Pickled fruit platter of medlar (Mespilus germanica L.) and rosehip (Rosa canina L.)

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Abstract. The common medlar, or Germanic medlar, was grown by the ancient Greeks as early as 700 BC. This plant has been cultivated in the Caspian regions of Azerbaijan for 3000 years. In the folk medicine of the Caucasus, unripe fruits and seeds of medlar are used for stomach and intestinal diseases, and an infusion of leaves is used as a gargle for throat diseases. Far behind the times of the ancient Roman period, when it, thanks to its healing properties, was the most important fruit crop. In the 17th and 18th centuries, interest in it gradually declined. And at present, this plant is grown quite rarely, since the prospects for its cultivation are not clear enough. This is largely due to the almost complete lack of industrial methods of processing the fruits of this specific plant. The development of methods suitable for processing the fruits of the Germanic medlar can be an incentive for the revival of interest in this culture. This circumstance led to the purpose of this study, which was at least partially to fill in the marked gap.

Keywords: Germanic medlar, nutritional value, pickling method.

1. İntroductions.

This plant is native to Southwest Asia and Southeast Europe (despite the species epithet) and it was brought to Germany by the Romans. It prefers regions with warm summers and mild winters, sunny dry places and slightly acidic soil.

The fruits of this plant are special, attractive, as in the figure [1, p. 1].

Figure. Shape and color of the fruit of the common medlar.

In the North Caucasus, the common medlar is usually called "cones" in Russian [1, p.2].

The aroma of medlar fruit is described as rich, wine-like. Fruits contain sugar, organic acids and tannins. Fructose, glucose, and sucrose are identified as the main sugars [2, p. 365]. Fruits contain up to 20 fatty acids (10 saturated and 10 unsaturated) [3, p. 441]. Of the volatile compounds, they contain alcohols, aldehydes, esters, terpenes, and acids, with a total of 32 volatile components [4, p.439].

In cultivated form, the common medlar is sometimes found in the gardens of Georgia, Azerbaijan and the North Caucasus, as well as in the United States and some European countries, especially in Hungary, Yugoslavia, Bulgaria, France and other European countries. In the wild state, it grows throughout the Caucasus, in the Crimea, as well as in Asia Minor and the Balkans.

Medlar has medicinal and dietary properties. Its fruits have a strengthening effect on the walls of the intestinal canal and stomach and have a positive effect in the treatment of intestinal catarrh. However, the medlar fruit can only be used fresh for 50-60 days.

In Azerbaijan, you can sometimes find marinated medlar on wedding tables as a snack for alcoholic beverages. It is delivered by private individuals without accompanying documents and therefore passes the test only for the taste, which is excessively sour.

We considered that obtaining a marinade from medlar fruits is a good clue for expanding the processing of this almost "forgotten" type of horticultural and medicinal raw materials. And we set ourselves the task of obtaining a slightly acidic marinade and increasing its biological value, given that medlar fruits are so rich in organic acids, and ascorbic acid is poorly represented in them.

2. 3. Theory /calculation

As an effective direction, we chose the previously tested method of designing multicomponent food systems based on the relationships between physical and chemical characteristics using food combinatorics [5, p.2].

3. Research methods.

Cultivated medlar fruits were collected for three years from the same trees on the farm of one of the local farmers. The fruits of the wild medlar with a relatively smaller size were bought at the market in Guba from the same harvester of forest fruits and berries.

It was meant that in the future, the raw material for industrial processing can be not only the fruits of cultivated medlar, but also wild. Wild medlar is widely distributed along with wild pomegranate and quince in the Lenkaran-Astara region of Azerbaijan. Some of the varieties of medlar cultivated here have such names as "Xan ezgili", "Nəlbəki", "Kitil", "Aghezgil", "Arkivanezgil". According to academician P. M. Zhukovsky [according to M. Musaev, 7, p. 141], the medlar was cultivated by the inhabitants of the Caucasus, especially in the above-mentioned region.

As the fruits used in the preparation of the marinade, in addition to the fruits of wild and cultivated medlar, the fruits of various forms of dogwood (Cornusmas L.), hawthorn (Crataegus oxyacantha L.,) and dog rose (Rosa canina L.), widely distributed in the vicinity of Guba, were also tested. For this purpose, taking into account the preliminary assessment of the food-tasting advantages of the marinade samples, fresh dog rose (Rosa canina L.) fruits were selected. The

choice of the optimal recipe was made taking into account the opinion of the tasters and on the basis of the chemical composition of the laboratory samples of the marinade.

The primary task was to choose the optimal time for processing the fruit, given that during the harvest, the medlar fruits are hard, and the aged softened fruits are delivered to the market.

This issue is partially covered in the scientific literature.

During harvesting, the medlar fruits were hard with a diameter of 24.4-27.8 mm and a weight of 14.2 to 17.4 g. Later they became soft (when storing the fruits in the refrigerator, softening occurs after a few months). During the post-harvest storage period until their full maturation, they decreased in diameter by 12.8 %, and in weight-by 23.4 %. Softening was accompanied by a decrease in the content of soluble solids and titratable acids [6, p.80].

The study of the chemical composition of the fruits of the German medlar after 134, 144, 154, 164 and 174 days after the full flowering of the plant showed that the content of ascorbic acid in them, the total amount of phenolic compounds decreased along with the deepening of the ripening time. During the same period, their total antioxidant activity decreased, and the concentration of trace elements and macronutrients (phosphorus and sodium) increased. The decrease in the total antioxidant activity occurred together with a decrease in the content of ascorbic acid and the amount of polyphenols, which in itself is evidence that ascorbic acid and polyphenols play a leading role in the formation of the total antioxidant activity of the fruits of the common medlar [5. p.79].

4. Results.

Immature fruits are dirty green in color, after maturing they acquire their characteristic cover color and maximum size and become reddish with yellow or brownish, about 2-3 cm in diameter with five seeds in a hard shell.

Table 1. Chemical composition of medlar fruits during their mass collection and after 2 weeks of storage in the air until softening.

Indicators of chemical composition	Fruit consistency:	
	firm	soft
Water, g/100 g	78.1±0.80	80.3±1.00
Soluble dry substances, ºBrix	24.00±0.25	25.00±0.31
Acidity (according to malic acid), g/100 g	1.47±0.02	1.00±0.01
Sucrose, g/100 g	0.00	0.00
Monosaccharides, g/100 g	12.78±0.13	13.34±0.17
Protopektin, g/100 u	1.71±0.02	0.44±
İnstant pektin, g/100 g	0.78±0.008	1.68±0.005
Üater-soluble poliphenols, g/100 g	3.10±0.03	1.00±0.01
Ascorbic acid, mg/100 g	2.94±0.03	1.94±0.02
Sugars-acid index	8.7±0.09	13.3±0.17

Average value of 5 repeated definitions ± SD

As can be seen from Table 1, solid medlar fruits of the period of their mass collection in terms of the concentration of polyphenols and ascorbic acid are higher than softened fruits as a result of their two - week aging in the post-harvest period.

Therefore, the technological experiments included the still solid fruits of medlar.

Some residents of the Gusar district of our republic have long used the method of preserving medlar fruits at home, including washing them, cleaning them with a sharp knife from the sepals and the pointed tip and laying them all the way to the top in glass jars with a wide neck (volume 1, 2 or 3 liters). To them, add fresh sea buckthorn fruits (in the amount of 7-10 pieces), sugar (one teaspoon per liter jar of the product), fill the remaining free space with clean water and seal with nylon lids.

The time of full maturation of the product is determined by the degree of swelling of the medlar fruits in the jar – in the ready-to-use product, the fruits crack from the moisture absorbed in them and the state of the liquid part of the product, which by this time is enriched with soluble pectin diffused into it from the fruits. The maturation period of the product lasts at least two weeks.

Aging is carried out at room temperature for about two weeks. During this time, it acquires a special taste as a result of the fermentation processes occurring in it. As a result of this method, a product of the "fruit in cider" type is obtained with a pleasant refreshing taste, which gives it 2-4 % ethyl alcohol content, almost the same sugar content and an abundant content of organic acids.

This method of preserving medlar has also been tested by us; the results of these tests indicate that the sensory characteristics of this product are mainly determined by its recipe, which is selected quite successfully taking into account its final taste and the need to increase its durability. Therefore, we did not build our own options, since this product is very popular with local Lezgins as it is and corresponds to their ideas about food.

In Azerbaijan, as a snack to alcoholic beverages, you can also find marinade and pickles made from medlar fruits at home. They are delivered by private individuals to restaurants, having passed the taste test only.

The chemical composition of these three products is the same as in Table 2 .

As the closest analogue, we chose the method of making pickled fruits, which is described in the special literature [8, p. 246].

The essence of this prototype method is that fruits of different types are washed, low-value parts are removed mechanically, placed in glass jars, a component containing sugar, acetic acid and extracts from spices is added, corked and pasteurized.

Table 2. Chemical composition of processed products of medlar fruit.

Types of canned fuood	Soluble dry substances, ° Brix	Simple sugars, g/100 g		Acidity (according to malic acid), g/100 g	Vitamin C, Mg/100 g
		Sucrose	Monosacha-rides		
Medlar fruit marinade	23.0±0.6	2.98±0.08	15.21±0.40	1.1±0.03	3.17±0.08
Soaked medlar fruit	7.0±0.25	0.78±0.03	0.59±0.02	0.60±0.02	1.58±0.06
Medlar pickle	7.0±0.25	0.00	0.47±0.02	0.53±0.02	1.58±0.07

Average value of 5 repeated definitions ± SD

Depending on the content of acetic acid in this way get:

Acidic marinades from grapes, cherries, dogwood, gooseberries, plums and currants with acetic acid content of 0.2 – 0.4 %; slightly acidic marinades from pears and apples with the content of acetic acid 0.41 – 0.60 %; sour pickles from grapes, plums and pumpkins with the content of acetic acid 0.61 – 0.80 %; disinfectants with the content of acetic acid of 0.41 – 0.80 percent .

Experiments were conducted on the preparation of a marinade from medlar fruits, which showed that with such a recipe, the product turns out to be too acidic in taste and low in vitamin C.

It should be noted that the low content of vitamin C and other vitamins is not only a disadvantage of this product. This disadvantage is typical for almost all canned products produced today. Nutritionists recommend enriching canned food with biologically active additives of plant origin in order to avoid this disadvantage.

Table 3. The chemical composition of the fruits of wild and cultivated German medlar and the marinades obtained from them by known and proposed methods.

Object of analisis	Soluble dry substances, ° Brix	Simple sugars, g/100 g		Acidity, g/100 g	P-active phenols, mg/100 g	Vitamin C, mg/100 g
		Моно-сахариды	Сахароза			
Wild medlar fruit	22.3±0.25	0.46±0.01	14.04±0.16	1.37±0.02	830.0±	8.94±9.30
Marinade of wild medlar (according to the prototipe method).	21.8±0.50	2.44±0.06	14.14±0.33	1.54±0.04	300.0±6.88	3.87±0.09
Marinade of wild medlar and rosehip fruits (according to the proposed method).	22.1±0.60	1.52±0.04	14.30±0.39	1.00±0.03	400.0±10.86	36.4±0.99
Fruits of the cultivated medlar	23.7±0.25	1.45±0.02	14.26±0.15	0.65±0.01	620.0±6.54	6.4±0.07
Marinade of cultivated medlar	22.0±0.55	2.34±0.06	14.76±0.37	1.12±0.03	250.0±6.25	3.52±0.09

(according to the prototype method).						
Marrinade of cultivated medlar and rosehip (according to the proposed method).	22.7±0.60	1.76±0.05	14.96±0.40	0.60±0.02	300.0±7.93	29.92±0.79

Average value of 5 repeated definitions ± SD

To meet the requirements of modern science for healthy food made from fresh fruits, healthy food products must be free from these disadvantages.

For this purpose, the recipe of the marinade of assorted medlar fruits and dog rose fruits, which ripen at the same time, was selected. Table 3 shows that this significantly enriched the marinade with vitamin C and P-active polyphenols, as well as slightly reduced its overall acidity (by reducing the amount of acetic acid used).

The proposed method is patented [9, p. 2] and is carried out as follows.

Example 1.

In obtaining a new type of marinade, fresh fruits of cultivated medlar and dog rose with the following *characteristics are used*:

Medlar -width 32.77 mm, height 31.78 mm, weight 16.3 g;

Rosehip - width 18.0 mm, height 23.1 mm, weight 3.0 g.

Initial data for a glass jar 1-82-500 (capacity 500 cm3; diameter of the corolla neck 82 mm; height 118 mm; weight 240 g): net weight of the product 559.6 g; percentage ratio between medlar and rosehip fruits and filling 55.4 – 8.9 – 35.7.

Recipe bookmarks for 559.6 g of the finished product: fruits of cultivated medlar 310 g; dog rose 49.6 g; filling 200 g.

Mature (but not softened) fruits of cultivated common medlar and dog rose are first inspected for quality, washed, sorted by size, cleaned from pedicels and sepals by mechanical means, then put them in glass jars with a capacity of 500 cm^3. Put in cans of 310 g of medlar and in the free spaces between them-49.6 g of rosehip fruits. Cans filled with fruit are served to the filling filler. Add 200 g of filling to each jar (with a filler), put tin lacquered lids on their necks, roll them up with a seaming device and pasteurize them for 15 minutes at a temperature of 85^0 C, taking 15 minutes for heating and the same time for cooling.

Before use, store at least two weeks to impregnate the fruit and establish the same taste over the entire mass of the fruit filler.

The preparation of the filling includes three operations: preparation of the spice extract; preparation of sugar syrup; mixing sugar syrup with acetic acid and extract from spices.

The technology of extraction from spices for 559.6 kg of the product (with the above initial characteristics) consists in the fact that a mixture of spices in the composition of cinnamon 0.25 kg, cloves 0.10 kg, allspice 0.115 kg is poured 49 liters of water and brought to a boil. After that, the solution is kept for 12-24 hours in a hermetically sealed vessel. Then the contents are reheated to a boil and cooled, after which they are filtered through a cloth filter. The mass of the filtered hood should be 44.8 kg.

To prepare sugar syrup, pre-sifted sugar is weighed in an amount of 40 kg and loaded into a boiler, 113.6 liters of water is added, dissolved with stirring, brought to a boil and boiled for 2-3 minutes, then filtered through a linen filter. To the filtrate, add 1.6 kg of acetic acid (in terms of 80 %).

Mix sugar syrup with a spice extract immediately before packaging. To the acidified syrup, add a pre-prepared extract of spices in the amount of 44.8 kg and water in the amount necessary to bring the filling mass to 200 kg.

Example 2.

In obtaining a new type of marinade, fresh fruits of wild medlar and dog rose are used with the following *characteristics* are used:

Medlar-width 25.60 mm, height 26.60 mm, weight 11.0 g;

Rosehip-width 14.0 mm, height 17.8 mm, weight 1.3 g.

Initial data for a glass jar 1-82-500 (capacity of 500 cm3, diameter of the corolla neck 82 mm, height 118 mm; weight of 240 g): net weight of the product is 568.0 g; the percentage ratio between medlar and rosehip fruits and filling is 52.8 -8.5 - 38.7.

The recipe of the bookmark for 559.6 g of the finished product: fruits of cultivated medlar 300 g; dog rose 48.0 g; filling 220 g.

Mature (but not softened) fruits of cultivated common medlar and dog rose are first inspected for quality, washed in washing machines, sorted by size using calibration machines, cleaned from pedicels and sepals by mechanical means, then laid in glass jars with a capacity of 500 cm^3. Lay 300 g of medlar and in the free spaces between them – 48.0 g of rosehip fruits. Cans filled with fruit are served to the filling filler. Add 220 g of filling to each jar (with a filler), put tin lacquered lids on their necks, roll them up with a seaming device and pasteurize them for 15 minutes at a temperature of 85^0 C, taking 15 minutes for heating and the same time for cooling.

Before use, store at least two weeks to impregnate the fruit and establish the same taste over the entire mass of the fruit filler.

The preparation of the filling includes three operations: preparation of the spice extract; preparation of sugar syrup; mixing sugar syrup with acetic acid and extract from spices.

The technology of extraction from spices for 568.0 kg of product from the fruits of cultivated medlar and dog rose (with the above characteristics) consists in the fact that a mixture of spices in the composition of cinnamon 0.26 kg, cloves 0.10 kg, allspice 0.12 kg is poured 452 liters of water and brought to a boil. After that, the solution is kept for 12-24 hours in a hermetically sealed vessel. Then the contents are reheated to a boil and cooled, after which they are filtered through a cloth filter. The mass of the filtered hood should be 45.0 kg.

To prepare sugar syrup, pre-sifted sugar is weighed in an amount of 46 kg and loaded into a boiler, 128.0 liters of water is added, dissolved with stirring, brought to a boil and boiled for 2-3 minutes, then filtered through a linen filter. To the filtrate, add 1.6 kg of acetic acid (in terms of 80 %).

Mix sugar syrup with a spice extract immediately before packaging. To the acidified syrup, add a pre-prepared extract of spices in the amount of 45.4 kg and water in the amount necessary to bring the filling mass to 220 kg.

5. Conclusions

The proposed method allows you to use medlar fruits in obtaining a new product for a healthy marinade diet and expand the range of pickled fruits.

6. References

1. Common medlar vulgaris - Medicinal properties of food plants. URL: rasten.liferus. ru/ fruit_berry_ mushmula. aspx (Accessed 12.04.2016).

2. Glew R.H., Ayaz F.A., Sanz C. et al., 2003. Changes in sugars, organic acids and amino acids in medlar (Mespilus germanica L.) during fruit development. Food Chem. 83: 363–369.

3. Ayaz F.A., Huang H.S., Chuang L.T. et al., 2002. The fatty acid composition of medlar (Mespilus germanica) fruit at different stages of development. Ital. J. Food Sci. 14: 439–445.

4. Milovan M. Veličković, Dragan D. Radivojević, Čedo Đ. Oparnicaet et al., 2013. Volatile compounds in Medlar fruit (Mespilus germanica L.) at two ripening stages. Hem. Ind. 67(3): 437-441.

5. Hafizov G. K., Mamedov D. Sh., Abubekirov G. Sh. Method of production of fruit mixture. Patent Az No. i 2016 0062 (Application no. a 20100096). 2014. Bulletin no. 2.

6. Rop O., Sochor J., Jurikova T. et al,2011. Effect of five different stages of ripening on chemical compounds in medlar (Mespilus germanica L.). Molecules, 2011. 16: 74–91.

7. Musayev M., Akparov Z., Huseynova T., 2014. Importance of biodiversity of fruit crops and their wild relatives for food and nutritional security in Azerbaijan. J. of Crop and Weed. 10(2): 141-146.

8. Collection of technological instructions for the production of canned food. Vol. 2. - M.: Food industry, 1977. - P. 246-250.

9. Hafizov G. K., Mammadov D. Sh., Abubekirov G. Sh. Method for obtaining fruit marinade. Patent Az No. i 2016 0061 (Application no. a 2009 0027). 2011. Bulletin no. 4.