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ANALYSIS OF THE EXISTING RESEARCH REGARDING THE USE OF THE SPECIES *ROSA CANINA* L.

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Abstract

Rosa canina L. is a shrub found in the wild or cultivated flora, from which mature, fresh or dried pseudofruits (Cynosbati fructus) are used. This species has a key position in the sustainable culture strategy, can offer solutions to social, economic and environmental problems. Numerous scientific studies mention various uses of the seeds, petals, flowers and fruits of the wild rose in different stages of maturity as well as their biochemical content and antioxidant properties. In this regard, a comprehensive literature review was conducted to promote the usefulness of this species in several areas: nutrition, pharmacology, improvement and environmental protection. Developing knowledge about the importance of the Rosa canina species can take full advantage of a small fraction of the genetic diversity of nature.

Key words*: rosehip, food, pharmacology, breeding, environmental protection.*

INTRODUCTION

Rose hip (*Rosa canina* L.) is a species of *Rosaceae* present in Europe, Western Asia and North Africa. It is a perennial shrub of spontaneous flora of 2-3 m high, with elongated stems and branches, with solitary pink, red or white flowers (Figure 1a).
The fruit has a red-brick colour, to a deep red with a pleasant sour taste and inside there are numerous small and hairy achenes (Figure 1b).
The rose hip is commonly used as a food or medicinal plant, in the form of natural pharmaceutical products. This species has a key position in the sustainable culture strategy and can offer solutions to social, economic and environmental problems (Roșu et al., 2011).
Rose hip fruits can be used as organic products either from spontaneous flora, where treatments with synthetic products are not applied or from organic plantations.
Rosa canina hip has been used for foods, making marmalades and soups or drinks wine or tea.
Sadigh-Eteghad et al. (2011) suggest that the *Rosa canina* extract used in traditional medicine might have immunomodulatory effects.
Numerous studies indicate *Rosa canina* L. fruits with a high content of ascorbic acid, phenols, flavonoids and antioxidants (Soare et al., 2015a; Roman et al., 2013).
The highest content of the vitamin C was identified in Turkey in fresh rosehip pulp (fruit flesh of rose hip) by Kazaz et al. (2009) of 2,200 mg/100 g and by Demir & Özcan (2001), respectively 2,712 mg/100 g.

Figure 1a. Shrubs with pink flowers of *Rosa canina*

Figure 1b. Shrubs with fruits of *Rosa canina*

Other scientific studies mention different uses of seeds, petals, flowers, as well as comparisons between biochemical components and their antioxidant properties. Seeds and oil from *Rosa canina* seeds can be good sources of phytonutrients. Ilyasoglu (2014) found that rose hip seeds contain phenolic compounds (2,554 pg/g), carotenoids (2.92 pg/g) and ascorbic acid (1,798 pg/g) and also seed oil was rich in acids, polyunsaturated fats, linoleic acid (54.05%), linolenic acid (19.37%), and phytosterols, mainly β-sitosterol (82.1%).

The aim of the study was to present a review of the literature to summarize the usefulness of this species in several areas: nutrition, pharmacology, improvement and environmental protection.

MATERIALS AND METHODS

The current study concerns the actual research regarding the use of the species *Rosa canina* L., benefiting from a small fraction of the genetic diversity of nature. In this respect, the following aspects were pursued:

- use of the species in nutrition;
- pharmacological importance;
- use in breeding of the *Rosa* genus;
- importance in agri-environment measures on combating wind deflation.

This paper includes articles published in journals and books written by specialists.

RESULTS AND DISCUSSIONS

Food importance

Numerous scientific studies mention different uses of seeds, petals, flowers and rose hip fruits in different stages of maturity, as well as comparisons between biochemical components and their antioxidant properties.

As food, rose hip fruits can be used as a raw material in making tea, pasta, jam, marmalade, dessert soup, wine and juices and other simple or combined preparations with other fruits (apples, seafood, tomatoes, etc.), contributing to the diversification of nutrition. Roșculete et al. (2013) studied different processing times of rose hip fruits in combination with tomatoes, in different ratios and concluded that the time of exposure with heat treatment has influenced the properties of the final product.

Recently studies have been conducted regarding the use of rosehips in obtaining preparations in combination with various vegetables, fruits and dairy products with high nutritional properties. Mocanu et al. (2009) conducted a study on the combination of rosehip extract and milk (sample B). Sensory evaluation of descriptors: the appearance and texture, colour, smell, taste, made in comparison with the control sample, consisting of milk plus probiotics (sample A) and sample C (milk plus licorice- sweet wood extract). The best qualities were recorded in sample B.

In Turkey, projects were started to get completely new products such as rosehip ice cream (Duman et al., 2005).

In Hungary, rose hip fruits are used in the manufacture of Palinka, in Denmark powder is available from the dried fruit and in Sweden and Scandinavia, fruits of rose hip are mainly used for the production of commercial soups (Gaik, 2011).

Polyphenols extracted from plants can reduce oxidative processes, namely oxidation of myoglobin and oxidation of unsaturated fatty acids, processes that change the colour and odour of meat during refrigeration. In order to determine the antioxidant effect of polyphenols extracted from rose hip fruits (*Rosa canina*), on chilled beef, Papuc et al. (2013), found that their antioxidant activity is dependent on their concentration, maintaining the colour and aroma of this meat.

Rose hip fruits stimulate digestion and are slightly diuretic and are recommended as a decoction.

Rosa canina tea is a source of supply with natural antioxidants. Tumbas et al. (2012), following the investigation of the effect of phytochemicals in the tea of masses, showed that vitamin C and flavonoids are responsible for the antioxidant activity of the rose hip tea, while the polyphenols contribute to its anti-proliferative activity on the tumor cells (anti-proliferative activity).

Pharmacological importance

The results of many studies have shown the potential for the use of the *Rosa canina* species from a therapeutic (medicinal) point of view also. The fruits of rose hip have shown their effectiveness against arthritis, inflammation, diabetes, heart ailments, pathogens, gastric ulcers.

Numerous studies indicate that *Rosa canina* L. fruits with a high content of ascorbic acid, phenols and flavonoids, with antioxidant and antimutagenic effects. Thus, the results obtained by Kilicgun and Altiner (2010) following studies on the correlations between the content of phenolic compounds and the antioxidant mechanisms/prooxidant effects, suggest that *Rosa canina* extracts may act not only as an antioxidant, but also as a prooxidant with different effects in depending on their concentrations.

The antioxidant properties of polyphenols from fruits have been confirmed in many scientific studies, with effects against many diseases, including anti-tumor. Human erythrocytes are oxygen transporters that can be exposed to oxidative damage. Several micronutrients can protect red blood cells from oxidative stress. Widen et al. (2012), after investigating the protective effect of fruits on erythrocytes, found that they contain many compounds with antioxidant protection.

Ozturk and Ercilsi (2011), following the study of antibacterial and antioxidant activities of four taxa (*Rosa pisiformis, Rosa canina, Rosa villosa* and *Rosa dumalis subsp. Antalyensis*), found that the most effective antibacterial agent was found in *Rosa canina* which inhibited the growth of most of the bacteria tested.

The antioxidant and antibacterial characteristics of the various extracts of *Rosa canina* fruit harvested from Iran were studied *in vitro* by Montazeri et al. (2011) and their data suggest a possible use of methanol extract of *Rosa canina* as a source of natural antioxidant and antimicrobial agents.

Celik (2011) found that infusion time is a factor that has an effect on antioxidant activity. Thus, a maximum antioxidant effect was observed in the infused tea for six minutes, and a minimum antioxidant effect was observed in the infused tea for 60 minutes. Regarding the optimal dose of antioxidant, another important factor of the antioxidant activity, Kilicgun and Dehen (2009), studied five different concentrations of tea (1%, 2%, 3%, 4% and 8%), suggesting that *Rosa canina* has the potential to be used as an antioxidant at a concentration of 3%.

The *in vitro* and *in vivo* anti-inflammatory effects of *Rosa canina* extracts are still under investigation. Lattanzio et al. (2011), following the study of the anti-inflammatory and gastroprotective effect of a crude hydroalcoholic extract of *Rosa canina* in rats, found that the extract has an effect similar to that of indomethacin, suggesting its use as an adjunctive therapeutic tool for the treatment of inflammatory diseases.

The possibility of the therapeutic potential of the fruits of *Rosa canina* L. in the prevention of functional renal disorders has been studied by numerous researchers. Gholampour et al. (2012), following studies in this direction, found that *Rosa canina* appears to be useful as a preventive agent against renal damage induced by ischemic injury in rats. Similar results were obtained by Gholampour and Owji (2013), who investigated the effect of *Rosa canina* extract on liver dysfunction induced by renal ischemia in rats, and found that *Rosa canina* has a hepatoameliorative effect.

Gallic acid is another phenol present in rose hip fruits, which is appreciated for its antioxidant properties, but also for cytotoxicity against human cancer cells (Fiuza et al., 2004).

In recent years, it has been cultivated to obtain pharmacological preparations, based on rose hip, to be used in the treatment of certain diseases. Many recommendations are for osteoarthritis, rheumatoid arthritis and low back pain. However, conclusive research is needed to ascertain the therapeutic effects of mass-based products.

Several clinical studies have investigated the effects of rose hip powder on arthritis and pain caused by it. A major feature of arthritis, especially osteoarthritis, is the degradation and erosion of the extracellular-extracellular matrix (ECM) in cartilage (Schwager et al., 2011). There are few relevant studies that indicate that *Rosa canina* is a source of natural compounds (flavonoids, polyphenols, etc.), which may alter the symptoms and evolution of osteoarthritis, inducing patients an effect similar to that of analgesic drugs, steroids or anti-arthritis drugs.

Rose hip extracts have also been shown to be effective in rheumatoid arthritis, which is a chronic, inflammatory and autoimmune disease. Willich et al. (2010), following a randomized, double-blind, placebo-controlled, parallel trial with 5g/days of rose hip powder for 6 months in patients with this disease, found a significant improvement in pain, similar to that of analgesics, steroids and anti-rheumatic drugs.

Extracts obtained from the fruits of *Rosa canina* are capable of reducing the cell proliferation of cancer cells. In this respect Cagle et al. (2012) and Idassi et al. (2012), following the investigation of the effectiveness of rose hip extracts in the prevention of cell proliferation of three human glioblastoma cell lines A-172, U-251 and U -1242 MG (tumors that develop in the brain) have shown that rose hip extracts may serve as an alternative or supplement to current chemotherapy regimens for glioblastomas.

Use in breeding of the *Rosa*

• Breeding for rootstock production

Rose hip presents importance in breeding of the *Rosa* genus, especially as rootstocks for ornamental roses (Shirdel et al., 2013; Nețoiu et al., 2008). Roses are traditionally propagated by cuttings and grafting. Choosing the right type of rootstock is the key to success for *Rosaceae* family vigour, productivity and flower quality.

Farzad et al. (2009) following the study of some parameters of plant growth and flower quality in four cultivars of roses, grown on their own roots and on rootstocks of *Rosa canina*, indicated that, the parameters studied were higher in the case of cultivars obtained on the rootstocks.

Khosh-Khui and Zargarian (2010), following the study of three rose varieties grafted on four different rootstocks of Rosa (*Rosa banksiae* Ait., *Rosa canina* L., *Rosa chinensis* Jacq. *"Masquerade"* and *Rosa multiflora* Thunb), it was concluded that *Rosa canina* was the best rootstock. As the grafting is more expensive and takes a long time, lately, there has been an increasing use of "tissue culture" for rootstock regeneration, being an alternative method of rapid multiplication (Horn et al., 1998). Thus, Moallem et al. (2013) managed the induction of callus and regeneration of *Rosa canina* from leaf explants on a medium containing 1 mg l IAA. Tian et al. (2008) reported a new protocol for the regeneration of leaves of *Rosa canina*.

• Breeding for fruits

Güne (2010) in Turkey, following the study on the pomological and phenological characteristics in 11 genotypes of *Rosa canina*, selected five genotypes, respectively MR - 12, MR - 15, MR - 26, MR - 84 and YL - 04, recommending them for cultivation and certification.

Dog roses are grown in Croatia on a very small scale and most of the rose hip used in the domestic processing industry is imported (Tomljenovic et al., 2019). Also, in their study, they stated that through selection and hybridization of perspective genotypes it would be possible to create clonally propagated varieties suitable for commercial cultivation. *Rosa canina* is widespread in different plant communities. This plant community is divided into the following groups: forestry, shrublands, grasslands and ruderal (Niculescu et al., 2015).

In Romania, the natural biodiversity of this species is high, even in small habitats, where valuable genotypes can be identified for inclusion in breeding programs (Soare et al., 2014a; Soare et al., 2015b). Roman et al. (2013) studied the chemical composition of eight *Rosa canina* biotypes from the spontaneous flora of Romania (Transylvania) regarding ascorbic acid, total polyphenols, total flavonoid content and their antioxidant activity. Based on these results, two perspective biotypes were selected for breeding these species.

The cultivation of this *Rosa canina* species raises the problem of promoting valuable forms (productive and high quality fruits), or of the forms with less prickles on the stems and

branches. The most effective solution in this case is to identify and take from the spontaneous flora some perspective genotypes and to include them in a breeding program. Thus, in Romania, following a study of the variability of some fruit parameters of *Rosa canina* L. in 36 genotypes, belonging to 25 indigenous populations from Bacău, Neamț and Vrancea, Ghiorghiță et al. (2012) identified valuable genotypes in terms of fruit/plant density, lower spike density, fresh biomass/fruit quantity and high vitamin C content, recommending them as gene sources in breeding this species. Also, Soare et al. (2014b) identified 20 valuable genotypes in Vâlcea county that showed a great variability of morphological characters, probably caused by altitude and phytosociological associations.

Roșu et al. (2011) identified in the Northeast area of Romania, genotypes of *Rosa* spp. with a high content in bioactive principles.

Importance in agri-environment measures

Due to reduced environmental requirements, especially those from the ground, shrubs of *Rosa* genre can be used in the establishment of plantations on land consolidation role in the establishment of shelterbelts role in combating deflation wind and the establishment of biological barriers against destructive action role the snow (Nețoiu et al., 2008; Soare and Paniță, 2009).

CONCLUSIONS

The fruits of *Rosa canina* contain a higher concentration of bioactive components which have a positive impact on health. Those are a source of vitamins and antioxidants which can be used in the food industry as functional food. But, the biochemical accumulation of useful compounds is influenced by the pedo-climatic conditions and the harvesting area.

Plenty of studies reveal the potential of rose hips uses in complementary and alternative medicine for their ameliorative effects.

By harvesting rose hip fruits and implicitly by seeds, plantations can be set up to provide biological material for grafting of the rose.

The specie *Rosa canina* should be introduced in stable cultures for rich biochemical composition and pharmacological importance and value nutritional.

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