

SOME BENEFICIAL NUTRIENT AND MINERAL CONTENT OF MEDLAR FRUITS

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Abstract

In Hungary, there is a growing demand for consumption of natural foods like fruits and vegetables. To increase the variety of fruits, consumption of medlar may be an especially good solution by several ways. In our study we compared nutrient and macro and micro element contents in two medlar types. Dutch giant and Szentesi rose species had high potassium, calcium and magnesium content. Iron concentration was also high. In late autumn it can be a source of vitamin C as well. According to the results of our study it is worth rediscovering medlar. It is especially recommended for children and for adults with weakened immune system.

Our test results underline the importance of nutritional physiology and especially draw attention to the nutritional aspects of domestic species, especially Szentesi rose.

1 Introduction

Medlar (*Mespilus germanica* L.) is a tree-shaped, thorny or thornless shrub, with Mediterranean origin. It originated in southwestern Asia, from where it was brought to Europe, initially to Greece and Italy. This Mediterranean fruit belongs to the order of the *Rosales*, family of the *Rosaceae*, and subfamily of the apple variety *Maloideae*. Medlar plants need warm weather and sunlight but do not have high demand on the soil type. As its roots are located shallowly in the soil it needs moist soil and regular water supply.

Medlar was used by numerous civilizations, because of its healing properties for thousands of years. Since the introduction of some fashionable fruits, vegetables and spices in the last century, it has become unfairly neglected. Its fruit is hardly known in our country and is rarely available commercially.

However, this situation is changing. Medlar is deservedly returning to everyday menus due to its abundance of nutritious and healthy ingredients. Nutritional significance of medlar is due to its high nutrient and vitamin content. Its energy content is almost double of the apple [1]. Acid content is triple in general, in turn its protein and carbohydrate content is about 20-30% higher than that of the apple. It also has higher mineral content (P, K, Ca, Na, Fe) [9]. It is an excellent natural source of potassium, calcium, iron and magnesium.

Medlar is rich in nutrition and healing ingredients. It contains proteins, carbohydrates, tannin, pectin and organic acids (e.g. malic, tartaric and citric acid). It is rich in vitamin C and many vitamins of the B family.

Medlar is a natural remedy and a delicatessen you can use in various ways.

Ripe fruits have beneficial effects on the inflammation of the gastro-intestine system and diuresis.

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The soft ripe fruits can be used as a base of jams, fruit cheese, juices, and even liquors due to its high pectin content [5]. Green fruits are not suitable for direct consumption, but may be used as tea for treatment of inflammatory processes in some organs.

In our work we studied and compared the nutritional values of two types of medlar common in our region, to call attention for these potential beneficial effects of this unfairly ignored fruit.

2 Materials and methods

About 1kg fresh fruit crops, in the same level of ripeness, were collected from two types of medlar around mid-November 2014. These types were “Dutch giant” from the vicinity of Kecskemét, and the other “Szentesi rose” from the garden of Cserni in Kecskemét. Medlar plants of both types were in the same age (about 20 years old) and physical condition visually.

The samples were analyzed for air-dry matter content, and for the main macro and micro nutrient contents and in parallel, some nutritional assessments from fresh fruits have also been made.

Analytical tests were made in the Soil and Plant Testing Laboratory of the Faculty of Horticulture, Kecskemét College. Fresh fruit samples were thoroughly homogenized in rotary blended grinder. Dry matter content was measured in the samples, air-dried at 70 °C. Titratable acid, sugar and vitamin C were determined in 1:10 water extracts of grinded fresh fruit. Organic acid content was determined by neutralization analysis. Reducing sugar content was analyzed by Schoorl method, whereas vitamin C was determined by redox titrimetry [7]. Free organic acid content was expressed in the dominant malic acid, and reducing sugar content was expressed in fructose.

For elemental studies, powdered samples were digested in a microwave device by means of concentrated nitric acid and hydrogen peroxide (40 to 60 bar pressure, 210 °C, 20 minutes, Milestone Ethos Plus). Macro element contents were measured by an atomic emission spectrometer (ICP-AES) using standard methods. Nitrogen (organic and ammonium nitrogen) concentration was tested by Kjeldahl method after sulphuric acid digestion (FOSS Kjeltec). After the digestion and filtration, the proper dilution ratio was set with high purity deionized water.

Nitrate level was measured in water extracts as well, by continuous flow photometric method (FiaStar).

3 Results

Our results showed some differences in the nutrient components of the two examined medlar types. Dry matter content, titratable acid and reducing sugar content tended to be higher in the Dutch giant type. Main difference was shown in vitamin C content, which was about three times higher in the Szentesi rose (*Table 1*).

Table 1. Dry matter and some main nutritional components in fresh medlar fruit

<i>Parameter</i>	<i>Unit</i>	<i>Dutch giant</i>	<i>Szentesi rose</i>
Dry matter	m/m% .	25.4	22.6
Titratable acid	m/m% .	0.308	0.288
Sugar	m/m%	9.60	7.40
Vitamin C	mg/100g .	2.64	8.81

Regarding the main mineral elements, phosphorus level was higher in the Dutch giant, while potassium was about half of that measured in the Szentesi rose fruit (*Figure 1*). There was no difference in the level of calcium, magnesium and sodium in the two species. Sodium levels were low (42.0 and 43.5 mg/kg). Regarding the nitrogen forms, organic nitrogen content was about 60 percent higher in the Szentesi rose, but nitrate level was under the detection limit in it.

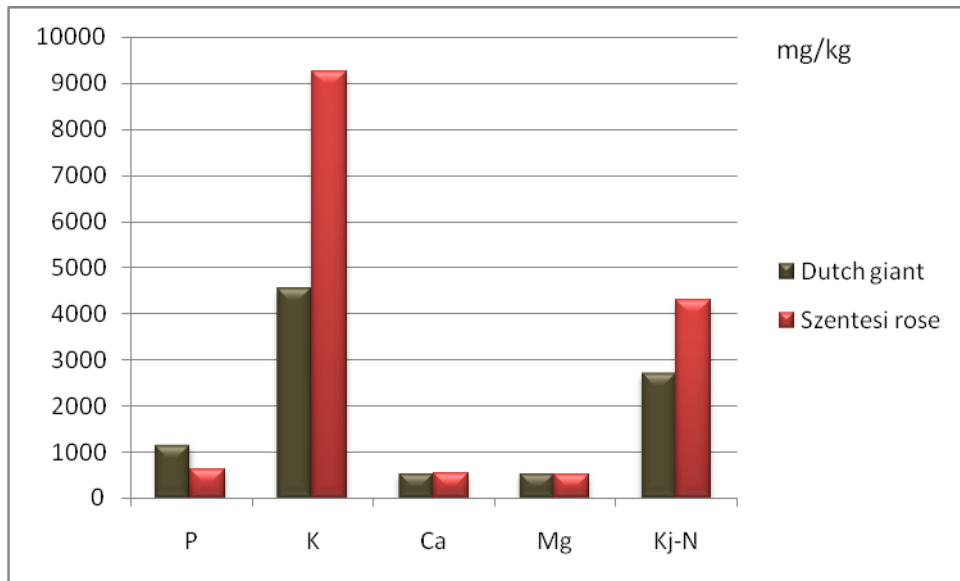


Figure 1. Main macroelement content in two medlar species

The levels of the main microelements were also compared. Among micronutrients, iron, manganese and cuprum level was higher in the species Szentesi rose, while zinc and boron was higher in the other medlar type (Figure 2). Molybdenum content was under the detection limit (<0.500 mg/kg) in both fruits.

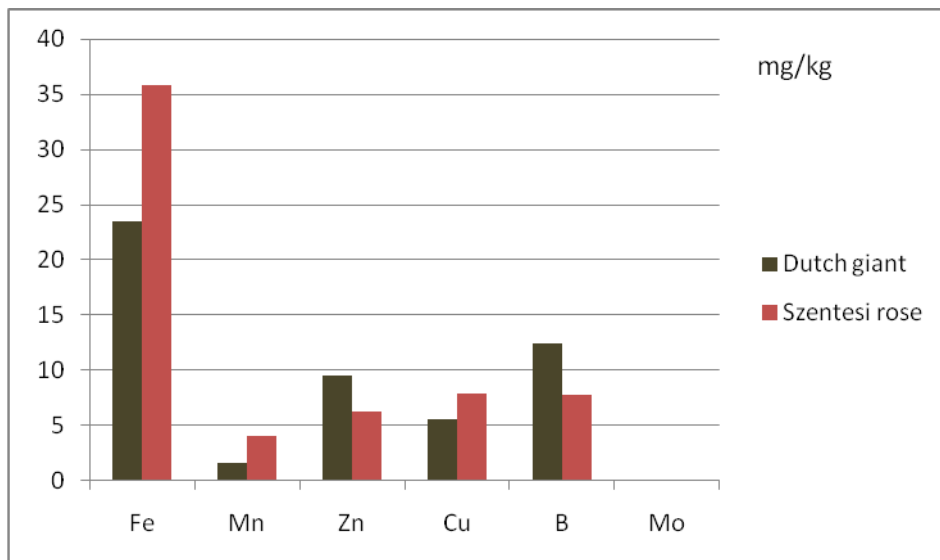


Figure 2. Main microelement content in dry matter in two medlar species

Domestic species, Szentesi rose is shown in Figure 3.



Figure 3. Szentesi rose (Cserni)

4 Discussion

In autumn, the supply of fresh fruits in gardens and in the market can be expanded with medlar. On one hand, its very tasty, sweet and distinctive flavor may guarantee its pleasant and beneficial use.

To increase the variety of fruits, consumption of medlar may be an especially good solution by several ways. The high sugar and organic acid content of medlar provides a pleasant taste. Its fruits, maturing in late autumn, are edible, but also make an excellent jam and its high vitamin C content strengthens the immune system, has strong antioxidant effect, and in winter helps the body's defense mechanism.

Mespilus is a typical fruit which gained value in human consumption in the recent years, so studying its nutritional and chemical composition seems to gain ground [2].

Large fruits of Dutch giant ripen in late autumn. The seeds of the fruit are large in size. The skin is thick, easily cracking. Szentesi rose type has dark green foliage and pear-shaped fruits with a high yield, achieved at the end of October.

Medlar has one of the highest Vitamin C contents, along the apples. Comparing the two types in this study showed that vitamin C content was about three times higher in the Szentesi rose.

It is known that large amounts of vitamin B1 are present in medlar as well. Vitamin B1 is necessary principally for mental clarity. Beside antioxidant vitamin C, carotene, phenols and other antioxidant components are present as well, so these help the protection of the body against the harmful free radicals and the proper function of the immune system [3, 6]. Free acid and sugar content tended to be higher in type Dutch giant, contributing to higher nutritional value in this aspect. Taking into account the dry matter content, the acidity levelled off, but the sugar content in dry matter was nearly 10% lower in Szentesi rose. Medlar has relatively high carbohydrate and sugar content. It is worth noting that pectin content is also important, as pectin facilitates and stimulates digestion, and it slows down the absorption of carbohydrates and has beneficial effects on blood sugar levels.

Macro and microelement content of medlar is around the average among fruits regarding potassium, calcium, sodium and phosphorus content, but about 50% higher compared to apple [9]. Among minerals, potassium level was the highest. It is in accordance with the results of others [8]. Potassium content of Szentesi was twice of that found in Dutch giant while total nitrogen was about 60% higher in the former. The fruit has a high N content, high protein content and the amino acid composition is also favourable [4].

Other analyzed macro nutrient (Ca, Mg, Na) levels were practically the same in the two species.

Regarding microelements, we found high iron content in both species, and cuprum, zinc, boron and manganese levels were also significant. The nutrient content of medlar, especially iron, potassium, calcium, magnesium, zinc helps provide the body with minerals. The level of iron, manganese and cuprum was higher in Szentesi, though the level of boron and zinc was higher in Dutch giant.

5 Conclusions

Our results draw attention on rediscovering medlar, in widening range of fruits in Hungary and help to show the beneficial nutrient and mineral constitution of this simple and easily growing, long life plant, suggesting beneficial effects on the body mainly in late autumn and winter. Our results showed higher vitamin C, potassium, nitrogen and iron content in the domestic species, Szentesi rose.

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