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The medicinal and pharmacological properties of Damascene Rose (*Rosa damascena*): A review

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Abstract

For centuries, the Damask rose has symbolized beauty and love. The fragrance of the rose has been captured and preserved in the form of rose water by a method that can be traced to ancient times in the Middle East and later to the Indian subcontinent.

Damascene Rose or *Rosa damascena* is one of the most important species of Rosaceae family flowers. This herb can grow in different climatic regions, but the best climate for this herb in arid and semi-arid regions with low temperature Damask Rose was originated from Damascus, Syria. It was suggested that the French Crusader Robert de Brie, who took part in the Siege of Damascus in 1148 at the second crusade, is sometimes credited for bringing the Damask rose from Syria to Europe. Other accounts state that the ancient Romans brought it to their colonies in England. *R. damascena* is an ornamental plant which have in addition to perfuming effect, several pharmacological and nutritional properties including antibacterial, antioxidant, antitussive, soothing, antidiabetic, anti-HIV, and culinary properties. The medicinal functions of Rosaceae are partly attributed to their abundance of phenolics compound. Phenolics possess a wide range of pharmacological activities, such as antioxidants, anti-inflammatory, antimutagenic, and antidepressant.

Keywords: Damask Rose, Essential oil, Pharmacological properties, *Rosa Damascena*, Rose water

1. Introduction

Damask Rose, or Damascena Rose (*Rosa damascena*) is a plant with mostly pink and red flowers which possess exceptional properties. *Rosa damascena* is one of the most important species of Rosaceae family for centuries, the Damask rose has symbolized beauty and love. The fragrance of the rose has been captured and preserved in the form of rose water by a method that can be traced to ancient times in the Middle East and later to the Indian subcontinent [1]. The Damask rose is a shrub grows to 2 meters tall, the stems densely armed with many curved spikes. It has five or seven leaflets which falls off after maturity. *Rosa damascena* flowers harvest is on-time per year. The roses are a light to moderate pink to light red. This plant has long been grown and cultivated in many countries and has several by-products, such as Rosewater [2]. This herb can grow in different climatic regions, but the best climate for this herb in arid and semi-arid regions with low temperature. The best temperature for this plant is 15-21 degrees and also in regions where the temperature difference between night and day is 5 to 10 degrees, the quality of the flowers is higher. All of the mentioned climate factors lead to enhancing the flower quality and Damask Rose perfume [3].

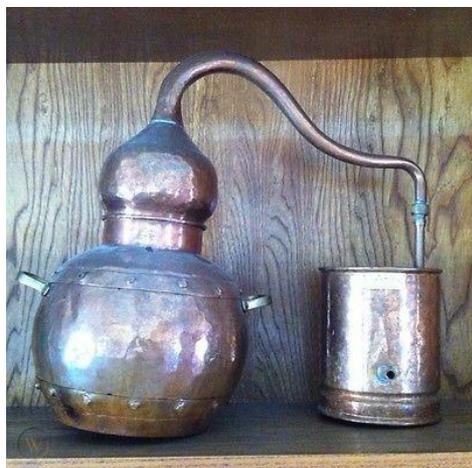


Picture 1: Damask Rose harvest in Damascus countryside

Damask Rose was originated from Damascus, Syria. It was suggested that the French Crusader Robert de Brie, who took part in the Siege of Damascus in 1148 at the second crusade, is sometimes credited for bringing the Damask rose from Syria to Europe. Other accounts state that the ancient Romans brought it From Damascus to their colonies in England [4].

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The main Products of Damask Rose are Rose essential oil, Rose water, Rose tea and petals. These products are used in a variety of industries such as perfumes, cosmetics, and pharmaceuticals. Flowers and the dried buds of the rose can be used in the food industry and jam production as well as cooking. The most fascinating feature of the *Rosa damascena* flower is its perfume. Rose Essence is one of the most famous essences in the world and is very expensive [5].



Picture 2: Alembic has been used to extract essential oil from Damask Rose

Nowadays, this plant is primarily cultivated in Damascus countryside, Al Marah village which is about 60 Km from Damascus for making rose water and extracting essential oil. There are many evidences the crude distillation of roses for the oil was known in the late 7th century AD [6]. Historically, *R. damascena* was used in therapy of abdominal and chest pain, heart health [7], menstrual bleeding [8] digestive problems, and prevention of inflammation [9]. It has been effective as a cough treatment especially in children besides being a gentle laxative. Rose oil can help in treatment of depression, nervous stress and tension. Using Damask Rose oil in vapor therapy can be helpful for some allergies, headaches, and migraine [10-12].

This article will discuss the important pharmacological and nutritional properties of *R. damascena* that recently have been published in many studies.

Rose water is the main product of *R. damascena* is which contains 10-50% rose oil. It's used in religious festivities and can be of high value in the food industry and in some special foods. Rose oil is another valuable product which is by distillation of the fresh flowers of *R. damascena*. The oil is prepared in copper alembic apparatus whereas dried bud and petals are in making jam or jelly which has nutritive value [13, 14].



Picture 3: Several products of Damask Rose

2. The Chemical analysis of *R. damascena*

R. damascena contains many important components such as terpenes, glycosides, flavonoids, and anthocyanins [15]. This rose also contains carboxylic acid [16], myrcene [17], vitamin C [18], kaempferol and quercetin [19]. It also contains fatty oil and organic acids. The identified compounds were; β -citronellol, nonadecane, geraniol, and nerol and kaempferol were the major components of the oil. Analyses of rose absolute showed that phenyl ethyl alcohol, citronellol, nonadecane and geraniol ethanol, and heneicosane were the major compounds [20].

3. The medicinal properties of *R. damascena*

3.1 Antibacterial effects

R. damascena has wide spectrum antibacterial activities against *Escherichia coli*, *Pseudomonas aeruginosa*, *B. subtilis*, *Staph. aureus*, *Chromobacterium violaceum* and *Erwinia carotovora* strains. The most sensitive microorganism against rose essential oil was *C. violaceum*. *E. coli* was also sensitive against rose essential. Rose absolute also showed antibacterial activity against both gram-negative and gram-positive bacteria [21]. The essential oil of *R. damascena* remarkably inhibited the growth of the three strains of *Xanthomonas axonopodis* spp. The *in vitro* antibacterial activities of essential oil from *R. damascena* were also shown by disk diffusion testing against *E. coli*, *Staph. aureus* and *Ps. aeruginosa*. *R. Damascena* showed antimicrobial activity against *Staph. aureus* in this study [22].

Antibacterial effect of major components of rose oil (citronellol, geraniol and nerol) was reported. Therefore, Antibacterial effect of rose oil maybe mediated by these components. Antibacterial properties of rose absolute could be attributed to its high phenylethyl alcohol content. The antimicrobial properties of alcohols have been known for a long time [23].

3.2. Antioxidant and anti-inflammatory effects

R. damascena posse's antioxidant properties. The antioxidant activity of hydro-alcoholic extract of petals and essential oil of this plant was also evaluated by DPPH for measurement of free radical scavenging activity and by ferric ammonium thiocyanate method for evaluation of lipid peroxidation properties. Additionally, three flavonol glycosides of ethanolic extract including quercetin-3-O-glucoside, kaempferol-3-O-rhamnoside and kaempferol-3-O-arabinoside have antioxidant activity. However, the potential of this effect is maybe due to existence of quercetin 3-O-glucoside and other flavonoids in the extract [24]. Damask Rose showed a potent antioxidant and lipid peroxidation inhibitory effects comparable to Vitamin E suggesting that the rose can be a method of treatment and prevention of many free radical diseases. The rose also contains vitamin C which has antioxidant and anti-inflammatory effects [25]. In a recent study, the effects of a rose-flower extract on the mortality rate of *Drosophila melanogaster* was evaluated. Supplementing *Drosophila* with the plant extract resulted in a statistically significant decrease in mortality rate in male and female flies. The study also observed anti-aging effects of the flower Therefore; *R. damascena* can extend *Drosophila* life span without affecting physiological mechanisms [26].

3.3. *R. damascena* effect on respiratory function

This plant significantly reduce number of coughs induced by citric acid, in guinea pigs. The potent relaxant effect of extract and essential oil that was comparable to that of theophylline

on tracheal smooth muscle of guinea pigs [27]. This effect might be due to its possible tachykinin inhibitory substance(s) content mediating both bronchodilatory and antitussive effects [28].

Some components of *R. damascena* can stimulate β -adrenergic receptors or inhibit histamine (H_1) receptors. These results indicated a stimulator effect for this plant on β -adrenoceptors and/or histamine (H_1) receptors blocking effect. Based on bronchodilatory effect of calcium channel blockers, an inhibitory effect of this plant on calcium channels of guinea pig tracheal chain also suggested [29].

There is also a relaxant effect on tracheal smooth muscle of guinea pigs of the aqueous, ethyl acetate and n-butanol fractions of *R. damascena* surpassing theophylline. The greater relaxant effect of ethyl acetate fraction compared to the other two fractions suggests that lipid soluble (non-polar) constituents of this plant are mainly responsible for its relaxant effect on tracheal smooth muscle [30].

3.4. *R. damascena* effect on cardiovascular functions

R. damascena potentially increased heart rate and contractility in isolated guinea pig heart. However, a possible stimulatory effect of the plant on β -adrenoceptor of isolated guinea pig heart is suggested. Cyanidin-3-O- β -glucoside was isolated from the buds of *R. damascena*. Which can significantly suppress angiotensin I-converting enzyme (ACE) activity. Because ACE is a key enzyme in production of angiotensin II, *R. damascena* may be effective to improve the cardiovascular function [31].

3.5. Neuropharmacological effects

Ethanol extract of the flowering tops of *R. damascena* has been shown to possess a potent depressant activity on CNS in mice [32]. Some of these effects that evaluated are described below.

3.5.1. Soothing effect

The ethanolic, aqueous and chloroformic extracts from *R. damascena* were used for soothing effect in mice. The ethanolic and aqueous extracts in doses of 500 and 1000 mg/kg significantly increased the pentobarbital induced sleeping time in mice which was comparable to diazepam. However, the chloroformic extract has not shown to have soothing effect [33]. Damask Rose can prolong the pentobarbital induced sleeping time comparable to diazepam. *R. damascena* contains several components such as flavonoids and terpenes [34]. These compounds have soothing effect [35]. Therefore, it is suggested that these compounds may be responsible for the soothing effect of *R. damascena*. Flavonoids have been shown to have anxiolytic and/or antidepressant activity in numerous studies. Flavonoids were suggested to contribute to the soothing effect [36].

3.5.2. The analgesic effect

R. damascena contains flavonoid. It is suggested that quercetin and kaempferol which are not soluble in water may be responsible for this effect [37]. It has been suggested that antioxidants in *R. damascena* reduce pain. Therefore, it seems that these compounds have some role in the analgesic effect of the plant [38].

3.5.3. Protective effects against dementia

R. damascena is considered beneficial in the treatment of dementia. studies found that the chloroformic extract of the *R. damascena* significantly induced the neurite outgrowth

activity and inhibited the amyloid β ($A\beta$), the major cause of Alzheimer [39, 40].

3.5.4. Anticonvulsant effect

Flavonoids and other components of essential oil of *R. damascena* such as geraniol and eugenol maybe involved in protecting against epileptic seizures and showed a significant reduction in the mean frequency of seizures in patients using essential oil of the rose. Therefore, the essential oil of *R. damascena* has beneficial antiepileptic effect in children with refractory seizures [41, 42].

3.6. Anti-HIV effects

The effect of water and methanol extracts of *R. damascena* has shown anti-HIV infection activities. Kaempferol 1 and its 3-O- β -D-glucopyranosides 3 and 6 exhibited the greatest activity against HIV infection of C8166 cells. Compound 8, a new natural product exhibited some anti-HIV activity, due to the presence of the galloyl moiety since 2-phenylethanol-O- β -D-glucopyranoside was inactive [43].

3.7. Glucose lowering effect

Oral administration of the methanol extract of *R. damascena* plant significantly decreased blood glucose. Anti-diabetic effect of this rose maybe mediated by inhibition of α -glucosidase that suppressed carbohydrate absorption from the small intestine and can reduce the postprandial glucose level. In addition, methanol extract inhibited postprandial hyperglycemia similar to of acarbose. *R. damascena* is a potent inhibitor of α -glucosidase enzyme [44, 45].

3.9. Culinary uses

Damask roses are used in cooking as a flavoring ingredient or spice. Rose water and powdered roses are used in Middle Eastern cuisines. Rose water is often sprinkled on meat dishes, while rose powder is added to sauces. Whole flowers, or petals, are also used in the herbal tea "zuhurat" or the flower tea which is very common in Syria and it is believed to have medicinal use during winter to fight cold and flu. In other countries of the Middle East, the most popular use is in the flavoring of desserts such as ice cream, jam, Turkish delights, rice pudding, and yogurt.

Western cuisines do not use roses or their products much although it was a popular ingredient in ancient times and continued to be popular well into the Renaissance. It was most commonly used in desserts, and still is a flavor in traditional desserts.

4. Conclusion

The *R. damascena* is one of the most important species of *Rosaceae* family mainly known for its perfume and rose water. This plant contains several components such as terpenes, glycosides, flavonoids, and anthocyanins that have medicinal properties. The pharmacological effects of *R. damascena* are widespread. Most of the CNS effects are soothing, analgesic, and anticonvulsant effects. The respiratory, cardiovascular, laxative, anti-diabetic, antimicrobial, anti-HIV, anti-inflammatory, and antioxidant are other effects of this plant. It is suggested that lipid soluble (non-polar) constituents of this plant are mainly responsible for most of the above-mentioned effects.

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