

THERAPEUTIC INSIGHTS OF ROSA SPECIES

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ABSTRACT

Rose (*Rosa spp.*), often praised and celebrated as the symbol of love and beauty, has potential beyond mere attraction by possessing rich medicinal aspects that go beyond beauty and attractiveness. This review delves into exploring the therapeutic insights of roses in terms of examining the bioactive compounds such as flavonoids, anthocyanins, tannins, and essential oils, which impart pharmacological attributes of diverse nature. It highlights both classical and modern viewpoints, suggesting that it can alleviate ailments such as inflammation, oxidative stress, microbial infections, with mental health disorders. The therapeutic efficacy of rose extracts and essential oils with anti-inflammatory, antioxidant, antimicrobial, and neuroprotective benefits is underscored through *in vitro* and *in vivo* studies. Moreover, integrating roses into nutraceuticals and modern pharmacology unveils a promising avenue for the development of remedies that are plant-based with minimal side effects. The review identifies considerable research gaps, such as low clinical trials and inconsistent standardization protocols, which encouraged further exploration to harness roses' full therapeutic potential. This work synthesizes a logical combination of centuries-old wisdom and modern scientific data, urging people to turn their attention to roses as powerful healing elements. The revelation of their secrets may become a game-changer in the natural medicine field and positively affect the health situations of the world population, and thus, it once again proves the idea that the petals of this eternal flower have much more than just a decorative worth; they are the synonyms of wellness and healing.

INTRODUCTION

The roses, the most popular flower of all, which are also adored as the Queen of Flowers, have enchanted mankind throughout centuries with their beauty, symbolic nature, and practical use. Apart from their ornamental or decorative beauty, roses are closely associated with the cultural, pharmaceutical, and financial implications of roses. The fossil reports indicate the existence of roses 40 million years back, with the earliest reports on their usage found in early Chinese and Sanskrit

literature (Nazarenko *et al.*, 1983). The genus *Rosa*, as a part of the Rosaceae family, includes over 200 species as well as more than 25,000 cultivars. The flexibility and eco-significance of those plants are evidenced by their prosperity on many continents, such as Europe, Asia, North America, and even the Middle East (Ljubojević and Tanjga, 2025). Such diversity and beauty, united with practical utility, make the roses phenomenal in the social life and history of a human being.



Figure 1: *Rosa centifolia* (Pierre-Joseph Redouté, Les Roses)

Roses as medicines are a source of a golden treasure of bioactive compounds, including phenolic acid, flavonoids, anthocyanins, and essential oils. The constituents help give the plant anti-inflammatory, antimicrobial, antioxidant, and antipyretic effects, and therefore, roses owe their value to them in both traditional medicine and modern healthcare (Kumari et al., 2017). An example is *Rosa rugosa*, endemic to East Asia, whose leaves and petals have been used in the treatment of stomach problems, diarrhea, and recurrent inflammation. In the same way, *Rosa canina* which is most common in Europe, is famous due to the large presence of numerous bioactive substances, including phenolic acids (gallic acid, ellagic acid, chlorogenic acid, ferulic acid, p-coumaric acid), carotenoids (β -carotene, lycopene, rubixanthin, lutein, and zeaxanthin), fatty acids (linoleic, oleic, palmitic, and stearic), flavonols (catechin and epicatechin and their derivatives), flavonols (quercetin and its derivatives, kaempferol and its derivatives), flavonones (luteolin derivates, apigenin derivates), and minerals (Na, K, Ca, Mn, Fe, Zn, P, S, Se) (Alecu et al., 2025). Outside the scope of conventional medications, rose oils and extracts are used significantly in dermatology, aromatherapy, and complementary cancer therapies (Milka et al., 2021). New studies also draw attention to the opportunities provided by them in the fight against such diseases as cancer and HIV (Akram et al., 2020).

Cultural resonance of roses began in the 12th century and is shared across cultures in the world, and is commonly used to represent divine love, grace, and virtue. Persians value the rose as symbolizing nature, the rose of Mohammed, the Gul-E-Mohammadi, but European folklore holds that the rose is a symbol allied to purity and romanticism. On the economic front, the perfume and cosmetics industries cannot do without the roses. *Rosa damascena* Mill., *Rosa alba* L., *Rosa gallica* L., and *Rosa centifolia* L. are widely utilized species in the construction of their valuable oil products, such as oils, concretes, and absolutes, which are prized for their unique aromas and therapeutic effects (Dirani and Ahmad, 2016). Roses are proving to be useful ingredients in the culinary field, too, with powerful health impacts. The edible rose with abundant antioxidants and phytonutrients is increasingly being used in teas, jams, baked products, and desserts (Jiang, 2024). These compounds add color and flavor to foods, and as bioactives, they are cardiovascular-protecting and can also have anti-aging effects (Wang, 2024). Although roses have such potential, they are not used in respectable gastronomy sufficiently because not many people know about the health value and medicinal possibilities of roses (Gillespie and Cousins, 2012).

Biomimetic inventions have also opened the mystery of roses in science and technology. Unique properties are described by the nanoscale and

microscale structure of rose petals, which is why they are water repellent and absorb light, leading to new achievements in the field of materials science, such as photonics and electronic devices (Zhao et al., 2023). Such innovations underline the versatile nature of the plant and expand its importance to spheres that are beyond the conventional treatment.

This review presents a detailed discussion about roses, as it brings into the picture the history of roses, the medicinal value they bring, their culture, and their technological application. Through discussing their therapeutic potential, uses in culinary and supplying in the industrial sector, it reveals the long-term significance of roses as a natural medicine and all-purpose products that are able to approach modern-day problems in various fields.

MEDICINAL HISTORY OF ROSES

The medical history cannot be disentangled from the history of humanity since human civilizations have developed together in a cycle of budding knowledge in the subject of medicine. Since the dawn of humanity, one of the main functions of the doctor has been diagnosis and subsequent treatment, which was the basis of the medical sciences. Medical progress was also advanced by ancient societies like those of China, India, Mesopotamia, and Egypt, where there was a lot of exchange of ideas, including those across borders (Lorkowski and Pokorski, 2022). Ancient Egypt had a strong rose relationship with goddess Isis, and roses were commonly employed in religious ceremonies and given as dedication offerings to the goddess. This cultural exchange preconditioned Greeks, and Ionians especially, to improve and continue the previous medical knowledge (Freeman, 2023). Their traditions were characterized by philosophical soundness and empirical investigations, and these formulations formed a basis that other civilizations embraced and improvised.

The torch was passed to the Islamic world, which preserved the ancient knowledge and added tremendously to existing knowledge with great ingenuity during the Middle Ages. Individuals like Avicenna (Ibn Sina) integrated and enhanced the body of knowledge of the past and produced a body of work that reached Europe in the Renaissance. Throughout history, this wisdom traveled the

continents, and this led to refinement, revisioning, as well as revolutionizing medical practices, and the trend continues in modern medicine (Saad, 2024). In this ongoing development, the rose reappeared as an unspoken major player in the art of therapeutics. Its path is representative of the more global story of medicine, switching civilizations and having its applications varied and multiplied with every cultural interaction.

The use of the rose as a source of medicine reached its peak during the Ottoman period and rose to become an inseparable part of the medicine of the physician. Medical manuscripts belonging to the Ottoman medical tradition detailed how its therapeutic solutions, syrups, oils, powders, and ointments were to be prepared, and each of these was specifically designed to treat particular ailments (Altıntaş, 2023). These scripts show that the appreciation and use of roses is of a high level of sophistication. Nevertheless, there is its therapeutic value of the rose precedes the Ottomans. Roses were used heavily in Greek and Roman pharmacology, especially rose oil, as a general remedy (Totelin, 2024).

It was described in detail in its uses by Pliny the Elder in his book Natural History (1st century CE) and by Dioscorides in his publication De Materia Medica (1st century CE).





(a)

(b)

Figure 2: (a) Ancient History by Pliny the Elder and (b) de Materia Medica by Pedanius Dioscorides

They also referred to the rose as cooling and astringent, and roses, when dried even more potent medicinally than fresh ones. In their writings, they described its many applications: against headaches, diseases of the eyes, ears, gums, mouth, against distress of the uterus, and against inflammations of the hypochondrium and stomach. It was also used to treat the conditions of erysipelas, diarrhea, dysentery, and blood spitting. Outside its internal applications, it could be used in the form of salves, lip balms, or in powder and ointments applied after baths. It is impressive that Pliny and Dioscorides seem to have resorted to the same material, because their descriptions are almost identical, and the cooperation in ancient pharmacology is evident.

The long tradition of the rose in medicine demonstrates how resourceful and medicinally strong the rose can be. Its path between the ancient times and the Ottoman period represents a larger story of scientific exchange in which natural remedies were constantly updated and redefined to respond to the requirements of the various civilizations. The historical legacy of the rose as a healing plant is used nowadays not only as a metaphor but as the source of modern medicine that is still developing its perspective to use plant

substances that can heal patients in another approach to providing innovation in the face of tradition.

TRADITIONAL THERAPEUTIC USES OF ROSE

Ancient Egypt (3000BC-30BC)

The roses were like golden apples in Ancient Egypt, which were appreciated both because of their beautiful look and due to their healing properties. The Egyptians extensively used rose oil and rosewater during their skincare process and loved their functions of relaxing, anti-inflammatory, and antimicrobial processes (Takahashi, 2024). There were some of the natural remedies that were very popularly used to calm a skin irritation, treat cuts and wounds, and rejuvenate a complexion, and as such were the most desired ingredients in their beauty and health regime. Owing to the fact that it is closely linked with goddess Isis, most people believed that its curative value guarded the body as well as the soul (Delcea and Buzea, 2025).

Ancient Mesopotamia (3500BC- 539BC)

Roses were deemed to have medical properties, especially the antiseptic and anti-inflammatory properties, in ancient Mesopotamia. The roses and

rose oil, and rose extract were used by the Sumerians, the Babylonians, and the Assyrians to heal wounds, infections, and other skin problems. Rose petals were also added to ointments to incorporate comfort and coldness effects. Other than medicinal purposes, roses were also used in religious practices so that when applying them, one could win the benefits of divine intervention (El-Malahi, 2025).

Traditional Chinese Medicine (TCM) (2700BC-Present)

Over twenty centuries, Traditional Chinese Medicine has known the worth of roses in the movement of the Qi or vital energy, or blood circulation enhancement (Matos et al., 2021). Rose petals have been adopted in the treatment of digestive disorders, such as bloating and indigestion, in Traditional Chinese Medicine, and these flowers are also thought to alleviate emotional disorders, such as irritability and stress. Besides, rose oil has also been an integral part of aromatherapy, where it is notorious due to its ability to calm the mind and enable people to achieve emotional balance (Xu et al., 2025).

Ayurvedic Medicine (1500BC-Present)

Roses have always been lauded in Ayurvedic medicine because of their cooling and soothing effects as well as their purifying effects (Gupta, 2023). Rosewater has been used to treat many skin disorders, such as acne, eczema, and skin rashes, and its petals (particularly as Gulkand) are considered effective in promoting good digestive health by assuaging bloating and constipation (Shukla et al., 2024). Additionally, rose oil is also appreciated for being used to relax the mind, as well as to relieve stress, which affects a Pitta dosha, which contributes to the maintenance of the heat and inflammation levels in the organism (Iche and Mane, 2024).

The Middle Ages (5th-15th Century)

During the Middle Ages, roses were valued for their most impressive healing powers. In a bid to have access to medicine, these beautiful flowers grew, and monks in monasteries became busy cultivating these beautiful flowers (Touw, 1982). Rose water was used as an ingredient in many medicines and proved to be an effective treatment for skin diseases, wounds, and burns. On top of this, rose petals were always included in herbal

decoctions, also meant to remedy respiratory problems as well as digestive ailments. Emotional healing and stress relief also took place with the soft scent of roses, especially in the calm surroundings of the religious environments (Winston-Allen, 2010).

The Renaissance (14th-17th Century)

The medicinal properties of roses were extensively researched and widely accepted during the Renaissance. Rosewater gained popularity in the domain of skincare and proved to be an effective remedy for problems such as acne and wound healing (Ellzey, 1973). Rose syrup, which was made of rose petals and sugar, was also used in treating ailments like colds, indigestion, and sore throats. Roses, too, were entangled with the humoral theory, as they were believed to aid in balancing the body's humors, particularly in cases of inflammation and digestive disorders (Mazzola and Foss, 2023).

The Victorian Era (1837-1901)

The Victorian era was the period when rosewater was recognized as one of the crucial elements of skin care habits, as it was applied to take care of several skin problems like acne, rashes, and injuries. Vitamin C-rich rose hip was used to prevent scurvy and promote the immune system. Rose oil, meanwhile, was developed as a remedy for relaxation, stress, and anxiety. Rose tea also became widely accepted as a healing drink to ease stomach problems, and rose petals were acclaimed to have a good influence on the mental and emotional field (Ramos, 2015).

The 19th Century (1800s)

The 19th century can be considered a major period in the use of roses as a remedy as well as beauty products. Rose syrup and rose hips were widely used in order to get rid of digestive distress, the common cold, and cough. In the meantime, rose oil became frequent in skin care since it has an outstanding effect, restoring the skin after scarring, downplaying body inflammation, and healing burns. Roses, in addition to being used in the fields of medicine, were used in perfumes and tonics, and preserved their noble position in herbal medicines due to their healing properties. This period underscored the enduring legacy of roses as versatile allies in health and beauty (Ryliene, 2018).

Early 20th Century (1900s)

In the early 20th century, rose essential oil emerged as a key ingredient in both aromatherapy and cosmetic formulations. Renowned for its rejuvenating effects, rose oil was believed to help diminish the appearance of wrinkles and promote youthful skin. Meanwhile, rose water and rose petals remained staples in herbal remedies, and rose tea continued to be enjoyed for its rich antioxidant properties and digestive benefits (Ryliene, 2018).

Modern Era (21st Century)

In the 21st century, roses remain a staple in both modern herbal medicine and skincare. Rosewater and rose oil are common ingredients in beauty products. Gulkand, the most delicious medicine known to mankind, has been used in the sub-continent till now to soothe the gastrointestinal tract (Shukla et al., 2024). Rose tea and rosehip supplements are still consumed for their digestive and immune-boosting benefits. The continued use of rose oil in aromatherapy reflects its ability to

alleviate stress and improve emotional well-being (Dagli et al., 2019).

Physiological as well as psychological relaxation has been proven to occur in viewing fresh red roses. In near-infrared time-resolving spectroscopy (TRS) experiments, a dramatic reduction in the concentration of oxyhemoglobin in the right prefrontal cortex has been observed in the initial minute of exposure, and is related to the reduced neural activity during responding to stress. Further analysis of heart rate variability (HRV) found a significant inhibition of the sympathetic nervous system in favor of the tranquilizing effect of roses. All this was psychologically proven when the participants stated that they felt more relaxed, natural, and good when looking at roses. Mood assessments indicated a considerable decrease in negative emotions and a rise in the overall good mood (Song et al., 2017). These findings match an earlier study conducted on nature-derived stimuli consisting of foliage plants (Song et al., 2018), testifying to the possibility of fresh flowers as stress and mental well-being drivers.

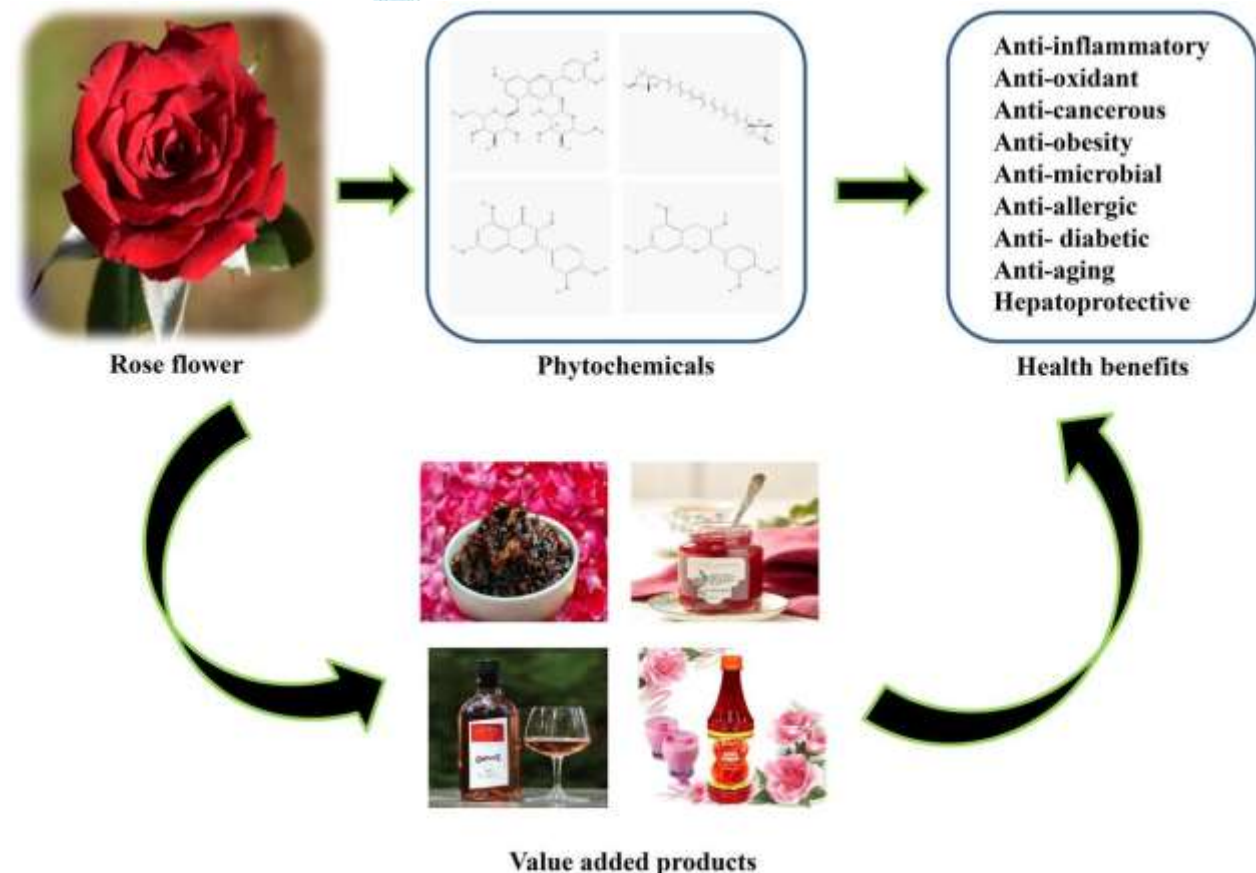


Figure 3: Phytochemicals, Health Benefits, and Value-Added Products of Edible Rose Flowers.

[Reprinted from *Food Research International*, 162(Part A), 111977, by Hegde et al., (2022), <https://doi.org/10.1016/j.foodres.2022.111977>]

CHEMICAL COMPOSITION AND MODERN THERAPEUTICS OF ROSE

Phytochemicals have been coined as naturally occurring plant compounds that are central to the color, fragrance, and taste of plants and offer necessary mechanical as well as physiologic shelter against afflictions, predatory attacks, and weather conditions (Vinci et al., 2025). In addition to their protective roles, the bioactive compounds also have great health benefits for people. Rose flowers have

a great abundance of numerous bioactive phytochemicals to date, such as carotenoids, phenolic acids, as well as flavonoids (Simin et al., 2024). Such compounds possess numerous therapeutic characteristics, including cancer treatment, diabetes treatment, inflammatory response, free radical scavenging, and anti-cyclooxygenase and anti-resorcinol, therefore, emerge as an abundant source of vital nutrients (Mármol et al., 2017).

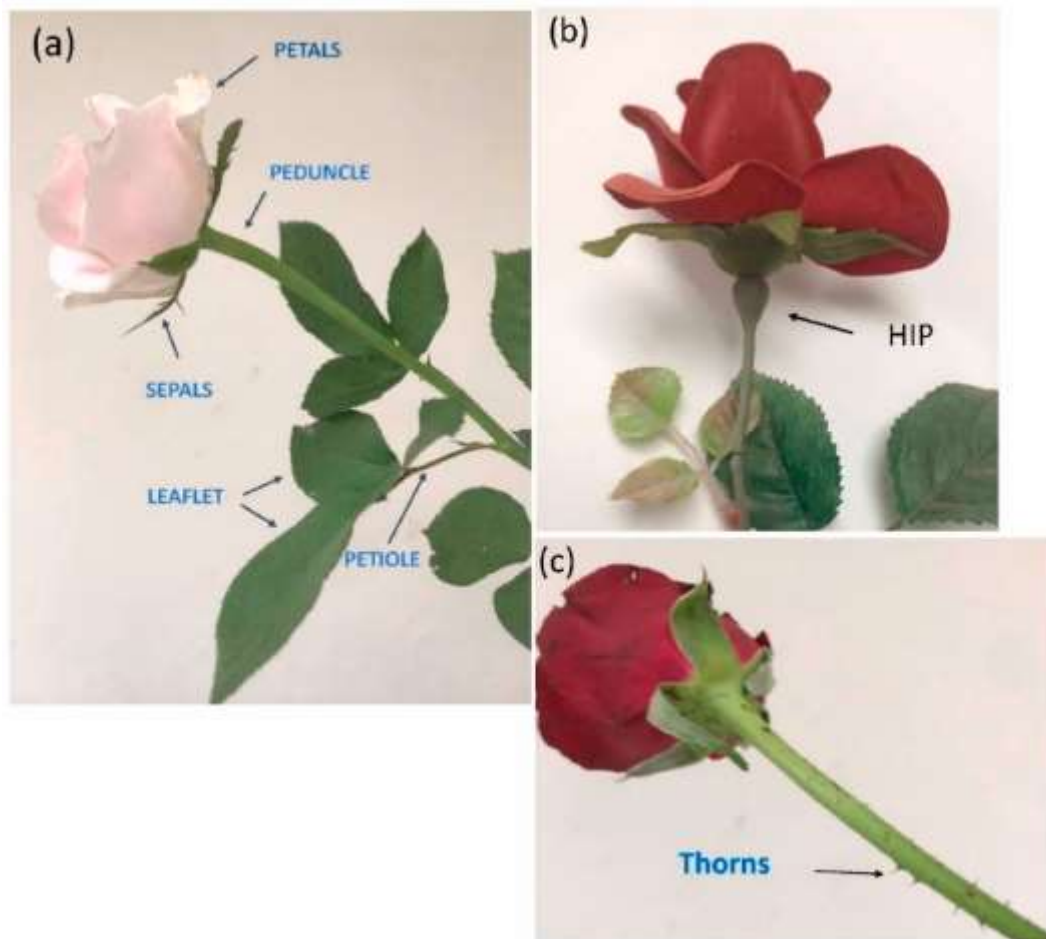


Figure 4: (a) Petals, peduncle, sepals, leaflets, and petioles of rose; (b) hip of rose; (c) thorns of rose. [Reprinted from *Heliyon*, 10(1), by Wang, (2022)]

The intensive research has revealed *Rosa* spp. to be a source of bioactive compounds, containing, in turn, phenolic and terpene derivatives can be identified as the most important. Genus *Rosa* L. features a wide range of essential bioactive compounds, i.e., flavonoids, triterpenes, tannins, phenolic acids, polysaccharides, fatty acids, organic acids, carotenoids, and vitamins (Wang et al., 2021). These bioactive compounds have been very significant in maintaining human health by aiding in many of the biochemical processes. The *Rosa* spp. is specifically famous for the richness of

essential vitamins, specifically vitamin C. The hip of *Rosa* L. species is also full of flavonoids like quercetin, hyperoside, astragalin, rutin, and kaempferol-3-arabinoside, in the wide phytochemical profile of its extract. In addition, tocopherols and numerous types of carotenoids, such as lycopene, lutein, and 3-carotene, further strengthen its nutritional worth. The leaves of rose plants are also abundant in biologically active compounds (carotenoids, chlorophylls, tocopherols, and flavonoids) (Tolekova et al., 2020).

Table 1. Important components of three popular used parts of roses for industry or medical applications.

Parts	Chemical compound	Possible industry or medical applications
Petal	terpenes, aroma alcohols, flavonoids, anthocyanin, phenolic acids, polyphenols, aldehydes, ketones, tannins, vitamin C (ascorbic acid), carotenoids, minerals	analgesic, anticonvulsive, hypnotic, cardiovascular, laxative, and antioxidant properties, aromatherapy, perfumery, cosmetics and skincare, teas, natural colorant
Hips	vitamin C (ascorbic acid), carotenoids, flavonoids, polyphenols, tannins, pectin, vitamin E (tocopherol), fatty acids, phytosterols	anti-Inflammatory and antioxidant properties, dietary supplements, cosmetics and skincare, natural coloring
Leaves	flavonoids, phenols, hydroxycinnamic acids, tannins, terpenes, aldehydes, alcohols, vitamin C, fatty acids, minerals.	diuretic properties, natural dyes, mild astringent properties

Figure 5: Important Components of Three Popularly Used Parts of Roses for Industry or Medical Applications. [Reprinted from *Heliyon*, 10(1), by Wang, (2022)]

This, in turn, confirms the position of roses as a valuable source of food and therapeutic interest.

Anti-Inflammation

Inflammation is an essential defense strategy deployed when there is an occurrence of harm (pathogenic infections as well as tissue damage). Macrophages are a crucial part of the innate immune response, coordinating immune responses through the production of bioactive factors that destroy pathogens as well as promote tissue healing (Oishi and Manabe, 2018). Nevertheless, the loss of control of macrophages can also have a harmful effect, e.g., in the case of macrophage activation syndromes caused by severe infections, e.g., as in the case of SARS-CoV (Kosyreva et al., 2021). It is important to note that the *Rosa rugosa* flower extract has demonstrated meaningful anti-inflammatory activity upon lipopolysaccharide stimulation of RAW264.7 macrophages (Tursun et al., 2016), whereas in

clinical trials, its preparations have been used in the therapy of coronary artery disease (Zhang et al., 2017). Neuro-inflammation is central in the pathogenesis of neurodegenerative disorders, and the neuroprotective role of flavonoids in modulating inflammatory responses has been reported. Contextually, fruit extract of *Rosa laevigata* Michx demonstrated neuro-protective outcomes against cerebral ischemia-reperfusion harm in rat models (Tao et al., 2018). On the same note, the fruits of *Rosa canina* also portray desirable anti-inflammatory and anti-nociceptive abilities, which further strengthen their use as therapeutic substances in the context of aches (Parandin and Mohammadi, 2019).

Anti-Diabetic

Diabetes mellitus occurs either due to the insufficient secretion of insulin or the inability to respond physiologically to insulin. The lack of

insulin secretion is acute, especially in type I diabetes (Katsarou et al., 2017). Of late, there has been the use of herbal interventions, such as the use of α -glucosidase and other interventions, as possible therapeutic agents in the management of diabetes (Kashtoh and Baek, 2022). The extract of *Rosa damascena* has shown significant inhibition of more than 50% of α -glucosidase and has been reported to have decreased blood glucose levels in experimental rats (Alsalti et al., 2022). In addition, *R. damascena* oil has the protective capacity against diabetes related testicular damage of rodents, which helps enhance the sperm count and raise seminiferous tube diameter (Hamedi et al., 2018). Rose pomace, which is an abundant source of insoluble dietary fiber, was found to be associated with increased insulin sensitivity, and therefore, it decreases the chances of type II diabetes (He et al., 2020). In addition, polysaccharides isolated by water-soluble potential of *R. roxburghii* Tratt fruit have boosted their great potentials in α -glucosidase inhibition (Chen et al., 2022).

Anti-Microbial

Rose water has a strong anti-microbial effect, where it successfully prevents the growth of different microorganisms. *R. rugosa* extracts were also found to be antibacterial to the pathogenic strain of *Bacillus cereus* and *Staphylococcus aureus* (Cendrowski et al., 2020). *R. gallica* cv. *Aedes aegyptiaca* leaves exhibit antioxidant and antimicrobial activity on several microbial strains (Abdelbaky et al., 2021). In a similar way, the flower cell sap of *R. rugosa* Thunb. has proven impressive antimicrobial effects, putting further accents on the therapeutic potential of *Rosa* specie in the fray against microbial infections with a broad spectrum of activity (Ren et al., 2018).

Anti-Aging

UV radiation also poses a major problem as it is an external age-related factor affecting the health of the skin (Dorosz et al., 2025). A mixture of *Kochia scoparia* and *Rosa multiflora* extracts has been promising in the treatment of photo-aged skin (Jeon et al., 2016), and *R. gallica* treatments were able to prevent UVB-induced aging by downregulation of cyclooxygenase-2 and matrix metalloproteinase-1 (Jo et al., 2021). *R. gallica* petal ethanol water extracts suppress the activity of tyrosinase and melanogenesis, therefore, helping to brighten the skin appearance (Shin et al., 2019).

Likewise, the *Rosa centifolia* extracts are also effective in anti-aging and anti-oxidant (Dubois et al., 2022). Due to its anti-bacterial and anti-aging properties, it identifies *Rosa floribunda* Charisma as useful in skin formulations (Younis et al., 2021) and allergy issues with rose oil (Ochando-Ibernon et al., 2018); thus, one should be cautious.

Seizures

Seizures are associated with abnormal and unleashed electrical activities in the brain, and epilepsy is one of the most common forms of long-lasting neurological afflictions (Giourou et al., 2015). There is emerging evidence that oxidative stress and inflammation are instrumental in the development of neurotoxicity of seizures, effectively inhibited by *Rosa hybrida*, which bears neuro-protective quality in murine models (Cuicui., 2021). In addition, *R. damascene* hydro-alcoholic extracts have the ability to delay seizures and decrease the occurrence of pentylenetetrazole provoked convulsions, which could be considered as an indication that the plant is an anticonvulsant drug (Homayoun et al., 2015). The results of this research highlighted the potential of *Rosa* species in the treatment of neurological conditions, especially in managing epilepsy (Yon et al., 2018).

Other

Rose extracts are researched in the neurological field, gastrointestinal field, and liver health. *Rosa* hybrid exhibited anti-proliferative activity on ovarian carcinoma cells through the activity of its methanolic extract (Rivas-Garcia et al., 2021). *R. rugosa* inhibits alcohol mediated hepatocyte apoptosis, showing hepatoprotective potential (Zhou et al., 2021). *R. damascena* oil, which has been used in migraines, provides short-term effects (Niazi et al., 2017) and could be applied in reversing mechanisms of cognition deficits in Alzheimer's disease entities (Esfandiary et al., 2015). In addition, *R. canina* has demonstrated its versatile pharmacological use, and *R. damascene* has still kept its reputation as an effective remedy against digestive disorders, liver diseases, menstrual bleeding, and spleen malfunctions (Akram et al., 2020).

CONCLUSION

The use of roses has remained deep in traditional medicine, and this has occurred over the ages, from ancient times to the modern era. Their medical

utilities have changed and focused more on the relaxation of body and mind, treating infections and skin disorders, as well as balanced emotions. The ever-thriving nature of roses in herbal and conventional medicine attests to the fact that it is an eternal plant in the field of medicine.

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