# Botanical Characteristics, Medicinal Effects and Uses of Rosehip (*Rosa canina*) Plant

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## INTRODUCTION

Food has been required for survival and reproduction since the beginning of humanity. Until roughly ten thousand years ago, people relied entirely on gathering and hunting for sustenance. However, they eventually settled down and shifted away from gathering. Even now, modern humans retain the tradition of collecting for specific foods, which they received from their forefathers. Rosehip is among the most significant of these foods. Rosehip is valuable due to its diversity in consumption, including marmalade, jam, juice, and herbal tea, as well as its high vitamin C content (Güneş & Şen, 2001).

Rosehip (*Rosa* spp.) is beneficial to health because of its numerous bioactive chemicals. Because of its high antioxidant content, it is consumed as tea, particularly during the winter months, to treat ailments like as the flu and the common cold. Rosehip seed oil is high in fatty acids and used to cure skin damage. This oil possesses antibacterial, antioxidant, and anti-inflammatory effects and is often extracted using conventional processes such as cold pressing. Rosehip is also well-known for its medicinal and fragrant properties. Medicinal and aromatic plants have been passed down through generations as part of humanity's millennia-long history (Macit, 2024). Medicinal and aromatic herbs, which were widely employed in practically every community until the late nineteenth century, received insufficient attention in the early twentieth century due to scientific and technological advancements and socio-cultural shifts. The capacity to synthesis organic molecules, particularly in the early 1940s, resulted in the development and widespread use of synthetic medications. The economic and societal implications of World War II increased interest in synthetic pharmaceuticals while decreasing the usage of medicinal and aromatic plants (Craker et al., 2003).

Since the 1980s, increased awareness of the metabolic side effects of synthetic medications, combined with enhanced health information, has fueled interest in drugs derived from medicinal and aromatic plants,

particularly in industrialized countries. This circumstance has accelerated research and studies on medicinal and aromatic plants in recent years, allowing previously gained knowledge to be compiled in scientific papers and incorporated into the literature over time (Başer, 1998).

The *Rosa* genus has 130 species, 25 of which are found in Türkiye (Cairns, 2001; Kutbay & Kilinc, 1996; Ercisli, 2004). They are usually perennial and shrub-like. The rosehip (Rosa canina) species is widespread in Türkiye. It is known by names such as wild rose, rose apple, dog rose, and dog rose among the people. Rosa canina has a thorny structure and can be used as a rootstock for roses with crown heights ranging from one to three meters (Hartmann & Kester, 1974; Türkoglu, 1990). Rosehip syrup was used in Europe during World War II to prevent vitamin C insufficiency caused by problems with citrus fruit importation (Haas, 1995). Rosehip, which has grown in popularity in recent years, is a plant sought after in the pharmaceutical and food industries due to its mineral and vitamin content (Didin et al., 1996). It has the highest vitamin C content of any fruit or vegetable (300-4000 mg/100 g) (Ercisli, 2007) and contains minerals, carotenoids, tocopherol, bioflavonoids, fruit acids, tannins, pectins, amino acids, and essential oils (Cinar & Colakoglu, 2005). It is an important raw material in the pharmaceutical and food industries in some European countries such as Switzerland, Germany and Finland. It is also used in vitamin enrichment processes in the processing of other vegetables and fruits (Keskioglu, 1989; Kaack & Kuhn, 1991).

## 1. TAXONOMY AND DISTRIBUTION

*R. canina* (rosehip) is a significant plant species of the genus Rosa, which is part of the Rosaceae (Rose family), which includes over 100 genera. It is an erect, broad-leaved shrub that grows to a height of 1-2 meters (Ghazghazi et al., 2010; Tolekova et al., 2020).

**Kingdom :** Plantae

**Subkingdom :** Tracheobionta

**Division :** Magnoliophya

**Class :** Magnoliopsida

**Subclass :** Rosidae

**Order :** Rosales

**Family :** Rosaceae

**Subfamily :** Rosoideae

**Genus :** *Rosa*

**Species :** *Rosa canina* L.

Rosaceae is a large family with roughly 2.950 recognized taxa from 100 genera of commercial and ecological value. The family name derives from the Rosa genus. The Rosaceae family consists primarily of herbaceous, shrubby, and tree-like plants. Most species are deciduous, while a few are evergreen. The genera *Sorbus*, *Alchemilla Crataegus*, *Rubus*, *Cotoneaster* and *Prunus* (plum, peach, cherry, apricot and almond) have the most species, totaling around 200. They are found all around the planet, but the Northern Hemisphere has the most diversity.

Rosaceae is one of the most commonly chosen plant families in ethnobotanical research (Franco et al., 2013; Garcia-Oliveira et al., 2020). The Rosaceae family includes woody or herbaceous plants that are sometimes branching. The leaves are simple or compound, usually grouped in many rows, spirally or alternately, and rarely opposite; auricles are frequently present at the base of the leaves, fused to the base of the petiole. Sepals are 4-5 in number, occasionally an epicalyx, and can be free. Petals are 4-5 in number, free, and contain numerous stamens. Flowers are actinomorphic, hermaphrodite (rarely monoecious), epicinal, or periginal. Hypanthyum is often present.

Carpels are abundant and free. Fruit is a nut, fleshy or dry achene, juicy with seeds (drupe) or follicular. They frequently yield aggregation fruits. Endospermless seeds contain nutrients concentrated in cotyledons (Davis et al., 1972; Akkemik, 2018). Insects are typically responsible for pollination. Many organisms reproduce vegetatively. Wood's anatomy is rudimentary. Davis (1965), Blumenthal (1988) and Gruenwald et al., (2000) have all reported that flowers can be sterile.

*Rosa canina* L. (Figure 1) is a 1-3 m tall shrub that grows upright and rarely climbs. The leaves are alternately oriented, dull green in color, and include 5-7 (3) leaflets. The leaflets are elliptical, narrow to widely ovate, 1.2-4.5 x 0.9-2.5 cm, often pointy at the tip, seldom blunt or rounded, with a pointed-wedge-shaped base that is rounded to blunt. The leaves are glabrous on both sides, or finely hairy on the underside; the midrib is glabrous or hairy, rarely stalked, glandular, and bears tiny spines. The stipules are 1.3-2.2 x 0.2-0.6 cm, narrow, long, and sometimes wide. The stipules are conspicuous, and the edges are whole and glandular. The lateral branches are normally arching, drooping downward, and flexible; the thorns are 3-7 mm long, tiny, and delicate on juvenile branches, but stiff, downward-curving, and uniform on older and major trunks. Thorns that resemble needles or hairs are absent. The flowers are glabrous or covered with sticky glandular hairs, solitary, and bractless, with a 1.5-2.7 cm long blackish, glandular, or glabrous stalk. Sepals are lanceolate and narrowly long-lobed at the apex, measuring 1.2-2.5 x 0.3-0.4 cm. The outer sepals are pinnatifid, widely lanceolate or narrowly, glandular-toothed lobed or entire, glabrous to softly densely hairy, and seldom glandular at the posterior end. Petals are typically curled backwards and fall off soon after flowering. Petals up to 3 cm long, white to pale pink, seldom dark pink, 1.5-2 x 1.7-2.2 cm, pointy, whitish cream or cream. Style is short and fuzzy, stigma-head is extremely broad, styles are free, typically glabrous or somewhat hairy, long, seldom finely hairy, stigma-head is more or less loose, cone or spherical, disc is broad and cone-shaped, and the mouth is narrow. Hypanthium is spherical or oval, typically glabrous, but infrequently

stalked glandular, orange-red to blackish-red when mature (Nilsson, 1972; Davis et al., 1972; Kültür, 1998).




**Figure 1:** (a) *R. canina* flowers and (b) ripe pseudo fruits of *R. canina* (Okatan et al., 2019).

Rosehip is widely distributed almost all across the world. It grows natively in a wide range of regions, including Western and Central Asia, Russia, Europe and Africa as well as North America and the Middle East. In Türkiye (Figure 2), the distribution areas of the rosehip plant are reported as Çatalca-Kocaeli, Ergene and Southern Marmara Regions, Upper Sakarya, Central and Upper Kızılırmak Regions, Inner Western Anatolia Region, Black Sea Region, Eastern Anatolia Region, Tigris Region and Mediterranean Region (Güner, 2012).

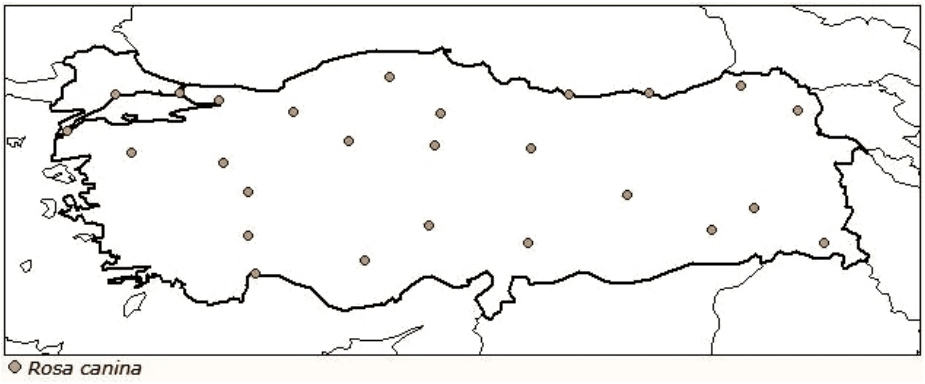



**Figure 2:** Geographic distribution of *Rosa canina* in Türkiye (TUBIVES)

## 2. CHEMICAL CONSTITUENTS OF *R. canina*

*R. canina* L. (red rosehip), a prominent member of the widely recognized *Rosa* L. genus, is regarded as a highly valuable plant-based food source due to its phytochemical properties and biological potential, attributed to its bioactive constituents including vitamin C, phenolic compounds, tocopherols, sugars, carotenoids, organic acids and essential fatty acids (Ercişli, 2007; Barros et al., 2011; Demir et al., 2014; Nadpal et al., 2016).

### 2.1. Fruit (hip) Components

Rosehip fruit includes vitamin C, phenolics, carotenoids (e.g., lycopene, lutein/zeaxanthin), tocopherols, tannins, pectins and organic acids. USDA research showed that 100 g of wild rosehip contains 426 mg of vitamin C, 6800 µg of lycopene, and 2001 µg of lutein+zeaxanthin (Fan et al., 2014).

### 2.2. Seed and Oil Fraction

The seed fraction contains high levels of fatty acids, including linoleic and α-linolenic acid which have been linked to COX enzymes involved in inflammation (Fan et al., 2014; Jäger et al., 2008).

### 2.3. GOPO (galactolipid)

GOPO, found in rosehip, is an anti-inflammatory galactolipid that prevents human peripheral neutrophil chemotaxis (Larsen et al., 2003; Fan et al., 2014). However, it is important to note that the amount of GOPO in rosehip powder may be modest and that the overall rheumatological activity cannot be explained only by GOPO; the impact is related to the synergy of other components (Fan et al., 2014).

Additionally, the table below summarizes the prominent components, reported effects and types of evidence in *R. canina* (Table 1).

**Table 1:** Selected bioactive constituents of Rosa canina, proposed mechanisms of action, and levels of evidence

| Bioactive constituent | Plant part | Proposed mechanism(s) of action | Level of evidence | Reference(s) |
|---|---|---|---|---|
| Ascorbic acid (Vitamin C) | Fruit | Free radical scavenging; inhibition of lipid peroxidation | In vitro, review | Roman et al., 2013; Fan et al., 2014 |
| Phenolic compounds | Fruit, leaves | Modulation of inflammatory mediators; antioxidant activity | In vitro, animal studies | Chrubasik et al., 2008; Pazhouhi et al., 2020 |
| Carotenoids (e.g., lycopene, β-carotene) | Fruit | Cellular protection against oxidative damage | In vitro | Fan et al., 2014 |
| Galactolipid (GOPO) | Fruit | Inhibition of neutrophil chemotaxis; suppression of inflammatory response | In vitro | Larsen et al., 2003 |
| Galactolipid (GOPO) | Fruit | Reduction of pain and stiffness in osteoarthritis | Randomized controlled trials (RCTs) | Winther et al., 2005; Chrubasik et al., 2008 |
| Linoleic acid | Seed | Cyclooxygenase (COX-1 and COX-2) inhibition | In vitro | Jäger et al., 2007; Jäger et al., 2008 |
| α-Linolenic acid | Seed | Anti-inflammatory modulation | In vitro | Jäger et al., 2008 |
| trans-Tiliroside | Seed | Regulation of lipid metabolism; anti-obesity effect | Animal studies | Ninomiya et al., 2007 |
| Standardized rose hip powder | Fruit + seed | Reduction of pain and stiffness in osteoarthritis | Randomized controlled trials (RCTs) | Winther et al., 2005 |
| Rose hip preparations | Fruit | Improvement in functional disability scores in rheumatoid arthritis | Randomized controlled trials (RCTs) | Willich et al., 2010 |

## 3. PHARMACOLOGICAL ACTIVITIES OF *R. canina*

### 3.1. Antioxidant Effect

The antioxidant capacity of R. canina preparations is explained by the contribution of different fractions, primarily polyphenols and vitamin C. A systematic review reports that various extracts (including phenolic/ascorbate/lipophilic fractions) showed activity in different antioxidant tests, with the phenolic fraction having a significant share (Chrubasik et al., 2008).

### 3.2. Anti-inflammatory effect and joint diseases

The inhibitory effect of GOPO on neutrophil chemotaxis is considered one of the main mechanisms of rosehip's anti-inflammatory profile (Larsen et al., 2003). Furthermore, it has been reported that rosehip extracts show inhibition of COX-1 and COX-2; some studies have shown that the efficacy is more pronounced in organic solvent extracts (Jäger et al., 2007).

### 3.3. Osteoarthritis (OA)

The most debated clinical evidence in OA is from randomized, double-blind, placebo-controlled studies with standardized rosehip powder. Winther et al., (2005) reported that rosehip powder may have beneficial effects on symptoms in patients with hip/knee osteoarthritis.

### 3.4. Rheumatoid Arthritis (RA)

In a randomized controlled trial by Willich et al. (2010), improvement in functional patient scores such as HAQ-DI was reported with a standard rosehip preparation (Willich et al., 2010; Fan et al., 2014).

### 3.5. Metabolic effects (anti-obesity, etc.)

It has been reported that trans-Tiliroside can exert effects at the preclinical level through pathways related to body weight/visceral fat

and lipid metabolism (Ninomiya et al., 2007). The review sources also report different experimental evidence regarding the anti-obesity/anti-hyperlipidemic potential of rosehip, but emphasize that further studies are needed to clarify clinical significance on an indication basis (Chrubasik et al., 2008; Pazhouhi et al., 2020).

### 3.6. Urinary System and Infections

Seifi et al. (2018), reported a randomized placebo-controlled (triple-blind) study evaluating the effect of rosehip use on the incidence of UTIs during the puerperium period after cesarean section.

## 4. AREAS OF USE

### 4.1. Food and Functional Food Applications

Rosehip is widely used in products such as tea, syrup, jam/jelly, and juice; it can also be considered as an ingredient in probiotic beverages and various food formulations (Pazhouhi et al., 2020).

### 4.2. Phytotherapeutic Products and Supplements

Standardized rosehip powder preparations (fruit peel + seed fractions) have been the subject of clinical research, particularly in the context of OA/RA symptom management (Winther et al., 2005; Willich et al., 2010).

### 4.3. Cosmetic/Topical Use (oil)

Seed oil is being investigated for skin applications (e.g., barrier support, appearance improvement claims) due to its fatty acid profile and antioxidant components; this area has more heterogeneous evidence, and product standardization appears critical (Chrubasik et al., 2008).

## 5. CONCLUSION

In conclusion, *Rosa canina* is a biologically rich medicinal plant with considerable potential as a functional food and complementary therapeutic agent. The accumulated evidence clearly demonstrates strong antioxidant and anti-inflammatory properties, supported by robust experimental data and moderate clinical evidence, particularly in the context of osteoarthritis. These effects appear to result from the synergistic action of multiple bioactive constituents rather than from a single active principle.

Clinical findings suggest that standardized rose hip preparations can provide meaningful, albeit moderate, symptomatic relief in inflammatory and degenerative joint diseases. However, the current body of evidence does not support the use of *R. canina* as a stand-alone treatment. Instead, it should be regarded as a supportive intervention integrated into broader, evidence-based treatment strategies.

Future research should prioritize the development of standardized *R. canina* preparations, the elucidation of precise molecular mechanisms underlying its pharmacological effects, and the conduct of large-scale, long-term randomized controlled trials. Such studies are essential to establish optimal dosing regimens, assess long-term safety, and clarify the clinical relevance of emerging indications, including metabolic and immunological disorders.

Overall, *R. canina* represents a compelling example of a traditional medicinal plant whose historical use is increasingly supported by modern scientific research. With appropriate standardization and rigorous clinical evaluation, rose hip may play an increasingly important role in the fields of functional nutrition and evidence-based phytotherapy.

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