jasmine, along with their biochemical and therapeutic properties, emphasizing their multifaceted applications in promoting health and wellness.

## 2. Exploration of volatile compounds in Rose and their health benefits

### 2.1 Bioactive volatiles in *Rosa* species

In *R. damascena*, hydrodistilled volatile oil and rose water from shade-dried petals were dominated by aliphatic hydrocarbons (56.4% and 46.3%, respectively) and oxygenated monoterpenes (14.7% and 8.7%), with heneicosane, nonadecane, tricosane and pentacosane as primary hydrocarbons. Notably, 2-phenylethyl alcohol was present at 0.4% in essential oil and 7.1% in rose water, highlighting differences between dried and fresh petal volatiles (Verma *et al.,* 2011). This is further supported by the findings of Rusanov *et al.* (2011) that in *R. damascena* flower extracts, phenylethyl alcohol (7.99-8.44%) was the predominant compound, followed by nonadecane (6.63-7.32%) and heneicosane (3.92-4.38%). Similarly, *R. damascena* rose oils were dominated by beta-citronellol + nerol (10.20-13.20%) and nonadecane (8.16-9.11%), with significant contributions from 9-nonadecene, heneicosane and trans-geraniol.

Similarly, *R. hybrida* cultivars displayed complex volatile profiles. For instance, *R. hybrida* 'Mi-hyang' contained 46 compounds, with carbonyls (12.96-21.79%) and alcohols (7.98-11.73%) dominating in simultaneous distillation-extraction (SDE) essential oils, while solid-phase microextraction (SPME) headspace analysis revealed lower concentrations of these compounds (Cho *et al.,* 2006). The volatile metabolome of *R. hybrida* 'Lanxing' further emphasized the role of benzenoid-phenylpropanoid metabolites, with eugenol dominating at 38.19% of the total (Sun *et al.,* 2023). Organ-specific variations were also evident, as sepals of *R. hybrida* contained minimal volatiles, primarily fatty acid derivatives like trans-2-hexenal (58.4%), while petals and stamens exhibited higher concentrations of monoterpene alcohols (geraniol, citronellol, nerol) and aromatic compounds (2-phenylethanol, 3,5-dimethoxytoluene). Geraniol was more abundant in petals (45.3%) than stamens (7.8%), whereas citronellol (11.1%) and eugenol (11.5%) were more prominent in stamens, reflecting distinct organ-specific compositions (Bergougnoux *et al.,* 2007).

In rosehips, bioactive compounds also varied significantly across species. Organic rosehips of *Rosa* sp. showed carotenoids dominated by β-carotene (45.56-70.34%), with *R.villosa* exhibiting the highest lycopene levels (1.18-5.62 mg/g DW). Polyphenols were most abundant in *Rosa canina* flesh (157.42 mg/100 g DW) and seeds (207.31 mg/100 g DW), while flavonoids and rutin peaked in *R.villosa* flesh (41.59 mg/100 g DW) and *R. canina* seeds (32.19 mg/100 g DW), respectively. Ascorbic acid levels were highest in *R. rugosa* flesh (736.27 mg/100 g FW), highlighting species-specific variations in bioactive compounds (Medveckienë *et al.,* 2020). Characterization of *R.iberica* rosehips using HS-GC/MS identified 25 volatile components, with 2,4-bis(1,1-dimethylethyl) phenol (20.35%), naphthalene (18.72%) and ethanol (16.59%) as predominant compounds, while IM-GC/MS detected 28 volatiles, primarily alcohols (27.88%) and acids (21.68%), with naphthalene (13.32%) as the major terpene and 1,2-propanediol as the most abundant alcohol, where 15 components differed between the two methods, emphasizing the influence of extraction techniques on volatile profiling (Abaci *et al.,* 2016). Unique compounds such as 3,5-dimethoxytoluene (4273 mg/g) and dihydro-b-ionone (247 mg/g) were identified in *R. odorata*, while *R. chinensis* var. spontanea emitted 1,3,5-trimethoxybenzene (331 mg/g) and germacrene D (1015 mg/g). In *R. damascena* and *R.centifolia*, 2-phenylethanol accounted for 49.95% and 27.44% of total volatiles, respectively (Feng *et al.,* 2022).

Among *R.spinosissima*, *R. pendulina* and *R. gallica*, *R. pendulina* exhibited the highest diversity of VOCs, with monoterpenes and sesquiterpenes accounting for 38% of the total. Aldehydes peaked at 23% in 'Fruhlingsmorgen' (*R. spinosissima*), alcohols ranged from 16%-42% and hydrocarbons varied from 15% in *R.pendulina* to 36% in 'Fruhlingsduft' (*R. spinosissima*), underscoring species-specific VOC profiles (Kunc *et al.,* 2024). A total of 62 volatile compounds were identified across four rosehip species (*R.pimpinellifolia*, *R. villosa*, *R. canina* and *R. dumalis*), with *R. dumalis* showing the highest alcohol content (67.53%), *R. pimpinellifolia* containing the most acids (48.13%) and *R. villosa* exhibiting predominant ester (19.24%) and ketone (15.08%) levels, while notable differences in specific compounds like naphthalene (*R. canina*: 40.7%) and phenols (*R. dumalis*: 2.27%) highlighting the distinct chemical signatures of each species (Murathan *et al.,*2016). Among 27 *R. rugosa*, 43 *R. hybrida* and seven scented *Rosa* species, *R. rugosa* had the highest fragrance levels, with phenethyl alcohol (11.76 µg/g), citronellol (3.76 µg/g), nerol (1.77 µg/g) and farnesol (1.27 µg/g) as key compounds (Cheng *et al.,* 2022). Rose hip fruits from *R. canina*, *R. dumalis*, *R. gallica*, *R. dumalis* subsp. boissieri and *R. hirtissima* revealed *R. dumalis* subsp. Boissierihad the highest total phenolic content (52.94 mg/g) and antioxidant capacity, while *R. canina*, had the lowest (31.08 mg/g). *R. gallica* showed the highest alcohol content (24.63%), with phenylmethanol ranging from 1.16 mg/kg (*R. gallica*) to 2.62 mg/kg (*R. hirtissima*) and other alcohols like 1-pentanol and 3-hexen-1-ol present at moderate levels (Demir *et al.,* 2014). Collectively, these studies highlight the rich diversity and complexity of bioactive compounds in *Rosa* species, influenced by species, cultivars, plant organs and extraction methods.

### 2.2 Promising health benefits of *Rosa* species

*Rosa* sp. has been widely recognized for its diverse health benefits, including the potential to maintain healthy cholesterol levels, thereby supporting cardiovascular health and its anti-inflammatory properties, which help reduce inflammation and alleviate associated discomfort. Additionally, *Rosa* spp. acts as a natural calming and sedative agent, promoting relaxation and stress relief, while also enhancing heart health and strengthening the body's immune defenses, aiding in disease prevention (Kumar *et al.,* 2022). Among its bioactive compounds, α-phenethyl alcohol exhibits broad-spectrum antimicrobial activity, making it an effective preservative in cosmetic formulations (Sirilun *et al.,* 2017). The petals of *R.damascena*, known for their delicate aroma and lack of bitterness, demonstrate potent antioxidant activity, making them suitable as natural food flavoring agents and preventive measures against free radical-induced diseases. This antioxidant potential is attributed to quercetin 3-O-glucoside and other flavonoids, particularly those with multiple hydroxyl groups on the B ring, which enhance free radical-scavenging capabilities (Yasa *et al.,* 2009). Quercetin glycosides, the predominant flavonols in rose leaves, significantly influence antioxidant activity more than kaempferol derivatives, with *R. gallica* exhibiting the highest quercetin content. This flavonoid is renowned for its antioxidant, antiproliferative and anticarcinogenic properties (Nowak and Gawlik-Dziki, 2007). Similarly, *R. laevigata*, contains total flavonoids and saponins that protect against liver injury, while *Rosa* species like *R. rugosa* are rich in flavonoids, triterpenoids, tannins and polysaccharides, demonstrating hypoglycemic potential with minimal adverse effects (Wang *et al.,* 2022). *R. alba* has shown memory-enhancing properties by inhibiting acetylcholinesterase, increasing acetylcholine levels in the brain and improving cognitive function, making it a potential candidate for managing cognitive disorders (Alom *et al.,* 2021). Rose absolute and essential oil, rich in phenolic compounds, exhibit significant antibacterial activity against pathogens such as *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Staphylococcus aureus*, *Chromobacterium violaceum* and *Erwinia carotovora* (Ulusoy *et al.,* 2009). Furthermore, *R.damascena* extracts demonstrate moderate anti-HIV activity, with kaempferol selectively inhibiting viral protease and 2-phenylethanol-O-(6-O-galloyl)-β-D-glucopyranoside neutralizing viral infectivity, showcasing synergistic anti-HIV effects (Mahmood *et al.,* 1996). In the context of mental health, rose oil vapor mitigates oxidative stress in experimental depression, with rose absolute reducing lipid peroxidation and enhancing antioxidant levels in the brain, highlighting its antidepressant potential (Nazýroðlu *et al.,* 2013). Lastly, *R. laevigata* fruit protects against $H_2O_2$-induced oxidative damage in nerve cells by modulating oxidative stress, inhibiting apoptosis and reducing inflammation, positioning it as a promising candidate for preventing oxidative stress-related conditions (Liu *et al.,* 2014). Collectively, these findings underscore the multifaceted therapeutic potential of the *Rosa* species in promoting health and preventing disease (Table 1).

**Table 1: Phytomedical benefits of prominent *Rosa* species**

| S. No. | Species | Chemical compounds | Therapeutic property | Significant findings | References |
|---|---|---|---|---|---|
| 1. | *R. dumalis*, *R. dumetorum*, *R. sempervirens* | Less polar compounds (methanol extract) | Moderate AChE inhibitory activity ($IC_{50}$: 1.23-7.97 mg/ml) | Methanol extracts more effective than water | Naðpal *et al.,* 2018 |
| 2. | *R.damascena* | Polyphenols (flavonoids, tannins, triterpenoids, saponins) | Antioxidant and anti-inflammatory (ferric reducing power and protein denaturation assays) | Rose water-based cream showed significant bio-activity | Safia *et al.,* 2019 |
| 3. | *R. canina* (rosehip) | - | Anti-glioblastoma (suppressed proliferation, enhanced temozolomide effect) | Outperformed temozolomide, targeted multiple cancer pathways | Cagle *et al.,* 2012 |
| 4. | *R. alba* | - | Memory enhancement (cholinesterase inhibition) | Improved learning and memory in animal models | Verma *et al.,* 2020 |
| 5. | *R. centifolia* | Flavonoids, alkaloids | Antidepressant (dopamine, norepinephrine, serotonin modulation) | Potential for neuroprotective therapies in anxiety and depression | Jeyamani *et al.,* 2018 |

## 3. Exploration of volatiles in Jasmine and their therapeutic potential

### 3.1 Bioactive volatiles in *Jasminum* Species

The floral volatiles of *Jasminum* species exhibit distinct profiles, with *J. auriculatum* dominated by benzyl alcohol, linalool, benzyl acetate, indole, cis-jasmone, farnesene and farnesol, while *J. grandiflorum* primarily emits benzyl alcohol, methyl benzoate, linalool, benzyl acetate, eugenol, farnesene and 3-methyl phenol. Both *J. multiflorum* and *J. malabaricum* share key volatiles, including benzyl alcohol, methyl salicylate, farnesene, cis-jasmone and indole, reflecting species-specific and overlapping scent profiles (Barman and Mitra *et al.,* 2019). In *Jasminum* species, benzyl acetate dominates phenylpropanoids/benzenoids, contributing 54.66% of total headspace volatiles, while linalool (92%) and α-farnesene (96%) are key monoterpenes and sesquiterpenes, respectively. Jasmone is a major sesquiterpene in *J. auriculatum* (16.48%) and *J. multiflorum* (9.3%), with α-farnesene also prominent in the latter (16%). Methyl salicylate is present in *J. grandiflorum* (3.38%), *J. multiflorum* (3.7%) and *J. sambac* (0.65%), but absent in *J. auriculatum* (Bera *et al.,* 2015).

Air temperature significantly influences the biosynthesis and emission of floral scent volatiles, primarily benzenoids and terpenoids, with emissions peaking at 25°C for benzyl alcohol, benzyl acetate and cis-jasmone, while 2-phenylethanol and phenethyl acetate peak at 30°C. Indole and other terpenes also show higher emissions at 30°C, with significantly lower emissions observed at extreme temperatures of 20°C and 35°C (Schuhfried *et al.,* 2017).

Alcohols are the most abundant volatile class in *J. grandiflorum* flowers (63%), *J. multiflorum* flowers (30%) and *J. grandiflorum* products (7-13%), but account for only 8% of *J. sambac* aroma. β-Linalool is the dominant alcohol in *J. grandiflorum* flowers (58%), *J. sambac* (7%) and *J. grandiflorum* concretes and absolutes (8-11%), with additional compounds like isophytol, phytol, benzyl alcohol and nerolidol detected in lower concentrations. Sesquiterpene hydrocarbons, the second most abundant class, constitute 14% of *J. grandiflorum* and 24% of *J. sambac* aroma, with α-farnesene being the major sesquiterpene in *J. sambac* (18%) and the only one detected in *J. grandiflorum* (Issa *et al.,* 2020). In *J. sambac* 'Bifoliatum', 30 volatile organic compounds were identified, with linalool peaking at 41.86 mg/kg FW at stage 2 and α-farnesene reaching 53.86 mg/kg FW at stage 3 before declining.

In detached flowers, linalool and β-farnesene emissions peaked at 22.03 mg/kg FW and 30.71 mg/kg FW, respectively, 8-16 h after excision, with benzyl acetate showing a similar but lower emission pattern (Yu *et al.,* 2017). The methanolic extract of *J. sambac* flowers is dominated by β-farnesene (52.52%), nerolidol (19.85%) and benzyl alcohol (17.56%), while hydrodistillation yields β-farnesene (45.13%), α-cadinol (26.21%) and linalool (9.96%). Similarly, *J. multiflorum* methanol extract contains nerolidol (42.44%) and benzyl benzoate (39.00%), whereas hydrodistillation yields hexenyl benzoate (35.89%) and β-farnesene (24.62%) (Khidzir *et al.,* 2015). A total of 23 volatile constituents were identified in *J. sambac* flowers, with cis-3-hexenyl acetate, (E)-β-ocimene, linalool, benzyl acetate and (E,E)-α-farnesene comprising approximately 80% of the fragrance. Terpenoids (63.7%) dominate, followed by phenylpropanoids (22.1%) and non-terpenoid compounds (9.1%). Key contributors in intact flowers include linalool, (E)-β-ocimene and benzyl acetate, while plucked flowers primarily emit benzyl acetate, linalool and (E,E)-α-farnesene, with SPME fibers revealing new compounds like β-myrcene, limonene and phenylethyl acetate (Pragadhesh *et al.,* 2011).

### 3.2 Potential health advantages of *Jasminum* species

*Jasminum* species produce a remarkable array of bioactive compounds with diverse therapeutic applications (Table 2). Their essential oils and extracts demonstrate potent antimicrobial activity, with *J. sambac* essential oil (100 μl) showing significant inhibition against *S. aureus* (1.9 ± 0.43 cm), *E. coli* (1.2 ± 0.54 cm) and *C. albicans* (3.2 ± 0.44 cm), comparable to ciprofloxacin (Lakshmi *et al.,* 2024). Similar broad-spectrum antimicrobial effects were observed in ethanolic callus extracts of *J. grandiflorum* and *J. sambac* (250-500 mg/ml) against *S. albus*, *P. mirabilis* and *S. typhi* (Joy and Raja, 2008), while *J. grandiflorum* essential oil exhibited strong activity against *P. acnes* (MBC = 0.5% v/v) (Zu *et al.,* 2010). Beyond antimicrobial effects, these species show remarkable antioxidant capacity, with *J. multiflorum* methanol extracts displaying superior DPPH radical scavenging (Khidzir *et al.,* 2015) and *J. angustifolium* ethanolic extract demonstrating both DPPH/hydroxyl radical scavenging (2-4 × higher $IC_{50}$ than ascorbic acid) and enhanced ABTS/$Fe^{2+}$z activity (2-fold greater potency) (Asirvatham *et al.,* 2012). *J. multiflorum* extracts further revealed strong antioxidant potential, particularly in leaf ethanolic extracts (141.2 ± 1.24 μg/ml DPPH) and flower ethanolic extracts (252.4 ± 2.41 μg/ml DPPH), with leaves showing superior ABTS activity (149.3 ± 2.41 μg/ml) (Kumaresan *et al.,* 2019).

The therapeutic potential extends to anticancer applications, where *J. grandiflorum* ethanolic extract reduced DMBA-induced mammary tumors through oxidative stress reduction (decreased TBARS) and enhanced antioxidant enzyme activity (SOD, GPx, CAT) (Balkrishna *et al.,* 2021). Similarly, *J. humile* extracts demonstrated significant cytotoxicity against THP-1 (46.63 μg/ml), HepG-2 (59.47 μg/ml) and MCF-7 cells (ethyl acetate $IC_{50}$ = 22.78 mg/ml) (Mansour *et al.,* 2022). Dermatological benefits include *J. sambac* flower extracts showing potent antityrosinase activity (100% inhibition at 263.5 mg/l) with excellent safety (>98.2% cell viability at 1000 mg/l) (Wu *et al.,* 2021), while jasmine extract (JSE) components like hesperidin exhibited strong antiageing effects ($IC_{50}$=12.87 ± 0.03 μg/ml for hyaluronidase) (Widowati *et al.,* 2018).

Innovative applications include *J. auriculatum*-mediated $TiO_2$ nanoparticles with anti-inflammatory (81.27% BSA denaturation inhibition) and antidiabetic properties (96.57% α-amylase, 89.57% α-glucosidase inhibition) (Edwin *et al.,* 2024) and oleuropein from *J. officinale* var. *grandiflorum* showing dose-dependent anti-HBV activity (Arun *et al.,* 2016). *J. sambac* essential oils also modulate autonomic nervous system activity, enhancing blood oxygen saturation, respiratory rate and attention (Ayaz *et al.,* 2017; Hongratanaworakit, 2010). Additionally, *J. multiflorum* flower compounds (*e.g.*, jasfloroside A) effectively target HCV-NS5A, suggesting potential as antiviral treatments (El-Hawary *et al.,* 2022).

Rose and jasmine, with their rich chemical profiles, have made significant contributions to both ethnomedicine and modern drug development. Ongoing pharmacological research and related studies hold the potential to expand their therapeutic applications, offering new possibilities for treatments and cures beyond their traditional use in aesthetics and decoration. Figure 1 presents a comparative visualization of the synergistic and unique therapeutic advantages offered by rose and jasmine species.

Table 2: Pharmacological and therapeutic properties of *Jasminum* species bioactives

| S. No. | Species | Chemical compounds | Therapeutic property | Significant findings | References |
|---|---|---|---|---|---|
| 1 | *J. sambac* | Muscarinic receptor activation, nitric oxide release, reduces adrenaline-induced oxidative stress | Cardio-vascular disorders | Exhibits antioxidant activity, prolongs noradrenaline-induced platelet adhesion, shows vasor elaxant and cardioprotective effects | Khan *et al.,* 2021 |
| 2 | *J. grandi florum* subsp. *floribundum* | Methanolic extract (JTME) | Inflammatory bowel diseases | 400 mg/kg dose showed anti-inflam matory and antioxidant effects compa rable to prednisolone (2 mg/kg); improved colon tissue integrity, red-uced ulcer index, suppressed pro-in-flammatory cytokines (IFN-$\gamma$, TNF-$\alpha$, IL-6, IL-1$\beta$, MPO), preserved intes-tinal barrier (claudin-5, occludin), reduced NF-$\kappa$B p65 and caspase-3 over expression | El-Shiekh *et al.,* 2021 |
| 3 | *J. auriculatum* | Flavonoids, triterpenoids (anti-microbial and free radical scave-nging properties) | Wound healing | Promote wound healing through enhanced wound contraction and epithelization | Bhat *et al.,* 2025 |
| 4 | *J. humile* | Secoiridoids | Potential anticancer agent | Cytotoxic effect on MCF-7 breast cancer cells ($IC_{50}$ = 9.3 ± 1.2 µg/ml); no cytotoxicity on normal HaCaT cells ($IC_{50}$ = 496.2 ± 4.88 µg/ml) | El-Hawary *et al.,* 2023 |
| 5 | *J. multiflorum* | Cardiac glycosides (polar sol-vents), other unspecified com-pounds (ethanolic extract) | Anthelmintic, antimicrobial applications | Cardiac glycosides detected in polar solvent extracts; ethanolic root extract showed anthelmintic and antimicrobial activity | Pahari *et al.,* 2020 |

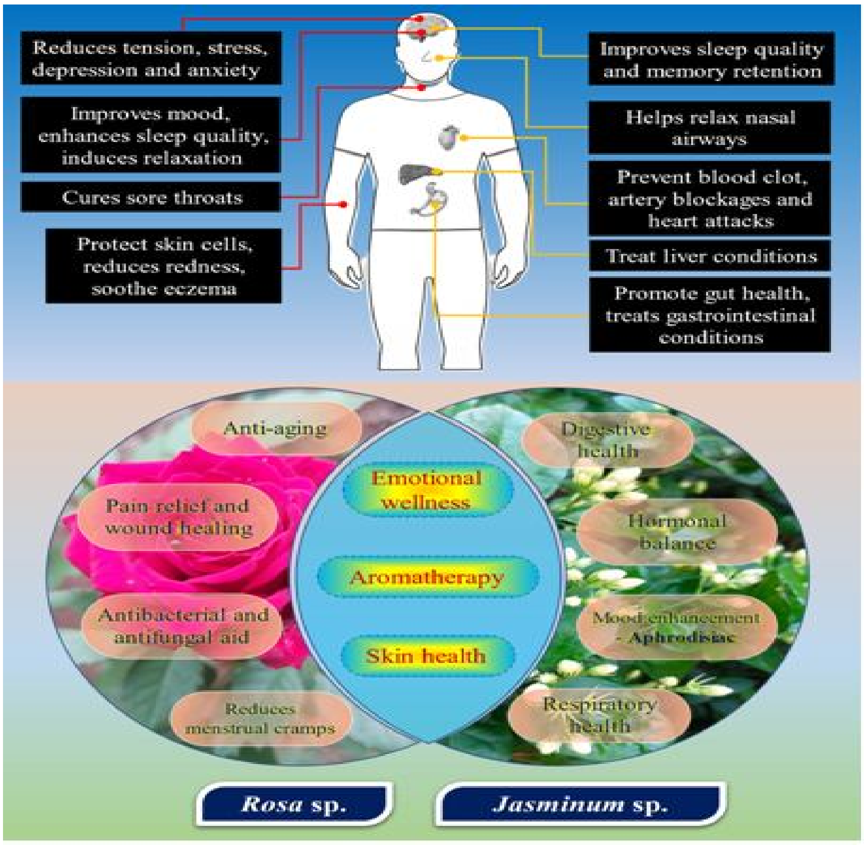


Figure 1: Distinctive therapeutic contributions of Rose and Jasmine in human health.

## 4. Healing art of aromatherapy: Emphasis on Rose and Jasmine essential oils

Aromatherapy has emerged as a promising complementary therapy, demonstrating significant potential to modulate both physiological and psychological states through bioactive volatile compounds. These natural aromatic agents interact with neurophysiological pathways, influencing psychosomatic homeostasis *via* the limbic system, autonomic nervous system, and endocrine axes (Ali *et al.,* 2015) which is briefly mentioned in Table 3. Essential oils exert their effects through combined pharmacological actions and psychological mechanisms, particularly in modulating sleep architecture and mood regulation (Hongratanaworakit, 2010).

Among the most studied botanicals, *Jasminum* and *Rosa* species have shown remarkable therapeutic efficacy across various clinical contexts. Jasmine oil (*J. officinale*), rich in benzyl acetate and linalool, exhibits distinct neurostimulatory properties. These bioactive compounds enhance dopaminergic and serotonergic transmission, providing empirical support for their antidepressant applications (Hongratanaworakit, 2010). Clinical studies demonstrate that inhalation of jasmine oil induces dose-dependent neurostimulation, evidenced by enhanced β-wave activity on EEG, improved profile of mood states (POMS) scores, and heightened psychomotor alertness (Sayowan *et al.,* 2013). Furthermore, jasmine oil has shown potential in improving sleep quality and duration in hemodialysis patients, likely through olfactory-limbic pathway activation (Sultani *et al.,* 2023). Its mood-modulating properties extend to alleviating symptoms of anxiety, apathy, and emotional dysregulation while promoting emotional equilibrium. In preoperative settings, controlled inhalation of *Jasminum* essential oil significantly reduces psychometric anxiety scores, particularly in patients undergoing laparotomy (Yadegari *et al.,* 2021).

**Table 3: Mechanisms of essential oils: Brain interactions and physiological effects**

| Pathway/Mechanism | Brain region/Target | Effect on brain/Body | References |
|---|---|---|---|
| Olfactory signaling | Limbic system | Emotion, memory, neurotransmitter release | Fung *et al.*, 2021 |
| Direct chemical interaction | Neurotransmitter receptors (*e.g.*, glycine, dopamine) | Modulation of EEG rhythms, relaxation, sedation | Aponso *et al.*, 2021 |
| HPA axis modulation | Hypothalamus, pituitary | Reduced cortisol, stress relief | Sattayakhom *et al.*, 2023 |
| Autonomic nervous system modulation | Suprachiasmatic nucleus (SCN), cardiovascular centers | Lowered heart rate, increased relaxation | |

Similarly, rose essential oil (*R.damascena*) has demonstrated significant anxiolytic effects in clinical studies. Inhalation of rose water volatiles during hemodialysis treatment improves affective states and enhances quality of life indicators (Barati *et al.,* 2016). Red rose essential oil has been shown to reduce preoperative anxiety severity, though baseline levels in surgical patients often remain moderate to high (Najafi *et al.,* 2020). In patients with acute myocardial infarction (MI), *R.damascena* essential oil (REO) modulates autonomic nervous system hyperactivity, alleviating cardiac-induced anxiety (Haddadi *et al.,* 2022). Beyond its anxiolytic effects, rose oil has been found to influence endocrine responses, including oxytocin secretion, which may facilitate parturition by enhancing uterine contractility (Asmawati *et al.,* 2024).

Aromatherapy is practiced for sensible cure against various mental illness. It is a procedural approach which involves various steps and methods as described in Figure 2. The synergistic effects of these essential oils highlight their broad therapeutic potential. Jasmine oil's uplifting and mood-boosting effects work well together with rose oil's relaxing and anxiety-reducing benefits through aromatherapy. Both oils demonstrate clinical relevance in reducing anxiety, enhancing emotional regulation, and improving quality of life.

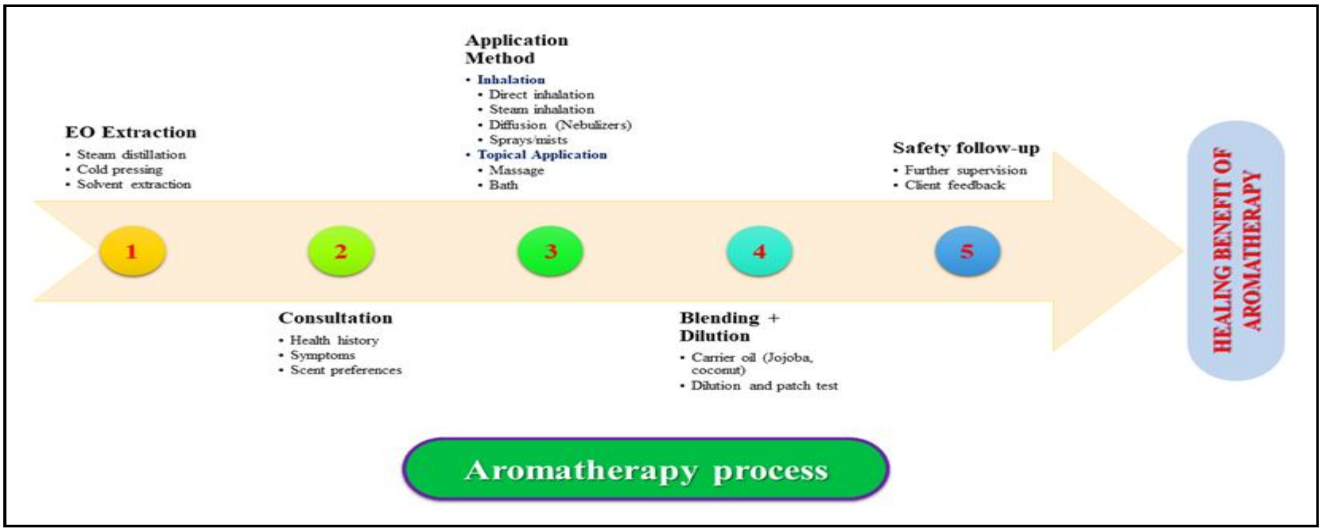


**Figure 2: Aromatherapy process: From plant to practice.**

## 5. Conclusion

The floral volatiles and bioactive compounds of *Rosa* and *Jasminum* species collectively represent a pharmacologically versatile class of natural products, bridging traditional herbal medicine with evidence-based therapeutic applications. From the fragrant petals of *Rosa* species, rich in phenethyl alcohol, citronellol and quercetin glycosides, to the complex terpenoids and benzenoids of *Jasminum* flowers, these plants offer a treasure trove of medicinally valuable constituents. The volatiles of *Rosa* species demonstrate remarkable antioxidant, antimicrobial and anticancer properties, with applications ranging from cardiovascular protection to cognitive enhancement and dermatological care. Similarly, *Jasminum* volatiles, dominated by benzyl acetate, linalool and oleuropein, exhibit broad-spectrum bioactivity, including antimicrobial, antiviral and neuroprotective effects. Both genera show significant potential in managing oxidative stress-related disorders, with *Rosa* extracts mitigating lipid peroxidation and *Jasminum* compounds scavenging free radicals *via* multiple mechanisms. Their essential oils and extracts further display targeted therapeutic effects, such as *Rosa*'s anti-HIV activity and *Jasminum*'s anti-HBV/HCV potential. The dermatological benefits from *Rosa*'s wound-healing properties to *Jasminum*'s tyrosinase inhibition highlight their cosmeceutical relevance, while their safety profiles support translational applications. Notably, the synergy between traditional uses and modern pharmacological validation underscores their credibility as sources of natural therapeutics. Together, *Rosa* and *Jasminum* species as indispensable resources for developing sustainable pharmaceuticals, nutraceuticals and functional fragrances.

## Conflict of interest

The authors declare no conflict of interest relevant to this article.

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