



# *Rosa Damascana*: A Review of its Conventional Uses Phytochemistry and Pharmacology

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## Review Article

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## Abstract

In the past ten years, the use of herbal and ayurvedic medications has gained international attention due to their potential medicinal and financial benefits. The consistency, safety, and effectiveness of herbs have come under scrutiny due to their extensive use throughout the world. *Rosa damascena* is the flower's king and a symbol of inspiration, beauty and it is a precious herb with contemporary pharmaceutical significance that is employed in medications. *R. damascena* has chemical constituents like anthocyanins, terpenes, flavonoids, and glycosides. And also, Vitamins A, B3, C, D, and E are among the vitamins found in flowers. These herbs are used to produce the herbal remedy Gulkand, which is effective for constipation. Besides, depression mood, nervous tension, and stress are treated with it. The *R. damascena* has many pharmacological actions such as antibacterial activity against *E. coli*, *P. aeruginosa*, *B. subtilis*, and *S. aureus*; antiviral activity against HSV-1, and *Haemophilus parainfluenzae*; anticancer activity; antidepressant activity; anticonvulsant effect; antioxidant effects; hepatoprotective activity and others. Thus, providing adequate logical support or evaluation for herbal health arguments has become the standard. This article examines traditional knowledge or claims, phytochemical and pharmacological justifications, as well as pharmacogenetic reasoning, and the plant's prospective applications. Since ancient times, people have been taking advantage of the earth's resources to discover novel phytoconstituents that can be used to cure a wide range of illnesses. Many of these treatments are still useful in today's medicine. The search for potent natural and fresh semi-synthetic or copied compounds to treat human ailments is still ongoing, according to emerging data, and it is leading to the discovery of novel potent natural and fresh semi-synthetic or copied compounds.

**Keywords:** *Rosa Damascana*; Phytochemistry; Pharmacology

## Introduction

The Damask rose, often referred to as *Rosa damascena* Mill, is the flower's king [1] and a symbol of inspiration,

chastity, love, joy, and beauty. It is a priceless ornamental herb with contemporary pharmaceutical significance that is employed in medications [2,3]. In the world, there are more than 200 species and 18,000 cultivars of *Rosa* [4].

Iran is where essential oil from *R. damascena* was first extracted beginning in the 7<sup>th</sup> century A.D. It is well-known for its pharmacological or therapeutic benefits as well as its holiness. Because of how much the Iranian people are reminded of the prophet Muhammad by its smell, they refer to it as Gol-E-Muhammadi (the flower of Prophet 'Mohammad'PBUH) [5]. (PBUH). The best essential oil is Bulgarian *R. damascena* oil, which is mostly produced in Bulgaria and Turkey. Due to the high cost of purifying just 5 ml of rose oil with 242 000 rose petals, *R. damascena* oil is not widely available [6]. The main ingredient in rose oil, phenyl ethyl alcohol, was first imported from Pakistan [7]. According to research, the species of rose plant existed about 40 million years ago.

According to Baser KHC, et al. [8] earlier accounts, people first noticed the rose around 5000 years ago. As the Akkadian monarch (2684–2630 BC) lived close to Babylon and may have been to Southeast Anatolia, it is possible that he purchased the rose seedlings during his military campaign across the Tigris River. Although roses are the most significant, practical, and well-liked plant, it is impossible to ascertain how many cultivars are currently in existence. The Flora of Turkey and the East Aegean Islands each support 24 species of *Rosa* [9]. According to Pliny the Elder, the rose's petals, blossoms, and heads can treat ailments in a variety of body areas, including the ears, eyes, tonsils, gums, head, mouth, chest, stomach, rectum, and uterus (23–79 CE) [10]. Rosebuds are regarded as having astringent, cardiac, and cephalic tonic effects in traditional Ayurvedic medicine in India. Petals are administered locally to alleviate uterine hemorrhage and mouth ulcers [11]. More than 600 works on roses and rose cultivation could be found in the Royal Library [8].

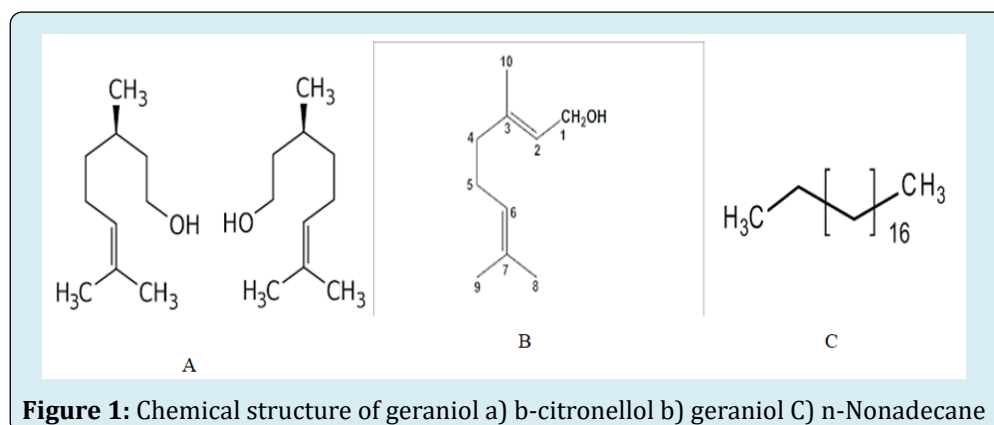
The first scientist to emphasize the benefits of rose fragrance on the brain and heart was the famous physician Ibn-e Sina. Ibn-Al-baitar also noted that rose water had advantageous benefits on the brain. In his book Haza'inu's-Saa'dat (Treasures of Happiness) written in the 15th century

CE, Esref bin Muhammad asserted that food made with rose water is the best suitable meal for infants [12]. Flowers from *R. damascena* should be handpicked early in the morning and used right away for industrial uses.

*Rosa damascena* is a perennial bushy shrub that grows to a height of only 1-2 meters and can live for up to 50 years. The blossoms are vivid and substantial. Oddly pinnate, with 5-7 leaflets, is how the leaves are oriented [13,14]. *Rosa damascena* (Rosaceae) is a shrubby plant with many strong, uneven prickles that are dilated at the base, 5-7 ovate, stiffish leaflets, an oblong flower bud, sepals that reflex after the flowers open, an elongated, frequently dilated tube, ovate-shaped fruit, and calyx and peduncles that are grandiosely hispid and viscous. This plant is used to treat respiratory tract infections, cardiovascular diseases, and erectile dysfunction [15]. Moreover, it promotes digestive motility and alleviates constipation. It possesses anti-HIV, anti-bacterial, and anti-inflammatory properties [16]. It has been documented that *R. damascena* has antifungal properties [17]. The medication is used to treat jaundice and all forms of hepatitis [18,19]. In addition to being used as a disinfectant, deodorant, and cosmetic agent, it is helpful for osteoarthritis and renal diseases [20]. In people with Parkinson's disease, this herb lessens the toxicity that Levodopa causes [21]. One of the most well-known decorative plants used in the perfume industry is *Rosa damascena*. Its pharmacological effects include antioxidant, astringent, antibacterial, antimicrobial, anti-inflammatory, and analgesic, in addition to its perfuming action [20].

### Chemical Constituents

*R. damascenes'* isolated petals have anthocyanins, terpenes, flavonoids, and glycosides in them [22,23]. Myrcene, carboxylic acid, kaempferol, quercetin, and vitamin C are all present in them. Fatty oil, tanning material, and organic acids are present in the flower. More than 95 micro- and macro-components were discovered in the essential oil of *R. damascena* by Loghmani Khouzani [24-26].



**Figure 1:** Chemical structure of geraniol a) b-citronellol b) geraniol C) n-Nonadecane

The predominant components of the oil were nerol and kaempferol, with geraniols (5.5–18%), b-citronellol (14.5–47.5%), and nonadecane (10.5–40.5%) being other compounds that were found [27]. Heneicosane, ethanol (0.00–13.43%), geraniol (3.71%), citronellol (9.91%), nonadecane (4.35%), and phenyl ethyl alcohol (78.38%) are the main constituents of absolute rose, according to an analysis [28]. Neroli (16.12%), phenyl ethyl alcohol (23.74%), citronellol (29.44%), and geraniol (30.74%) were discovered to be the hydrosol's primary constituents [28,29]. According to reports from Pakistan [30], the primary ingredient in rose essential oil is phenyl ethyl alcohol (71%). *R. Damascena* contains phosphorus, potassium, calcium, magnesium, sodium, iron, copper, manganese, zinc, and boron [31] (Figure 1).

### Medicinal Uses

It is a nervine tonic recommended for people with depression. Rose flowers are used to create the herbal remedy Gulkand, which is effective for constipation. It improves mood and counteracts depressed symptoms. Vitamins A, B3, C, D, and E are among the vitamins found in flowers. Depression, nervous tension, and stress are treated with it. The herbal remedy from rose petals known as Gulkand (rose petal preserve, rose petal jam) is helpful in constipation and is used as a laxative [32]. It is used to treat nervous tension and has antistress properties. Also, it works well for heart and stomach ulcers. It improves bile production and aids with digestion. Both high blood pressure and uterine diseases are cured by it [33,34]. Many vitamins, including A, B3, C, D, and E, are present in rose blooms. Rose tea aids in the treatment of digestive infections and the restoration of the normal bacterial balance in the intestine. It is employed to treat painful and erratic menstrual cycles. It eases the pain and profuse bleeding brought on by uterine congestion. Moreover, *Rose damascena* is utilized in perfumes, creams, hand lotions, and cosmetics to treat numerous illnesses, the renowned Persian scientist Avesina extracted the essential oil from *R. damascena* in the 10th century. In Iranian traditional medicine, the decoction of flowers was used to treat chest and abdominal discomfort, digestive disorders, and monthly bleeding. The decoction of dried flowers is used to treat fever, menstruation issues, and breast soreness and is recommended as a diuretic [35]. Rose petals that have been cooked with sugar and honey provide a cooling effect that helps to relax the body and mind. Because rose hips are a recognized blood cleanser, Iranians used them with bread. Because it is an antibacterial agent, rose water was also used for mouthwash and eye washing. Its antispasmodic properties made it useful for treating bronchial and chest congestions as well [36,37].

### Traditional Uses of Rose Products

Traditional Iranian medicine employed a floral concoction to treat digestive issues, menstrual bleeding, and chest and stomach pain (gentle laxatives for constipation). It is well-known as a cardiogenic substance that fortifies the heart [38]. In the 10th century, AveSina, a renowned Iranian scientist, produced rose essential oil, which was then utilized to cure a variety of illnesses. Rose water has long been used as an antiseptic for cleaning the mouth and eyes, as well as an antispasmodic to treat cramps, bronchial and chest congestion, and abdominal pain. It was advised to drink a decoction of dried rose water to treat menstruation irregularities, breast soreness, and fever. Rose petals were boiled with sugar or honey in traditional Iranian medicine and used to calm the body and mind. Iranians use rose hips with bread and have been given them as a blood purifier [39–41].

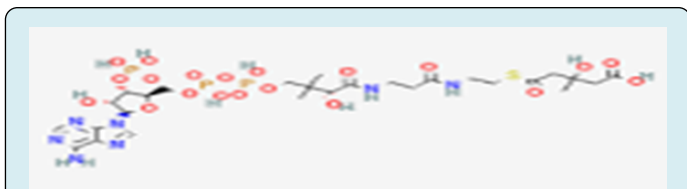
### Pharmacological Actions

#### Study in Vitro

**Antibacterial activity:** The bactericidal activity of rose petal extracts in alcohol and water was higher than that of petroleum ether extract. While its aqueous extract showed greater sensitivity, *E. Coli* was resistant to rose petal ethanol extract [42]. Rose water and rose absolute have been shown to have antibacterial properties against the strains of *E. coli*, *P. aeruginosa*, *B. subtilis*, *S. aureus*, *Chromobacterium violaceum*, and *Erwinia carotovora* [43,44].

**Antiviral activity:** Citronellol and geraniol, two major components of rose essential oil, have been shown to have antiviral action against HSV-1, a strain of Haemophilus parainfluenzae [45,46]. Rose petal extracts in methanol and aqueous form show antiviral effectiveness against HIV infection by concentrating on several phases of the HIV replication cycle. Viral protease and gp120/CD4 are affected by kaempferol and its derivatives [47].

**Anticancer activity:** *R. damascena* has been shown to have anti-tumour, anti-carcinogenic, and cytotoxic actions on cancer cells [48,49]. Geraniol, one of *R. damascenes'* primary constituents, exerts its effects in a variety of ways. It causes cancer cells to undergo apoptosis and increases the expression of the apoptotic protein Bak in these cells. It also arrests the cell cycle in the G0/G1 phase and decreases cdk2 activity [48]. It also inhibits the activity of 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) reductase and ornithine decarboxylase, which leads to the death of cancer cells [50,51] (Figure 2).



**Figure 2:** chemical structure of 3-Hydroxy-3-methylglutaryl-CoA.

### Study in Vivo

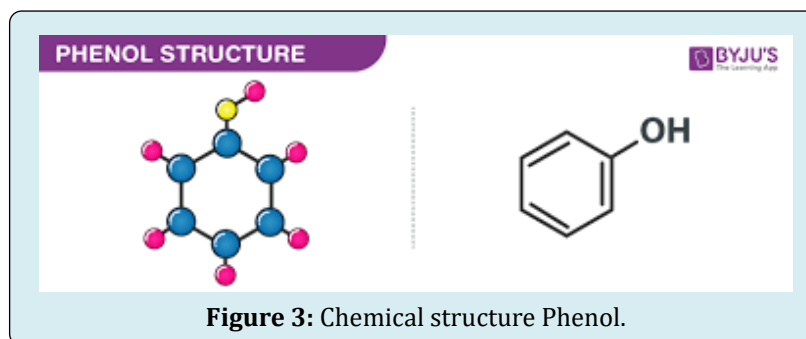
**Antidepressant activity:** Animal models confirmed that *R. damascena* aqueous extract had anti-depressant properties [52]. By reducing lipid peroxidation and raising antioxidant levels in the cerebral brain, rose absolute displays anti-depressant action [53]. Additionally, libido might be caused by depression. As previously noted, rose essential oil and rose water are thought to have aphrodisiac and sensual properties as well as bring happiness and self-confidence. The diameters of the seminiferous tubules, sperm count, and motility, as well as the stimulation of testosterone synthesis, have all been shown to improve infertility and libido. Also, during weeks 2 through 8, rose essential oil treatment improves sexual dysfunction and depression symptoms in male patients with serious depressive disorders who are on selective serotonin reuptake inhibitors [54].

**Relaxant activity:** *R. damascena* exhibits relaxing activity through activating  $\beta$ -adrenergic receptors, blocking histamine H1 receptors, blocking calcium channels of the tracheal chain, reducing KCl-related contraction, and generating

electrical fields. Some *R. damascena* subfractions, including its ethyl acetate fraction, block muscarinic receptors and cause relaxation in the tracheal smooth muscles [55-57].

**Anticonvulsant effect:** Hosseini carried out a study to look at *R. damascenes'* anti-seizure properties. Pentylene tetrazol caused convulsions in the mice chosen for the investigation. The mice were separated into various groups. A group received standard saline treatment. The third group received diazepam treatment, whereas the second group received *R. damascene* extract treatment. Treatments of all kinds were given intraperitoneally. These dosages were given before the pentylene tetrazol injection. Mortality rate, initial minimum colonic seizure, and generalized tonic-colonic seizure were the assessment criteria. By using *R. damascena*, these parameters were significantly reduced. *R. damascena* may help treat PTZ-induced seizures, but more research is required to determine how it works exactly [58].

**Antioxidant effects:** *R. damascena* has a substantial antioxidant and lipid peroxidation inhibitory effect in vitro, similar to tocopherol, as demonstrated by its inhibitory effect on lipid oxidation and antioxidant effect. According to certain sources [59,60], this plant can be utilized to treat and prevent ailments brought on by free radicals. Both fresh and spent flowers (flowers that have died or are in the process of dying) exhibit antioxidant activity, however, the fresh flower extract has stronger antioxidant activity than the spent flower extract. The presence of a phenolic component in the ethanol extract demonstrated excellent antioxidant activity [61] (Figure 3).



**Figure 3:** Chemical structure Phenol.

### Study in Humans

**Antidiabetic activity:** When used orally, the methanol extract from *R. damascena* lowers blood sugar levels. Similar to acarbose, it suppresses postprandial hyperglycemia. *R. damascena* substantially inhibits the enzyme  $\alpha$ -glucosidase, which slows down the absorption of carbohydrates from the small intestine and produces an antidiabetic effect by lessening the impact of postprandial glucose level [61,62].

**Antilipase effect:** The anticipated effect of *R. damascena* extract has been researched in one study. *R. damascena* ethanol extract contains anticipate action. This plant's anticipate activity has been documented in the literature [63].

**Analgesic effect:** *R. damascena* extracts in ethanol, aqueous, and chloroformic forms were the only ones to exhibit analgesic effects when tested on mice using the tail flick and

hot plate methods [64]. Antioxidants reduce pain during a formalin test, and flavonoids found in *R. damascena* are partly to blame for this analgesic effect [65,66]. The analgesic action is also caused by kaempferol and quercetin, which are insoluble in water [67].

**Hepatoprotective activity:** The hepatoprotective efficacy of *R. damascena* flower aqueous extract on acetaminophen-induced toxicity in rats was investigated [68]. The biochemical markers creatinine, urea, bilirubin, albumin, lactate dehydrogenase, serum alkaline phosphatase, serum transaminase, and reduced glutathione levels were all altered after oral administration of N-acetyl-p-aminophenol (2 g/kg). These values were reversed following oral treatment of *R. damascena* at doses of 250, 500, and 1000 mg/kg b.w. [69].

**Optic effects:** *R. damascena*'s herbal eye drop was tested for conjunctival xerosis, post-operative cataract, conjunctivitis, and acute dacryocystitis, among other ophthalmic conditions. Because of its anti-inflammatory and anti-infective qualities, improvement was observed in several cases. It is crucial in the treatment of several infectious and inflammatory ocular illnesses [70].

## Conclusion

*Rosa damascena* is a key member of the Rosaceae family and is well known for its fragrant qualities, while it also has a variety of other uses and pharmacological activities. Rose water and its oil are the primary products of *R. damascena*. Flavonoids, anthocyanins, terpenes, and glycosides are among the elements of *R. damascena* that have beneficial effects on the body. Analgesic, antibacterial, antiviral, antimicrobial, anticonvulsant, depressive, anticancer, relaxing, and hypnotic properties are all attributed to *R. damascena*, according to studies. It is employed as a laxative and for a variety of digestive issues, including constipation. *R. damascena* eye drop is excellent for treating ocular conditions. The pharmacological action discussed in this paper demonstrated that *R. damascena* holds promise for new hepatitis treatments in the future. According to the literature, this plant exhibits great hepatoprotective action. *R. damascena*'s anticipate, anti-disease, Alzheimer's antiseizure, alpha-glucosidase inhibitory, anti-dysmenorrheal, anti-inflammatory, analgesic, hypnotic, antidementia activity, and laxative activities have all been proven by recent scientific investigations. Based on its use in Unani and folklore, documented medical action implies the significance of the substance and provides some insight. To comprehend its antiviral action and the development of novel medications, thorough phytochemical screening and biological activity investigations must be carried out. Only then will the global hepatitis epidemic be addressed.

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