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New Methods and New Products in Rosehip Fruit Processing

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Abstract
This study aims to produce raw materials for products from rosehips in Türkiye. They are raw materials of high economic importance. The studies were mainly conducted in 2021-2023 at Süleyman Demirel University, Ecological Products Laboratory (in Isparta province). A total of 15 rosehip products were developed in the study. This article describes 4 new products (rosehip extract, rosehip seed oil, rosehip seed powder and rosehip hydrosol). These products are very important for the health, cosmetics and food sectors:
Rosehip powder and essence: Produced using three different methods:
a) After being harvested and sorted from foreign materials, it was dried, ground and turned into powder. The conversion from raw material to product is around 95% by weight.
b) After being harvested and sorted from foreign materials, it was boiled. It was filtered, the liquid part was boiled and dried in the oven and turned into powder. The yield is 5% from dried fruit and 3% from fresh fruit by weight. Its thickness is powdery like ash. This product is essentially the essence of the rosehip fruit. For this reason, the product is called 'rosehip essence'. This product has a short shelf life as it is a very fine powder. It is recommended to store it in small packages and consume it within 3 months.
c) After being harvested and sorted from foreign materials, it was boiled, and then the large parts such as the core, trikom and shell were separated by sifting, concentrated and turned into powder. The yield is 70% from dried fruit and 15% from fresh fruit. The particle size is around flour particles.
The products are rose pink in color, the density is around 0.8-0.9/cm3. The highest quality product is obtained by evaporating the liquid part and turning it into powder. They are raw materials that can be used in food and medicine.
Rosehip oily water (hydrosol): Produced by steam distillation of mature fruits in a still. Distillation time for 50 kg of fruit is approximately 4 hours, yield is 50 kg (1/1) by weight. Color is transparent/cloudy white, easy to drink, and slightly aromatic. Specific gravity is 1/1 cm3. It is a functional food for medical purposes. It has been concluded that drinking at most one cup a day for a person of normal weight and age for three months increases the activation of the intestines and provides better nutrition to the cells.
Rosehip oil: Obtained by squeezing rosehip seeds in a strong cold press. The yield varies depending on the raw material but is between 2-3.5% by weight. Its color is pale yellow.
Rosehip seed powder is obtained by grinding the other product (solid, dry part) that comes out as a result of cold pressing. The yield is 100% by weight. Its density is 08.97/1 cm3.

The powder obtained by roasting the beans without removing the oil or by drying them in the shade and grinding them without roasting is not considered suitable for making rosehip coffee.

The most difficult to produce and the most valuable of the above-mentioned products is rosehip oil. Currently, commercially available rosehip oils are produced using a very cheap, chemical solvent extraction method, but their use in the health sector is against legal regulations. The total oil content in the seed is estimated to be approximately 8% in wild species. It is 4% in R. alba and other garden roses. During cold pressing, approximately 3-5% of the oil in the seed is absorbed by the hairs and other dry parts of the seed. It is recommended to perform raw material extraction with a chemical solvent to obtain the remaining oil in the material after cold pressing. Since this product is second-quality rosehip oil, it should not be used in the health sector. Rosehip powder and rosehip seed powder produced from rosehip water are important raw materials for functional foods for medical purposes (rosehip tea, rosehip coffee, rosehip paste, rosehip marmalade, rosehip molasses or drug filler material that can be impregnated with the liquid active ingredient of drugs). It is recommended to drink half a cup of rosehip hydrosol (oil water) daily on a full stomach to strengthen the immune system; to use rosehip seed oil in hand and face creams as a raw material for skin beauty and anti-aging. The chemical composition and shelf life of the products have not been determined. However, it is estimated that they will not deteriorate in a period of one year. It is hoped that these products will make significant contributions to the food, health and cosmetics sectors.

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INTRODUCTION

Rosehip species (*Rosa* L. spp.) belong to the Rosaceae family. They are widely and naturally distributed in Europe, Asia and North Africa. 60 rosehip genotypes belonging to about 15 species have been identified in Türkiye. The majority of rosehip species are wild species. Some are taken from nature and produced in gardens due to their fruit and landscaping features (Baytop, 1999; Nilsson, 1972). They are known for their thorny structure, attractive flowers and fruits that are beneficial for health. Among the *Rosa* genus, those whose fruits are used are called 'rosehip'; those whose flowers are considered important and used are called 'rose'. All are members of the *Rosa* L. genus. However, their chemical, morphological and pomological properties may differ. *Rosa* species used as rosehip are generally wild and grow in nature. They are widely found worldwide and grow as bushes. There are some cultural genotypes of *R. canina* for landscaping purposes. *R. alba* can be used for both oil and rosehip purposes.

There are some rosehip products produced by local people in Türkiye for food purposes using traditional methods. The demand for these products has increased more than expected in recent years and has entered the path of industrialization. Therefore, there is a need to develop and diversify traditional rosehip products and find new products to be produced in the industry. During our studies, approximately 15 new rosehip products have been produced. This article describes 4 new products that are candidates for raw materials in food, medicine and cosmetics.

Minerals taken with food ensure that organs function healthily and regularly. To eliminate problems caused by insufficient natural resources in the world compared to the population, the term FOSHU (Foods for Specific Health Use), meaning "functional foods", was proposed in Japan in the 1980s. This term was discussed in detail in Europe and America in the 1990s. Food substances or components that have a health-protective and disease-reducing effect due to one or more effective components added to food during processing are also defined as "functional

foods". In other words, 'Functional food products' refer to products that have functions other than nutrition, such as those that are beneficial for treatment. 'Functional rosehip products' are included in a broad category that includes many different products obtained from rosehip (*Rosa* L. spp.) species or intraspecific genotypes (Özçelik, 2013; Özçelik & Özçelik Doğan, 2018). Rosehip products are processed industrially and offered for consumption, primarily in the provinces of Isparta, Gümüşhane and Tokat. A commercial company in Dinar (Afyonkarahisar) district produces and exports probiotics from rosehip fruits. For example, in 2022, around 15 tons of rosehip were processed by Arzen İlaç Kozmetik Gıda Ltd. Company. These rosehip products were sold in the region. Kurucum Gıda Com. (Isparta) also processes rosehip and sells it as food. However, these companies could not continue production due to insufficient raw materials. The main reason for the insufficient raw materials is seen as the difficulty of harvesting, i.e. the problem of finding workers.

Figure 1: Rosehip processing at Kurucum Gıda Com. (Isparta) and probiotic production at Simbiyotik M&Y Com. (Dinar/Afyonkarahisar).

Rosehip is known for being rich in vitamin C. Rosehip varieties rich in vitamin C are determined in every region of Türkiye. In the Middle Ages, it was used against bleeding gums, tapeworms and 'Yılancık' ills, and also in the treatment of kidney and gallstones; in ancient times, it was used in the treatment of scurvy and was widely used in Egypt. In Rome, its flowers were used to treat stomach aches (Baytop, 1999; Kara & Gerçekçioğlu, 1992). Rosehip fruit has been used in the treatment of rickets, rheumatism, piles and haemorrhoids in Türkiye; it is also used in the treatment of feverish diseases and colds due to its high vitamin C content (Şen and Güneş ,1996; Kılıçgün, 2008).

Among the *Rosa* species, the highest vitamin C content is found in *R. cinnamomea* with 5300 mg/100 g; the lowest vitamin C content is found in *R. tomentosa* with 118 mg/100 g (Halasova and Jicinska, 1988; Cçelik et al., 2006). For these and similar reasons, functional rosehip products have attracted great attention in recent years, especially from consumers looking for natural/ecological and healthy products (Yılmaz and Ercişli, 2011; Şar, 2009; Keleş & Kökosmanlı, 1996; Orhan et al., 2009). Functional rosehip products are generally introduced in various forms such as teas, oils, extracts, capsules and tonics. The compounds in the rosehip fruit are associated with various health benefits, especially due to the presence of bioactive compounds such as vitamin C, flavonoids, carotenoids, polyphenols and essential fatty acids (Çınar et al., 2004; Baytop, 2001; Doğan and Özçelik, 2017**).**

In research in Bursa on determining some properties of rosehip fruits growing naturally region; fruit weight (0.88-2.22 g); fruit length (15.33-21.83 mm); fruit width (10.27-14.53 mm); flesh/seed ratio (1.21-5.34); number of seeds (11.00-35.33 pieces/fruit); reducing sugar (09.09-28.67 g/100 g); total sugar (12.012-21.28 g/100 g); TSS ratio (% 22.00-

40.32); total acidity (1.51-3.50 g/100 g); pH (3.30-4.08); Vitamin C (30.11-57.91 mg/100 g) amounts were determined. In another study, it was explained that rosehip extract contains components called catechin and quercetin. This study was carried out to understand rosehip's chemical composition and determine its active components. The researcher analyzed the rosehip extract and determined the components catechin and quercetin. Catechins are polyphenolic compounds commonly found in plants and have antioxidant properties. Quercetin is one of the flavonoids and is known for its antioxidant, anti-inflammatory and anticancer effects. This study shows that rosehip fruit contains components that are beneficial for health and that these components may have potential health benefits. In the study by Başgel (2005), 14 macro and micro elements (Ca, Mg, Mn, Fe, Cu, Zn, Al, Ba, Sr, Ni, Co, Cr, Cd, Pb) were determined in samples of sage (Salvia officinalis), nettle (*Urtica dioica*), fennel (*Foeniculum vulgare*), linden (*Tilia* spp.), chamomile (*Matricaria* spp.), senna (*Cassia senna*) and rosehip (*Rosa* spp.) which are widely used for therapeutic purposes in Türkiye and in their infusions. The levels of gallic acid, epicatechin gallate, epigallocatechin, epigallocatechin gallate and epicatechin polyphenols in the infusions of these plants were indicated. According to the results, the tea samples used in terms of macro and microelement contents; nettle> senna> sage> linden> rosehip> chamomile> fennel", in terms of the number of toxic elements (Cr, Co, Pb, Cd) they contain; "nettle> sage> chamomile> fennel> rosehip> linden> sennaki/senna" and the total content of 5 polyphenols was listed as "linden> nettle> chamomile> sage> fennel> sennaki> rosehip". Gökçek (2003); determined the trace elements (Se, Mo, Pb, Zn, Cu, Ni, Cd) contained in dried rosehip fruits by using the Differential Pulse Polarography (DPP) technique. The researcher took samples from dried rosehip fruits and conducted trace element analysis. Differential Pulse Polarography (DPP) technique was used in this analysis. This study is important to provide information about the nutritional value and potential health benefits of dried rosehip fruits. In addition, electrochemical analysis methods such as the DPP technique are shown to be an effective tool for trace element determination. Güleryüz and Ercişli (1996), compared wild rosehip, blackberry, barberry and 2 different hawthorn species in Kalkanlı (Zigana) village of Torul district of Gümüşhane province in terms of their nutritional content. They found rosehip fruits to be richer than other species in terms of vitamin C, ash, total dry matter, total sugar, reducing sugar, TSS, P, K, Cu as elements, and poorer than other species in terms of water content. They explained the low water content of rosehip fruit as being because it grows in more barren conditions compared to other species and that most of its water is bound water. There are some rosehip products produced for food purposes by local people in Türkiye using traditional methods to meet their domestic needs. The demand for these products has increased more than expected in recent years and has entered the path of industrialization. However, studies on functional rosehip products for therapeutic purposes are quite insufficient. A powder for medicinal purposes has been produced from the fruit of a subspecies of *R. canina* (Rein et al., 2004; Fattahi et al., 2017). Therefore, there is a need to develop traditional rosehip products and find new products. This study aims to find production methods to obtain functional food products from plants known as Rosehip (*Rosa* L. spp.) and to develop known traditional methods. Our study is expected to be beneficial to the food, health and cosmetic sectors as well as the agricultural and industrial sectors.

MATERIAL AND METHODS

There were about 60 rosehip genotypes collected from Türkiye in Süleyman Demirel University Botanical Garden. Some of them are cultivated and some are in natural form. Rosehip fruits required for production were largely harvested from plants exhibited in Rosarium plots in SDÜ Botanical Garden. Experiments were carried out on 19 genotype samples belonging to 6 species determined to be important by us. The species to which these samples belong are as follows: *Rosa canina, R. dumalis, R. beggeriana, R. alba, R. gallica* and *R. phoenicia.*

Figure 2a: Important Rosehip (*Rosa* L.) species of Türkiye: 1: *R. dumalis* (wild), 2: *R. canina* (cultured form), 3: *R. beggeriana* (wild).

Figure 2b: *Rosa alba* (cultural form).

The identification and characterization of plants were carried out by us at GUL Herbarium. Herbarium samples taken from different Rosehip genotypes were dried according to herbarium techniques, pasted onto herbarium cartons, given herbarium inventory numbers and preserved at the GUL Herbarium.

Product development studies were carried out in the 'Ecological Products Laboratory' in the Biology Department of the Faculty of Engineering and Natural Sciences of SDÜ between 2021-2023. Materials and machines not available in the laboratory were obtained from the market. The products were offered to the consumer's preference, and the quality of the product was tried to be understood with the survey method applied to almost 30 people. No chemical analyzes or microbial tests were performed on the products. All methods designed by us for production were successfully implemented.

The production methods and required materials for new Rosehip products for raw material purposes are as follows:

Rosehip powder:

Rosehip powder was produced with 3 different methods as stated below:

Method 1: After the rosehip fruits were harvested and dried, they were turned into powder in the mill. A certain amount was put into a strainer and boiling water was slowly poured over it and filled into the glass. The feature of Rosehip Tea was presented to the consumer. This product was prepared for rosehip tea purposes.

Method 2: After the dried fruits were lightly crushed, they were brewed for 5-10 minutes and filled into a glass and served. The feature

of Rosehip Tea was presented to the consumer.

This product was prepared for rosehip tea purposes.

Method 3: Dried fruits were soaked. They were softened by waiting for 2 days. They were squeezed in a press machine and the juice and pulp were separated from each other. The liquid part was turned into powder by evaporating the water with the boiling method and then drying in sunlight. The feature of being tea and food additive was presented to consumers.

Figure 3: Drying rosehip fruits in the shade and production studies of extract (in powder or gel form).

Rosehip seed oil:

The plants from which the fruit was taken were turned into herbarium material, numbered, and placed in the GUL Herbarium. Rosehip fruits were harvested. They were cleaned of foreign matter, weighed, their weight recorded, and dried in the shade. The drying process took about 1 week. The seeds were separated from the other parts of the fruit. Cold press extraction was applied. Genotypes with very few seeds were combined with others with few seeds. The extraction process was carried out in the workshop of ARZEN Food, Pharmaceuticals and Cosmetics Co. (Keçiborlu, Isparta). The oil obtained as a result of cold pressing was placed in a glass jar and its color, smell, and amount were recorded. This process was repeated several times.

Figure 4: Obtaining oil from rosehip seeds by cold pressing.

Rosehip seed powder:
After the oil is extracted from the rosehip seeds by cold pressing, the remaining part of the seed is lightly roasted by the heat of the machine. This material was taken from the machine, ground, and passed through a narrow-mesh sieve. Thus, Rosehip Seed Powder was produced. Another method is; after the beans are sorted and cleaned, they are roasted in different ways, dry and soaked. Then, it is presented to the consumer to see if it can be a food called rosehip coffee.

Rosehip oily water (hydrosol):
Rosehip Oily Water (hydrosol) was obtained by steam distillation with a distillation machine previously designed and produced by us. Wood was used as the energy source.

Figure 5: Production of rosehip oily water (hydrosol) by imbik (local production aparat).

FINDINGS AND DISCUSSION

Our functional rosehip products produced in the research are divided into 3 groups food, cosmetics and cleaning products:
Within the scope of food; Rosehip tarhana, vinegar, pestil, sausage, sherbet, coffee and tea; Within the scope of cosmetics and cleaning products; Rosehip massage cream, lotion, soap, and burn cream were manufactured.

Within the scope of raw material; 4 products were developed as rosehip oily water (Hydrosol), powder, rosehip seed oil and powder. The manufacturing of raw material products is introduced in this article.

Rosehip seed oil: A separate technology is required to separate the seed from hairs and fruit flesh. The manual seed removal process is very laborious and tedious. Oil production is a difficult task. The pressing machine must be very powerful. It is almost impossible to extract oil from a small amount of seed. For this reason, seed oil may not have been produced to this day.

There is no rosehip seed oil on market. There is no research done on this product. The seed oil is an important, expensive and sought-after raw material in the cosmetics sector. Successful results have been obtained from our production trials. The lowest amount of seed oil obtained by cold pressing was obtained in *R. alba* (% 1.35) and the highest in *R. canina* (% 4.38). Although the oil ratio varies according to the species and genotype/species, the color and smell of the oil do not change much. The seed of *R. alba* is larger and harder. The fruit is small and the seed smaller in *R. phoenicia*. As the fruit gets larger and the plant becomes more spineless, the spoilage/rot of the fruits occurs earlier. Although the total oil ratio varies according to the species, it is estimated that the general situation is 5-8% in the seed. The color of the oil is slightly yellowish, fluid, slightly fragrant, the smell is not cloying, and its fluidity decreases in about a month during oxidation. The Cosmetics Sector produces rosehip oil in Türkiye. It is estimated that these oils are produced from the entire fruit. Rosehip oil can be obtained by crushing the raw material and using chemical solvents (petroleum ether, hexane, etc.). This method is not an ecological method. The cost of the original rosehip seed oil produced is at least 10 times higher than that sold in market. On the other hand, the quality of the rosehip oils sold commercially in market is very low and our product is very low in terms of color, smell,

fluidity, and density. Since chemical component analyses have not been performed, comparison cannot be made. We have no experience with the shelf life of the product. However, according to sensory analyses; there has been no deterioration in the product after 6 months. Our work on developing products, determining shelf life, and chemical properties and quality of products continues.

Rosehip seed powder: After the oil in the seed is removed by cold pressing, remaining part of the seed is partially roasted by heat of the machine. This material is ground into powder. By passing it through a narrow-mesh sieve, flour-like 'rosehip seed powder' is obtained. Since it is completely converted into a product, the yield is 100%. This seed powder produced is an important raw material that can be used in coffee production. It is also anticipated that it can be used at least as a filling material in the pharmaceutical and cosmetic sectors. The color of the product did not change in 6 months, but its aroma decreased.

It was possible to produce bean powder by roasting air-dried beans without removing the oil, but the product was not considered suitable for coffee production. The undesirable odor coming from the bean oil was dominant in the prepared rosehip coffee. It was understood that the oil in rosehip bean powder that can be used for coffee purposes should be 2-3%. Excess oil deteriorates the quality of the product. It was very difficult to grind the beans, the ungrindable part is around 40%. The oil in the unpressed bean is at a high rate. The product was evaluated as a low-standard coffee powder/product in coffee production. However, it may be possible to use it for purposes other than coffee. It was concluded that genotypes with high oil content are not suitable for coffee powder production. Therefore, seeds of *R. alba* and landscape roses may be more suitable for coffee powder production. In fact, coffee powder can be produced by roasting the beans without pressing them in genotypes with low oil content. The beans are soaked in water and left for about 1 hour. In the meantime, the seeds absorb about 15% water. Rosehip bean powder was obtained by roasting the wet beans. This method is more successful than roasting and grinding without soaking. The conversion rate of raw material into product is around 85%.

Rosehip extract: After the rosehip fruits were harvested and separated from foreign substances, they were boiled for about 1 hour. It was filtered, the liquid part was separated, concentrated by boiling and dried in the oven and turned into powder. The yield is 5% from dried fruit and 3% from fresh fruit by weight. Color of the powder is light pink. It can be easily dissolved in hot and cold water. Its specific gravity is 0.93/ cm^3. Its thickness is ash or powder consistency. This product is essentially essence of the rosehip fruit. Therefore, the product is called 'Rosehip extract'. It can be used for tea purposes, as well as an important raw material that can be an additive in health, cosmetics and food. It can also be used as an additive for food dye purposes. There is no significant active ingredient left in the parts such as fruit stalk, peel, seed, hair, etc. other than the liquid part. This part can be added to animal feeds or can be used as a filling/coloring agent in the production of creams etc. by turning it into powder.

Rosehip oily water (hydrosol): Rosehip oily water was produced by distilling mature rosehip fruits with water vapor in a still. This product could have been distilled a second time to obtain the oil. In this case, rosehip oil and oily rosehip water (hydrosol) could have been obtained. However, the quality of this hydrosol would have been poor and its economic value would have been low. This method was not preferred, and oily rosehip water was produced. It is a product that is not available on the market at all. When 50 kg of rosehip fruit is placed in the distillation boiler, distillation begins after it starts to boil. The distillation period lasted approximately 4 hours. Hydrosol production from fresh fruit is 1/1; in other words, 50 kg of oily water was obtained from 50 kg of fruit. Distillation could have been continued and more product could have been obtained. In such a case, the quality of the product would have been poor. Color of the product is transparent/slightly cloudy white, easy to drink, and slightly aromatic. Its specific gravity is 1 /1 cm^3. It is a functional food for medical purposes. We believe that drinking a maximum of one cup a day for a person of normal weight and age for three months increases the activation of the intestines and provides better nutrition to the cells. We believe that it is a health product that

chronic patients can use and has no side effects.

The remaining material in the cauldron was squeezed and dehydrated, the liquid part was concentrated and sweetened, this was called 'Rosehip marmalade'. The liquid part, which was concentrated without sweetening and without additives, was called 'Rosehip molasses'. 'Rosehip powder' was produced from the solid part. This part is one of the rosehip powder production methods. The raw materials produced can be evaluated in the food sector.

Karakaya and El (1999), in their study on the amounts of quercetin, luteolin, apigenin and kaempferol in rosehip and some foods, reported that only quercetin (16.7 g/lt) was found in rosehip. Gökçek (2006), determined trace elements (Se, Mo, Pb, Zn, Cu, Ni, Cd) contained in dried rosehip fruit by using the Differential Pulse Polarography (DPP) technique. Çınar et al. (2004) investigated the potential of using rosehip fruit carotenoids in value-added food production by enzymatically extracting them; It has been stated that it contains rich vitamins (C, B1, B2, P, E and K) and minerals (P, K, Na, Ca, Mg, Fe, Mn, Cu and Zn), as well as bioflavonoids and carotenoids (lycopene, zeta-carotene, beta-carotene, xanthophyll, neoxanthin and lutein). Adıgüzel (2006), determined the changes in some compositions during the pulp processing of rosehip fruit in the study. As material of the study, samples were taken from raw material, mash, heated mash and pulp during the pulp processing of rosehip from a factory in Tokat province and the parameters examined for the changes in composition elements were determined as dry matter, water-soluble dry matter, titratable acidity, pH, ash, formol number, total sugar, invert sugar, sucrose and ascorbic acid. As a result of the research; dry matter % 28.82-19.17, soluble solids (soluble solids in water) %23.67-15.33, titratable acidity (as malic acid) % 1.94-1.69, pH 3.79-3.88, ash 1.88-0.78%, formol number 33-18, total sugar 143.80-84.17 g/kg, invert sugar 67.01-39.48 g/kg, sucrose 72.22-43.13 g/kg, ascorbic acid 597.90-214.93 mg/100 g were found between the values. In addition, 44.34%, 51.09% and 64.65% losses were determined in vitamin C during the mashing, heating and palpation stages during pulp production from rosehip fruits, respectively.

These findings show that different *Rosa* species may differ in terms of nutritional value and that species rich in vitamin C may be preferred. In some rosehip samples, the amount of ascorbic acid was determined as 1010 mg/100 g and the pH value as 3.68 (Artık and Ekşi, 1988). In Russia, the vitamin C content was 9000 mg/100 g; the highest value for Turkish rosehips was found as 4500 mg/100 g in the endemic rosehip (*R. dumalis* subsp. *boissieri* var. *antalyensis*) in Dedegül Mountain in Isparta. These findings show that rosehip fruits are an important source in terms of nutritional value and potential health benefits with their high ascorbic acid content and low pH value (acidic).

Vitamin C content in rosehip fruits varies between 100-1273.17 mg/100 g depending on the species. Fruit flesh ratio varies between 50-63%, total dry matter between 41.0-70.08%; and water amount varies between 20.05-48.10% (Yıldız and Nergiz, 1996). It is a fruit that is quite rich in vitamin C, vitamin K, Ca, Na, Fe, Mg and P (Ercişli, 2005). The amount of vitamin C has been interpreted according to locality and altitude (Çelik et al. (2006). It has been determined that the amount of vitamin C increases as the altitude increases in types of *R. canina* and this increase is parallel between types depending on the altitude. For this reason, rosehips grown at high altitudes in Eastern Anatolia and the Mediterranean region are of higher quality. It is stated that rosehip fruit is one of the most important foods for the human body due to its high vitamin C content and that since the human body cannot synthesize ascorbic acid, it has to be supplied from outside; the daily requirement for adults is 60 mg, for babies 35 mg and for mothers who are breastfeeding 100 mg (Yıldız and Nergiz, 1996).

It is observed that the amount of vitamin C is related to climate, especially temperature. The amount of vitamin C is higher in rosehip species grown in cold climates. Because the excessive production of vitamin C is a chemical protective armor for the plant to survive under these difficult conditions. It has been observed that fully ripe light-colored rosehip fruits contain higher amounts of vitamin C compared to very ripe and dark-coloured fruits; fully ripe light-colored fruits contain more vitamin C; and dark-colored

fruits have lower amounts of vitamin C (Razungles et al., 1989). Rosehip fruits are also a source of lycopene. This substance is an important active ingredient in protection against cancer. This substance can be isolated and used to make medicine.

CONCLUSION AND RECOMMENDATIONS

Four important new products have been introduced in the studies. Rosehip seed oil, Rosehip coffee powder, Rosehip hydrosol and Rosehip extract. New research should be done on economic importance of these products, their chemical composition, and their usage possibilities in health, food and cosmetics. After rosehip products reach industrialization, the evaporation process of water should be done by machines. Evaporation of water with spray dryer will reduce the cost of products. As production increases, more and different research will certainly be done on the shelf life, storage and packaging of products. Sensory analyses are very important in customer appreciation. The market value of products that appeal to the traditional taste of the people is high. Therefore, production with traditional methods has been taken as a basis in our study.

Rosehip food products are delicious and nutritious. Rosehip jam, tea or dried rosehip are important functional foods. They can add flavor to many foods with their sweet, sour and fruity aromas (Yamankaradeniz, 1983; Yılmaz et al., 1996; Türkben et al., 1999). Research focused on rosehip has mostly been conducted on its pomological and chemical properties to draw attention to its food and economic importance. Rosehip products are manufactured in Türkiye with traditional methods to meet domestic needs. Tea and fruit juice are produced as factory-made products in Gümüşhane; while a cold drink called 'rosehip syrup' is popular in Tokat. It is an unexpected result that rose factories, especially in Isparta, which is the gene center of the rose known as the heart of rose cultivation, remain indifferent to the issue in the Lakes Region. One reason for this is that while rosehip plants are processed in factories, only the fleshy part is used as food for the economy, and the seeds are considered waste, and therefore used as animal feed or fertilizer. The ratio of the seed to the fleshy part of the rosehip fruit is approximately the same. The weight of fresh fruit is slightly lighter than water. Dried fruit is significantly lighter than water. This is one of the main reasons why rosehip products are expensive. For this reason, great importance was given to the evaluation of the seeds in our study. Because the more we can process a raw material, the more we can add to the economy. Unprocessed raw material is waste, pollution. As processing techniques and methods are developed, the waste rate approaches zero; the cost of the products also decreases.

Rosehip fruits are considered important foods for health. Due to its antibacterial and antiviral properties, it is beneficial for cold and flu infections; due to its antioxidant properties, it is beneficial for skin health; and due to its anti-inflammatory properties, it is beneficial for joint pain, rheumatism and other inflammatory diseases. It strengthens the immune system and protects against cancer. It reduces the risk of cardiovascular diseases, diabetes and obesity.

Rosehip fruits are traditionally considered healthy (functional) foods due to their antioxidant, anti-inflammatory, antibacterial and antiviral properties. Due to their antibacterial and antiviral properties, they may have a protective effect against infections such as colds and flu (Kurucu and Kesikoğlu, 1990; Ileina and Bogdan, 1992). Due to their antioxidant properties, consumption of rosehip foods may help skin health, strengthen the immune system and have a protective effect against cancer. The anti-inflammatory properties of rosehip can provide relief from joint pain, rheumatism and other inflammatory conditions. Carotenoids are the components that give rosehip its color and have antioxidant properties. In addition, carotenoids have been reported to protect eye health and reduce the risk of cancer due to the abundance of lycopene in them. Polyphenols are another important component of rosehip and have antioxidant, anti-inflammatory and anticancer properties. Consumption of polyphenols may help reduce the risk of cardiovascular diseases, diabetes, and obesity (Mısırlı et al., 1999; Fettahi et al., 2017). Rosehip (*Rosa* L. spp.) fruit is a nutritious fruit that contains high amounts of vitamin C, antioxidants, phenolic compounds, flavonoids, carotenoids, and other bioactive components.

These compounds provide rosehip with various positive effects on health.

Rosehip fruit has high antioxidant capacity, anti-inflammatory effects, anticancer potential, antimicrobial activity and other biological properties. Türkiye is the gene center of the Rose/Rosehip genus. Around 500 Rosa genotypes grow naturally or are cultivated.

These genotypes differ in terms of various growth characteristics, fruit characteristics and chemical compositions. In addition, the differences between different rosehip genotypes allow for product development. In our study, approximately 15 rosehips were produced, 4 of which are introduced in this article in terms of production methods. It is a subject that can be developed for newer products.

Türkiye has an important position in the export of rosehip products. Rosehip products are exported to countries such as Germany, the Netherlands, England and the United States. In short; rosehips are versatile plants with a wide range of use and consumption. Being resistant to both diseases and pests and tolerating different climate and soil conditions has increased the amount and variety in use and production. In recent years, with food becoming strategic product and the increase in the need for food and diseases, it is clear that the need for rosehip products will increase even more in line with the increasing demand for natural and functional food products and nutrition. It is expected to be among the agricultural products whose production should be encouraged with the increase in drought and warming.

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