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The antioxidant activity of rosehip (*Rosa canina* L.) - a review

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Abstract

In recent years, rosehip has been the subject of several studies due to its nutraceutical properties for human health and the observed beneficial health effects that may result from certain compounds extracted from the fruit, such as polyphenols, carotenoids, vitamin E, flavonoids and the antioxidant vitamin C. The medicinal properties of *Rosa canina* fruits are due in part to their richness in phenolic substances. Rosehips contain several biologically active compounds, such as: organic acids, pectins, flavonoids, tannins, carotenoids, fatty acids, vitamins (especially vitamin C and also vitamins B1, B2, K, PP, E).), macro- and microelements, etc.

Keywords: *Rosa canina* L, antioxidant activity, chemical composition, rosehip

1. Introduction

The increasing interest, in recent years, for herbal remedies, has led to the appearance of numerous studies that had as their main objective the analysis of a large number of plants used in traditional medicine and which are recognized by humans [1].

Currently, various constituent parts of these plants, which have been exploited since ancient times and which could be sources of beneficial and valuable compounds for human consumption, are used in various technological processes [2]. For more than 2,000 years, the pseudofruits of *Rosa canina*, as some researchers call them, often known as rosehips, have been used as an herbal remedy. *Rosa canina* L. belongs to the *Rosaceae* family, which consists of more than 100 species and is very widespread, especially in Europe, Asia, North America, Africa and the Middle East (Figure 1) [1,2]. Rosehip is a perennial shrub from 2 m to 3.5 m tall, with thin stems with thorns, sometimes climbing, its branches are often curved or arched. The flowers are 4–6 centimeters in diameter and 5 petals that eventually mature into red-orange fruits. The color of the petals varies from pale pink to dark pink and white. The fruits of the rosehip are usually red to orange in color and ripen in august-september. The fruits consist of about 30–35% seeds and 65–70% pericarp, and the average fruit weight is 2.6–2.9 g.

This plant is very resistant to environmental problems such as rocky, poor and dry soils [3,4,5].

2. The importance of rose hips in food

Among the edible wild fruit species, the *Rosa* species is particularly important. The species is valued mainly for its fruits (rosehips) and occupies an important place in the human diet and in the food industry due to its nutritional and sensory properties and the wealth of bioactive compounds [6,7]. In addition to edible fruits, seeds and flowers are valued and used for food, medicine, fodder, fuel, agriculture, etc. [6].

Numerous scientific studies have been carried out on the different uses of rosehip seeds, flower petals and fruits at different stages of maturity, as well as the comparison of their biochemical components and antioxidant properties.

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As a food, rosehip fruits can contribute to diversifying the diet, as an ingredient in teas, pastas, jams, marmalades, fasting soups, wines, juices and other simple preparations or in combination with other fruits (apples, seafood, tomatoes, etc.). Recently, research has been carried out on the use of rosehips to obtain preparations combined with various vegetables, fruits and dairy products with high nutritional value (Table 1) [8].

Figure 1. Rosehips-fruits, seeds and pulp

Table 1. Nutritional value of rose hips/100g [9]

No	*Nutrients*	*Quantity*
1	Water	58.6 g
2	Energy	162 kcal
3	Protein	1.60 g
4	Fat	0.34 g
5	Carbohydrates	38.22 g
6	Sugars	2.52 g
7	Dietary fiber	24.1 g
8	Calcium	169 mg
9	Magnesium	69 mg
10	Iron	1.06 mg
11	Sodium	4 mg
12	Potassium	429mg
13	Vitamin C	426 mg
14	Vitamin A	4345 UI
15	Vitamin E	5.84 mg
16	Vitamin K	25.9 µg

3. Biological activity of rosehip

Rosehip has been the subject of several studies due to its nutraceutical properties for human health and the observed beneficial health effects that may result from certain compounds extracted from the fruit, such as polyphenols, carotenoids, vitamin E, flavonoids and the antioxidant vitamin C. The medicinal properties of *Rosa canina* fruits are due in part to their richness in phenolic substances. Phenolic substances have a wide range of biochemical activities, including antioxidant, antimutagenic and anticarcinogenic effects, as well as the ability to modify gene expression. Antioxidant studies have reported the use of isolated nutrients in disease prevention and treatment [10].

4. Biochemical composition

In recent years, several studies have been initiated to determine the compounds contained in *Rosa canina* fruits using high performance liquid chromatography, thin layer chromatography, mass spectrometry, gas chromatography, etc. [1].

Rosa canina (rose hips), contains various vitamins A, B1, B2, K, PP, D, E, especially vitamin C and minerals (Ca, Mg, K, S, Si, Se, Mn), but also other valuable compounds such as polyphenols, carotenoids, carbohydrates, tocopherols, flavonoids, fruit acids, tannins, pectin, sugars, organic acids, amino acids and essential oils (Figure 2) [3,4,11-14].

Its seeds are rich in oil and mineral substances. The fatty acids in rosehip oil are mainly: linoleic, oleic, linolenic, palmitic, stearic and arachidonic acids (Figure 3) [4,7].

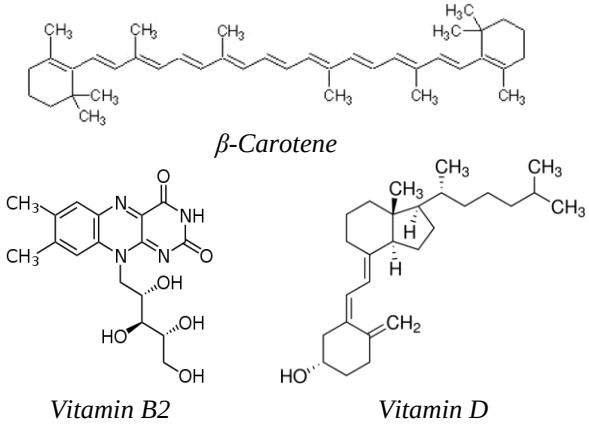

Figure 2. Provitamins and vitamins in rosehip

5. Antioxidant activity

Currently, there is considerable interest in new natural antioxidants to replace synthetic ones that are used in foods and therapeutic regimens [15].

Antioxidants play an important role in the body's defense mechanisms against pathologies related to

the attack of free radicals. Therefore, the intake of plant-derived antioxidants has been implicated in the prevention of degenerative diseases caused by oxidative stress, such as cancer, Parkinson's disease, Alzheimer's disease, and atherosclerosis. Antioxidants should not impart unpleasant flavors or colors. Also, they must be easily incorporated into foods and food systems and must be optimized in the pH of the food system and during food processing [16].

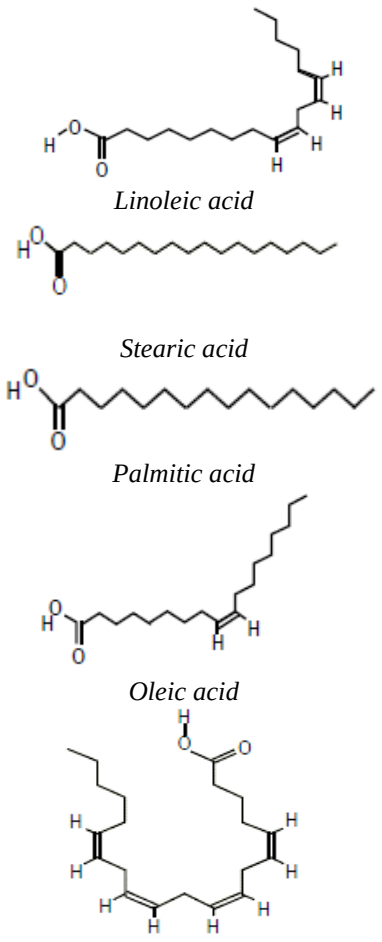

Figure 3. Fatty acids (as glycerides) in rosehip

Rosa canina L. is a natural source of multivitamins, especially vitamin C (whose content exceeds 10 times that of currants and fifty times that of lemons) and phenolic compounds [17].

It can be seen that both the amount of compounds and the antioxidant properties of rose hips are greatly influenced by its geographical location, growth stage, weather conditions, harvesting time and the methods used for their storage and extraction [3,18].

The high antioxidant activity of rosehips is due to both vitamin C and the high total phenolic content. Vitamin E and carotenoids are also reported to be components that contribute to antioxidant activity [19].

A study, conducted in 2010 on six types of plants, including *Rosa canina* that were collected from southern Europe, indicated that rose hips had excellent antioxidant properties and could be used as an alternative to synthetic antioxidants.

Plants with the highest amount of antioxidants include: rose hips, sour cherries, blackberries, strawberries, raspberries, sunflower seeds and pomegranates.

Rosehips contain higher amounts of different antioxidants compared to many other fruits. Moreover, some studies have shown that the level of carotenoids in rose hips far exceeds other fruits, with 6 to 7 times more in rose hips than in blackberries [3].

6. Conclusion

Rosehip occupies an important place in the human diet and in the food industry due to its nutritional and sensory properties and the wealth of bioactive compounds.

Rosa canina L. is recognized for its high content of polyphenolic compounds.

Rosa canina L. is a natural source of multivitamins, especially vitamin C.

Rosehips contain higher amounts of different antioxidants compared to many other fruits.

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