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# MULBERRY, ITS CHEMICAL COMPOSITION AND USE AS A FOOD SUBSTANCE

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**Annotation**
The article presents the results of studying the chemical composition of mulberry fruit and mulberry molasses made from it. The amount of carbohydrates and dietary fibers, as well as proteins, fats, a number of vitamins and minerals contained in mulberry molasses was determined and analyzed.
Based on the analysis, the medicinal properties of mulberry molasses, its use in the treatment of certain diseases and the technology of its preparation were concluded and the necessary information was provided.

**Keyword:** mulberry, mulberry holly, sun holly, pearl mulberry, mulberry, carbohydrates, ballast substances.

## Introduction

It is known that useful and healing drinks, juices, molasses have been prepared from various fruits in oriental medicine since ancient times. Due to their useful and healing properties, it was customary to use them both as food and medicinal drink. One of such important products is molasses made from mulberry fruit [2]. Mulberry fruit is watery and contains 11-12.7% carbohydrates. If the mulberry is dried and eaten, the amount of juice increases, especially in the mulberry raisin, the carbohydrate content is 73.3-83.7%. In addition, mulberry is rich in vitamins of group B, C, E, K, RR. Mulberry contains a lot of minerals such as potassium, sodium, zinc, selenium, copper, phosphorus, calcium, magnesium, and iron [7, 8].
The above-mentioned vital substances are preserved in sufficient quantities in mulberry molasses. Accordingly, there is good reason to say that studying the chemical composition of mulberry molasses on an experimental basis is one of the most important issues today.
Another aspect justifying the relevance of the mentioned problem is that mulberry fruit, especially mulberry molasses, can be used effectively in the treatment of many diseases. In particular, scholar Abu Mansur, who lived in the 9th-10th centuries,

recommended the use of mulberry molasses in upper respiratory tract diseases, as a cough suppressant and as a remedy against colds. In his works, the famous doctor Husayn Sherozi admitted that "Mulberry molasses creates clean blood in the human body, gives energy to the brain, opens blockages in the organs, improves the functioning of the liver and spleen, and is also a diuretic" [5, 8]. Abu Ali ibn Sina, the Sultan of Medicine, says this about mulberry: "mulberry repels swellings of the mouth and throat, and its leaves are useful for swellings from both sides of the throat." All types of mulberries should be eaten before meals, so that they do not harm the stomach" [1].

It can be seen that mulberry fruit and products made from it have been used in medicine for thousands of years. Currently, it is recommended to use mulberry fruit and its molasses for people who are weakened by various diseases, people who often catch colds, young people in the period of growth and development, pregnant women, people who are constantly engaged in mental activities, people suffering from deprivation and diseases of the cardiovascular system.

According to information, mulberry molasses is effectively used in asthma, bronchitis, pneumonia, angina, anemia, gout, diabetes, peptic ulcers, as well as in various intestinal diseases such as colic, enterocolitis [7, 8].

In folk medicine, mulberry molasses is widely used for fever, to purify blood, to increase mental strength, to eliminate swellings in the mouth and throat, as well as to improve eyesight, to move phlegm, to reduce temperature, to increase blood, to drive urine, and to heal wounds [7].

Mulberry molasses satisfies the daily need for a number of vitamins and minerals, provides necessary energy to the athlete's body, improves mental activity, has a positive effect on the cardiovascular system, and serves as an important source of nutrition for pregnant women [3, 6].

The importance of mulberry molasses is immeasurable, and it has many potential uses in many diseases. In a word, mulberry molasses stands out as both a high-value nutritional product and a medicinal substance.

However, today, attention to the consumption of this product has decreased, and it is not used in most cases. Instead, among young people and adults, there is a clear aversion to various sweets, sugar-courses, all kinds of confectionery or other types of products produced on the basis of modern technological means. Several studies have shown that such "modern" products have more negative aspects than positive ones. Especially in the last 100 years, the large-scale production of sugar on an industrial scale has further weakened the focus on natural products. As a result, obesity,

diabetes, cancer, cardiovascular disease and many other "civilization" diseases have increased among the population [3, 6].

Mulberry and mulberry molasses are considered to be very important products in preventing the above-mentioned negative situations and meeting the population's demand for sweets and carbohydrates. If we take into account many of the mentioned properties, it becomes clear that the determination of mulberry molasses and its chemical composition in laboratory conditions, as well as the study and analysis of its medicinal and useful properties, is one of the most urgent issues today.

**Purpose of Work**

To study the methods of preparation of mulberry molasses, to determine its chemical composition based on laboratory analysis, to analyze the nutritional, useful and healing properties of the product, and to promote its consumption.

**Material and Methodology**

For research, mulberry molasses made from local mulberry varieties grown in Karshi district of Kashkadarya region, especially from Balkh mulberry (white mulberry) variety, was taken. Local mulberry molasses was made at home from the May-June 2022 harvest of white mulberries.

The chemical composition of the finished product was studied in a special laboratory at the Faculty of Food Industry of the Institute of Counter-Engineering Economics. The methods of polarimetry and refractometry were used. The measurements were carried out on a modern Universal sugar meter - polarimeter P1000-LED (DIiCHTe GmbH Siemensring 9147877 Willich, District Court Krefeld HRB 12256 Germany/ production time 18.08.2019) and Refracto METTLER TOLEDO devices [4].

Studies were conducted in two series, both results were compared and the average amount was taken. In the studies, the main attention was paid to the amount of carbohydrates, vitamins and minerals in the sample.

The obtained results and their analysis. The obtained results showed that the chemical composition of mulberry molasses is rich in many substances. In particular, the amount of carbohydrates in 100 grams of mulberry molasses is 46.9 grams on average, and in addition, this product contains 1.44 g of protein, 0.35 g of fat, and 1.9 g of dietary fibers. The table below shows the determined amounts of macro- and micronutrients in mulberry molasses.

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**Table. Chemical composition of mulberry molasses (in 100 g of product)**

| | | |
|---|---|---|
| **Macronutrients, g** | | |
| 1. | Proteins | 1,44 |
| 2. | Oils | 0.35 |
| 3. | Carbohydrates | 45,8 |
| 4. | Dietary fiber | 1,9 |
| 5. | Laughter | 0,68 |
| **Vitamins, mg** | | |
| 6. | Vitamin A (retinol) | 1 |
| 7. | Vitamin B1 (thiamine) | 0.029 |
| 8. | Vitamin B2 (riboflavin) | 0.102 |
| 9. | Vitamin B6 (pyridoxine) | 0.06 |
| 10. | Vitamin B9 (folic acid) | 0.089 |
| 11. | Vitamin C (ascorbic acid) | 33.5 |
| 12. | Vitamin E (tocopherol) | 12,5 |
| 13. | Vitamin K (phylloquinone) | 7.8 |
| 14. | RR vitamin (nicotinic acid) | 0.63 |
| **Mineral substances, mg** | | |
| 15. | Calcium (Ca) | 109 |
| 16. | Magnesium (Mg) | 15 |
| 17. | Sodium (Na) | 32 |
| 18. | Potassium (K) | 121 |
| 19. | Phosphorus (P) | 12 |
| 20. | Iron (Fe) | 1.9 |
| 21. | Copper (Cu) | 60 |
| 22. | Zinc (Zn) | 0.12 |

The results show that mulberry molasses contains a large amount of carbohydrates, i.e., 46.9 g of carbohydrates per 100 g of product. Dietary fiber in mulberry molasses is 1.9 g. This high level of carbohydrate content in molasses increases both its nutritional value and medicinal value. In addition, this indicator is the main factor in the fact that mulberry molasses is a very nutritious product. Such amount in 100 g of product is important in meeting the need for carbohydrates and providing the body with a significant amount of energy. The results show that mulberry molasses contains a large amount of carbohydrates, i.e., 46.9 g of carbohydrates per 100 g of product. Dietary fiber in mulberry molasses is 1.9 g. This high level of carbohydrate content in molasses increases both its nutritional value and medicinal value. In addition, this indicator is the main factor in the fact that mulberry molasses is a very nutritious product. Such amount in 100 g of product is important in meeting the need for carbohydrates and providing the body with a significant amount of energy.

Mulberry molasses is especially important as an energy source for growing children and adolescents, pregnant women, athletes, and people engaged in constant physical activity. The dietary fibers contained in molasses participate in many vital functions necessary for the human body.

The most common vitamins in mulberry molasses are ascorbic acid (vitamin C), tocopherol (vitamin E) and phylloquinones (vitamin K). The obtained results show that the amount of these vitamins in mulberry molasses is 33.5 mg, 12.5 mg and 7.8 mg, respectively.

Mulberry molasses is unique in that the amount of vitamin C, that is, ascorbic acid, is high compared to many other products. In particular, the amount of this vitamin in mulberry molasses is close to the amount of vitamin C in citrus fruits, that is, lemons and tangerines (for comparison: 100 g of lemon and orange contain 40.0 mg and 38.0 mg of ascorbic acid, respectively). Based on this, it can be said that mulberry molasses can be recommended in all cases related to vitamin C deficiency. In particular, ascorbic acid actively participates in important processes such as increasing immunity, controlling metabolism, and improving the condition of the mucous membrane of the digestive tract. It should also be noted that the daily need for ascorbic acid increases in people who smoke regularly, who live in an ecologically unbalanced region, pregnant women who take a lot of various drugs, antibiotics, people who are often exposed to the effects of stress, and athletes. In the present complex situation, where there are many negative situations in our life, it is appropriate to use mulberry molasses as a source of vitamin C effectively.

The high content of vitamin E in mulberry molasses increases its value. In particular, mulberry molasses can be used for changes related to sexual activity, increasing muscle mass, cleaning blood vessels from various blockages, and improving heart muscle activity. It is known from the literature that vitamin E is present in large quantities in products such as bread, buckwheat groats, chakanda, spinach, and eggs. The content of vitamin E in mulberry molasses is several times higher than that of these nutrients. In a word, mulberry molasses serves as the most important natural source of tocopherol.

Our research has shown that mulberry molasses also contains a lot of minerals. In particular, 100 g of the studied product contains 197 mg of potassium, 60 mg of copper, 41 mg of calcium, 35 mg of phosphorus, and 1.97 mg of iron.

The amount of potassium in mulberry molasses is higher than in products such as wheat flour, buckwheat, carrots, cabbage, khadi, fish, and milk. This increases the possibility of using mulberry molasses in cases of potassium deficiency. In particular, mulberry molasses can be used rationally in important processes such as improving

the activity of heart muscles, ensuring the normal functioning of soft tissues (brain, kidney, stomach, intestine, liver, endocrine glands, etc.).

According to the amount of calcium, mulberry molasses can be equal to important products such as some citrus fruits, khadi, carrots, turnips, cabbage, beets. As a result, mulberry molasses can be recommended for all processes that require calcium in the body (ensuring the strength of bones, controlling muscle contraction, maintaining the same biochemical composition of blood, normal blood clotting, ensuring neuromuscular excitability, etc.).

It should be noted that the content of iron and copper elements in mulberry molasses is very high. This is an important indicator that determines the role of mulberry molasses in blood formation. The reason for this is that it is iron and copper that together ensure normal blood formation. The amount of iron in mulberry molasses is almost equal to products such as wheat bread, buckwheat, apples, apricots, plums.

It is noteworthy that the amount of copper element in mulberry molasses (60 mg) is several times higher than a person's daily need for this element. In addition, mulberry molasses also contains zinc, which, together with copper, is a component of many enzymes.

In general, mulberry molasses contains a significant amount of vitamins, macro- and microelements, which serves as an important indicator of its nutritional and healing properties. The presence of many micronutrients in such a high amount in one product determines their complex effect. Accordingly, mulberry molasses has a positive effect on the normalization of many physiological and biochemical processes in the body.

The results of our observation confirm the accuracy of the information given in the literature about mulberry molasses [5-8]. It allows us to conclude that mulberry molasses is an invaluable product due to its medicinal and nutritional value.

Based on the above, it can be noted that the use of mulberry molasses in the daily consumption of the population, as well as in the food industry as a nutrient rich in natural vitamins and minerals, is of great importance. Accordingly, a more in-depth analysis of the chemical composition of mulberry molasses, the study of its medicinal properties in clinical conditions, and the development of necessary measures for its practical application will allow the wide and effective use of this product, providing the population with a nutritious, high-quality and healing food source.

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